



MID TERM EVALUATION REPORT

GRAMYA-II

Uttarakhand Decentralised Watershed
Development Project

**WATERSHED MANAGEMENT
DIRECTORATE, (WMD),
UTTARAKHAND**

IDA [Credit No. 5369-IN]

Acknowledgement

The Consultant would like to thank all those who participated in the Mid Term Review Process. We would like to acknowledge the contribution of Ms. Neena Grewal (Project Director), all the DPDs (at Directorate and Division level), the Consultants at Directorate & GIS Team for the key role each of them played in refining the research tools and extending support to the Consultant during survey and inputs. We would like to extend our gratitude to the respective unit officers who facilitated the piloting process, the field work and released the necessary staff for operational support in the data collection process with our team. Most importantly, the consultant would like to acknowledge the hospitality and enthusiasm shown by the villagers who were involved in the study. Their participation in discussions and interview sessions demanded much time, yet it was willingly given.

The Consultant hopes that this study will assist WMD in further improving the quality of its projects, thereby ultimately benefiting villagers in the division. The credit for this report is shared among all those who assisted one way or the other in accomplishing this study while we owe the responsibility for all the errors and omissions in this study. Any comments, suggestions would be helpful for planning further research activities.

T able of Contents

Abbreviations.....	5
List of Tables	8
List of Figures.....	12
List of Success Stories	13
Annexure.....	14
Executive Summary	16
1. Project Background.....	40
1.1 Watershed Development: An Overview	40
1.2 Learnings from UDWDP I.....	40
1.3 About the Project Components	41
2. Project Description	45
2.1 Project Details.....	45
2.2 Project Budget Allocations	47
2.3 Institutional and Implementation Arrangements.....	48
3. Scope of Mid Term Review	56
3.1 Scope.....	56
3.2 Methodology and Sampling.....	56
3.3 Tools for MTR.....	57
3.4 Process of the Mid-Term Survey and Data Analysis	58
3.5 Sample Description.....	59
4. Project Results	65
4.1 Soil and Water Conservation	65
4.2 Forestry	93
4.3 Agriculture and Allied Sectors.....	114
4.3.1 Agriculture and Horticulture.....	114
4.3.2 Livestock and Animal Husbandry.....	143
4.3.3 Energy Conservation.....	153
4.4 Agribusiness and Value Chain.....	161
4.5 Environment and Social Safeguard.....	203
4.6 Institution Development and Capacity Building.....	215
5. Knowledge Management and Project Coordination	236
6. Project Impacts	256

6.1 Social Impacts.....	256
6.2 Environmental Impacts	269
6.3 Economic Impacts.....	271
6.4 Institutional Impacts	274
7. Economic Analysis and Projection	278
Annexure.....	286

Abbreviations

AAY	Antyodaya Anna Yojana
ABGC	Agri Business Growth Centre
ABSO	Agri Business Support Organisations
AI	Artificial Insemination
ANR	Assisted Natural Regeneration
AWP	Annual Work Plan
AWS	Automatic Weather Station
BA	Bachelors of Arts
BCR	Benefit Cost Ratio
BEF	Biomass Expansion Factor
BPL	Below Poverty Line
CartoSAT DEM	Cartosat-1 Digital Elevation Model
CBH	Circumference at Breast Height
CD	Change Detection
CS PRO	The Census and Survey Processing System (Software)
DBH	Diameter of Breast Height
DiD	Difference-in- Difference
DN	Digital Numbers
DPD	District Project Director
ESG	Environmental and Social Guidelines
ESMF	Environment and Social Management Framework
FF	Farmer Federation
FIGs	Farmer Interest Groups
FNGO	Field Non-Government Organisation
FPO	Farmer Producer Organisation
FRR	Financial Rate of Return
FY	Financial Year
FYM	Farm Yard Manure
GCA	Gross Cropped Area
GIS	Geographic Information System
GoI	Government of India
GoUK	Government of Uttarakhand
GP	Gram Panchayat
GPS	Global Positioning System
GPWDPs	Gram Panchayat Watershed Development Plan

GRM	Grievance Redressal Mechanism
HH	Household
ICAR	Indian Council of Agricultural Research
IDA	International Development Association (World Bank)
IEC	Information, Education, Communication
IEG	Institute of Economic Growth, Delhi
IGA	Income Generation Activity
INM	Integrated Nutrient Management
IPM	Integrated Pest Management
IPNM	Integrated Plant Nutrient Management
IR	Irrigated
IWMP	Integrated Watershed Management Programme
LAI	Leaf Area Index
LDP	Low-density polyethylene
LULC	Land Use Land Cover
LULUCF	Land Use, Land Use Change and Forestry
M&E	Monitoring and Evaluation
MAP	Medicinal and Aromatic Plants
MDM	Minimum Distance to Mean
MDT	Multi Disciplinary Team
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	Management Information System
ML	Maximum Likelihood
MLE	Monitoring, Learning and Evaluation
MSL	Mean Sea Level
MTR	MidTerm Review
MWS	Micro Watershed
NBC	Natural Breeding Centres
NDVI	Normalized difference vegetation index
NGOs	Non-Government Organisation
NRM	Natural Resource Management
NRSA	National Remote Sensing Agency
NSS	National Sample Survey
OBC	Other Backward Caste
ODK	Open Data Kit
PAD	Project Appraisal Document
PDO	Project Development Objective
PME	Participatory Monitoring Evaluation
PMU	Project Management Unit
PNGO	Partner Non Government Organisation
PoP	Poorest of Poor
POP	Package of Practices
PRA	Participatory Rural Appraisal

PRI	Panchayati Raj Institution
PVB	Present Value of Benefits
PVC	Present Value of Costs
RF	Reserved Forests
RVC	Revenue Village Committee
SC	Scheduled Castes
SHG	Self Help Groups
ST	Scheduled Tribes
TAP	Transhumant Action Plan
VGF	Vulnerable Group Family
VGI	Vulnerable Group Individual
VPKAS	Vivekananda Parvatiya Krishi Anusandhan Sansthan
WMD	Watershed Management Directorate
WOP	Without Project

List of Tables

Table 1: Summary of Results	32
Table 2: Details of Project Area under UDWDP II	46
Table 3: Project Budget Allocations	47
Table 4: Panchayat Level Institutions	48
Table 5: Field Level Institutions	50
Table 6: Field Level Institutions	54
Table 7: Distribution of the Sample Project Villages by Topography	60
Table 8: Distribution of Sample by District and Reach	60
Table 9: Distribution of Sample by District and Farmer Category	61
Table 10: Distribution of Sample by Gender	61
Table 11: Distribution of Sample by Social Group	62
Table 12: Distribution of Sample by Poverty Group	63
Table 13: Water sources Rejuvenated - Average Pre monsoon (Dec-Jan) Discharge of water (In lpm)	68
Table 14: Water sources Rejuvenated - Average Post monsoon (May-June) Discharge of water (In lpm).....	68
Table 15: Summary of Water sources Rejuvenated under Gramya II	68
Table 16: Increase in rainfed area brought under irrigation in Gramya II	69
Table 17: Area Details of 8 MWS	71
Table 18: Gram Panchayat Details of 8 MWS.....	71
Table 19: Traditional water sources rejuvenated in Gramya II.....	79
Table 20: Total area impacted through natural resource conservation techniques till March 2019.....	80
Table 21: Farmers adopting soil moisture conservation technology (% of households)	81
Table 22: Soil Moisture Conservation Measures Adopted	82
Table 23: Progress of Drainage line treatment and river / Nala training work	82
Table 24: Progress in implementation of Soil Conservation Measures	83
Table 25: Progress in implementation of Terrace repair / Vegetative field boundaries.....	83
Table 26: Progress in implementation of Water Harvesting & Source Sustainability measures	84
Table 27: Progress in preparation of Soil Health Cards.....	84
Table 28: Progress in implementation of Inter GP Fund Activities as per MWS Plans in RF Areas	85
Table 29: Progress in Implementation of Inter GP Fund Activities as per MWS Plans within GP area	85
Table 30: Percentage of Households adopted natural resource conservation techniques	87
Table 31: Yield of Irrigated Crops and Income Impacts (With Project).....	88
Table 32: Progress in implementation of Water Harvesting & Source Sustainability measures	88
Table 33: Micro watershed wise sediment load (t/ha/year) with % variation.....	89
Table 34: Targeted Plantation Area in Project Appraisal Document.....	94
Table 35: Annual Targets Of PDO 2	96
Table 36: Biomass estimation Baseline vs Midterm.....	99
Table 37: Crop Wise Contribution to Biomass of Fallow Land	100
Table 38: Micro watershed wise change in Biomass	101
Table 39: Stratum Wise Biomass Distribution	103
Table 40: Progress Plantations under Gramya II	105
Table 41: Detailed Progress of Plantations in Gramya II	106

Table 42: Progress of Advance Soil Work and Nursery Establishment in Gramya II	106
Table 43: Category wise Land Use and Land cover for Micro water sheds	107
Table 44: Biodiversity and Species Richness	110
Table 45 : Survival Rate	112
Table 46: Impact on fuel wood and fodder due to forestry activities in Gramya II	112
Table 47: Impact on women due to forestry activities in Gramya II	112
Table 48: Increase in crop productivity PDO 4	118
Table 49: Crop Yields of Irrigated Crops under Gramya II (Productivity of Irrigated Crops)	119
Table 50: High yielding crop varieties	119
Table 51: Crop Yields of Rainfed Crops under Gramya II (Productivity of Rainfed Crops)	119
Table 52: HYV Crop introduced under Gramya II	121
Table 53: Intermediate Indicator 5.....	122
Table 54: Soil Moisture Conservation Measures Adopted	123
Table 55: Agriculture and Horticulture Activity Progress	123
Table 56: Project Progress of Agriculture & Horticulture demonstrations	126
Table 57: Crop wise demo and adoption of different divisions	127
Table 58: Produce marketed by FIGs	133
Table 59: Comparison of productivity Polyhouse Vs open field cultivation	134
Table 60: Response of Farmers on Crop rotation	137
Table 61: Response of Farmers on Irrigation Techniques	137
Table 62: Response of Farmers on Application of Bio compost & Vermi compost.....	137
Table 63: Response of Farmers on demonstration for High Yielding agricultural crops	138
Table 64: Farmers response on Benefits of diversification of vegetable cultivation	139
Table 65: Farmers response on Orchard Plantation	140
Table 66: Farmers response on Demonstration of Poly houses	141
Table 67: Farmers response on Homestead Plantation	141
Table 68: Progress under Livestock Breeding Program	143
Table 69: Progress under NBC	143
Table 70: Progress of Para vet Centre	145
Table 71: Mass Artificial Insemination with ordinary semen.....	147
Table 72: Milk Productivity.....	147
Table 73: Infrastructure Development	148
Table 74: Fodder production	149
Table 75:Community and Beneficiary Response on Paravet services	150
Table 76: Community Response on Stall-feeding Program.....	150
Table 77: Impact of Stall Feeding Intervention	151
Table 78: Community feedback on Fodder Programme	152
Table 79: Progress of Energy conservation intervention	153
Table 80: Cumulative increase in area of Rainfed high yielding varieties	154
Table 81: Cumulative increase in areas under high yielding vegetable crops	155
Table 82: Cropping Intensity	156
Table 83: Income/Ha for different crops season wise.....	157
Table 84: Asset ownership- cattle.....	158
Table 85: Dietary improvements	159
Table 86: Achievement of Project Development Objective 5	166
Table 87: Self-sustainability of Farmer Federations.....	166
Table 88: ABSO Accomplishments.....	168
Table 89: Project Progress of Agribusiness interventions	170
Table 90: Demonstration of Agriculture in area	171
Table 91: Formation of Farmer's Interest Group.....	173

Table 92: Social Category wise distribution of Village members in FIGs	174
Table 93: Capacity Building of FIGs	174
Table 94: Savings by FIGs (in Lakhs)	175
Table 95: FIG financials 2017-18.....	175
Table 96: FIG financials 2018-19.....	176
Table 97: Average profit earnings and savings of FIGs	176
Table 98: Division wise Farmers' Federations Gramya-1	177
Table 99: Status of Federations in Gramya I	177
Table 100: Farmers' Federation Status –Gramya 2	178
Table 101: Division wise FIGs' Productivity, Production, and sale	179
Table 102: Sale through Gramyashree App.....	180
Table 103: Status of Gramin Krishi Mausam Sewa (GKMS)	181
Table 104: Growth Centre of Farmers Federations	184
Table 105: Change in Price of Crops due to Project Interventions (FY 2018-19) Vikasnagar.....	185
Table 106: Expected Income Expenditure of ABGC Bageshwar	186
Table 107: Marigold production Cost benefit analysis.....	187
Table 108: Lillium production Cost benefit analysis.....	188
Table 109: Medicinal and Aromatics Plant Cultivation.....	188
Table 110: Cost benefit analysis of seed production	189
Table 111: Comprehensive Demonstration Plot	192
Table 112: Ropeway intervention.....	194
Table 113: Price difference between Normal and Certified Seed.....	200
Table 114: Economics of pea cultivation (success story)	202
Table 115: Area covered under afforestation.....	210
Table 116: Assisted Natural Regeneration of Oak Areas	210
Table 117: Fodder Plantation.....	211
Table 118: Forest Fire Management	211
Table 119: Usage of Bio-compost in any crop in the last cropping season	212
Table 120: Percentage of Households adopted natural resource conservation techniques	212
Table 121: Year wise Status of Women Participation in Aam Sabha.....	223
Table 122: Division wise Participation of Women in Aam Sabha (WAS).....	223
Table 123: Women Aam Sabha proposals.....	224
Table 124: Gender and Social Category-wise Distribution of RVC members	226
Table 125: Status of Woman Members in Water and Watershed Management Committee.....	227
Table 126: Status of Training, Workshop and Exposure Visits.....	228
Table 127: Transhumant Routes in project area	229
Table 128: Transhumant Population stay in various Divisions of the Project	231
Table 129: Families And Livestock Census Of Transhumant In UDWDP II.....	231
Table 130: Detailed Physical and Financial Achievement of TAP.....	232
Table 131: Name of Agri Business Support Organizations (ABSO).....	239
Table 132: Year wise break up of project expenditure	240
Table 133: Pratyaksh Spatial Data Status	246
Table 134: Division-wise Details of PME Conducted.....	249
Table 135: Status of Women Members in Water and Watershed Management Committee.....	257
Table 136: Coverage of Men and Women Participants in Trainings/ Workshops/Exposure Visits	257
Table 137: Coverage of SC, ST, OBC and General Category Participants in Trainings/ Workshops/Exposure Visits	258
Table 138: Status of Training, Workshop and Exposure Visit	258
Table 139: Community response on Inclusion of Women's Suggestion in Plans	259
Table 140: Community response on Budget Allocation.....	259

Table 141: Community response on Knowledge Level about Schemes	259
Table 142: Community response on Benefit of Aam Sabha.....	259
Table 143: Individual Assets created under GPWDP	260
Table 144: Activity wise Status of Vulnerable Individuals	261
Table 145: Financial details of VGA group activities	261
Table 146: Response on Women Concerns	265
Table 147: Response on Women Leadership.....	266
Table 148: Response on Mobility of Women	266
Table 149: Nutrient intake of beneficiaries in project area.....	269
Table 150: Average number of cattle owned	272
Table 151: Income enhancement through Crop demonstration	273
Table 152: Inclusion of Women’s Suggestion in Plans	274
Table 153: Budget Allocation.....	275
Table 154: Knowledge Level about Schemes.....	275
Table 155: Benefit of Aam Sabha.....	275
Table 156: Status Of Gram Sabha Participation	276
Table 157: Yield of Rainfed Crops and Income Impacts.....	281
Table 158: Yield of Irrigated Crops and Income Impacts	282
Table 159: Financial Analysis (Financial Ratios for Project as a whole)	284
Table 160: Economic Analysis (Economic Ratios for Project as a whole)	284
Table 161: Financial Analysis (Financial Ratios for Project for Watershed and Rainfed Area)	284
Table 162: Economic Analysis (Economic Ratios for Project for Watershed and Rainfed Area Interventions)	285
Table 163: Financial Analysis (Financial Ratios for Livelihood Support interventions)	285
Table 164: Economic Analysis (Financial Ratios for Livelihood Support interventions)	285

List of Figures

Figure 1: Coverage Area of UDWDP- II.....	46
Figure 2: Distribution of Sample by Social Group (Control)	62
Figure 3: Distribution of Sample by Social Group (Project)	62
Figure 4: Distribution of Sample by Poverty Group (Project).....	63
Figure 5: Distribution of Sample by Poverty Group (control).....	63
Figure 6: MWS wise sediment yield reduction.....	90
Figure 7: Land use land cover comparison for 8 MWS (Baseline vs Midterm) in Ha	107
Figure 8: Benefits of diversification of vegetable cultivation.....	139
Figure 9: Intervention for poly houses.....	141
Figure 10: Adoption area under cereal crops (2015-19).....	155
Figure 11: Implementation arrangements	208
Figure 12: Grievance Redressal mechanism.....	209
Figure 13. Awareness about GPWDP activities screened through ESMF.....	213
Figure 14: Institutions under Gramya II	215
Figure 15: Organogram of Gramya II.....	219
Figure 16 : Women Participation in Aam Sabha	223
Figure 17: Transhumant routes in project area	231
Figure 18: Breakup of beneficiaries by types of benefits	233
Figure 19: Knowledge management & Project Coordination.....	236
Figure 20: UDWDP II Institutional Structure.....	237
Figure 21: Project financing share 2014-15 to 2018-19	240
Figure 22: Year wise proportion of financing.....	240
Figure 23: Proportion of Expenditure across heads.....	241
Figure 24: Constitution of PME Team	249
Figure 25: Social Capital Dimensions and Parameters	263
Figure 26: Social Capital score in treatment area	264
Figure 27: Women’s role in agriculture.....	264
Figure 28: Women Empowerment Scores in treatment areas- Baseline Vs MTR.....	265
Figure 29: Women’s Ease of mobility and role in household decision-making	266
Figure 30: Women’s Role in agriculture and economic decision-making.....	267
Figure 31: Women’s Perception on ease in access to services	267
Figure 32: Safety Perception of women	268

List of Success Stories

Success Story 1: Increased water for Irrigation	91
Success Story 2: Cost Effective Technology for Irrigation	92
Success Story 3: Controlling Lantana.....	92
Success Story 4: Afforestation in Sakholi	113
Success Story 5: Medicinal Plant Cultivation.....	113
Success Story 6: Transforming lives through Integrated Agricultural Technique	129
Success Story 7: Pomegranate Plantation	133
Success Story 8: Bringing Fallow Land under Cultivation.....	136
Success Story 9: Adoption of Innovative Technologies & Business Development.....	194
Success Story 10: Oil Extraction	196
Success Story 11: Food Processing Unit	197
Success Story 12: Floriculture Intervention.....	198
Success Story 13: Innovative approach towards economic sustainability by FIG.....	199
Success Story 14: Certified Seeds Intervention	200
Success Story 15: Cluster Approach to Farming	201

Annexure

Annexure Table 1: Household Survey Matrix	286
Annexure Table 2: District wise progress of plantation activities	288
Annexure Table 3: Vendors/Buyers registered in Gramyashree App.....	288
Annexure Table 4: Farmers registered in Gramyashree mobile app.....	289
Annexure Table 5: Production detail	290
Annexure Table 6: Micro Finance details.....	300
Annexure Table 7: Crop-wise Production data.....	300
Annexure Table 8: Awareness on Organization of PRA for GPWDP Preparation	302
Annexure Table 9: Awareness on Participation in PRA Exercise for GPWDP Preparation	302
Annexure Table 10: Awareness on Beneficiary Selection and Various GPWDP Activities	302
Annexure Table 11: Awareness about GPWDP activities screened through ESMF	303
Annexure Table 12: Justification of Beneficiary Selection during GPWDP Preparation	303
Annexure Table 13: Organization of WAS Prior to GPWDP Preparation	303
Annexure Table 14: Ensuring Selection of SC/ST/Widow/Divyang as Project Beneficiaries	303
Annexure Table 15: Employment Generation through Project Activities	304
Annexure Table 16: Information Sharing on Project Funds	304
Annexure Table 17: Awareness on Display of Information	304
Annexure Table 18: Awareness on Display of Information on Status of Expenditure in GP	305
Annexure Table 19: Awareness on Place of Displayed Information	305
Annexure Table 20: Maintenance of Transparency by WWMC/RVC/MDT	305
Annexure Table 21: Timely payment of works under GPWDP	305
Annexure Table 22: Scrutiny of Documents	306
Annexure Table 23: Technological Improvement in Traditional Occupations of Vulnerable Individuals and Groups.....	306
Annexure Table 24: Income enhancement due to technological advancement of Vulnerable Individuals and Groups.....	306
Annexure Table 25: Conversion of Abandoned Agriculture land in UDWDP-II.....	306
Annexure Table 26: Increase in productivity due to Technical Training on Agri/Horti/Animal Husbandry & Exposure Tours.....	307
Annexure Table 27: Technical Assistance by Village-In-charge	307
Annexure Table 28: Assistance by Motivators/Facilitators/Coordinators	308
Annexure Table 29: Technical Assistance by Unit In-Charge.....	308
Annexure Table 30: FIG & Farmer Details	308
Annexure Table 31: Distribution of Individual Assets	308
Annexure Table 32: FIG Production Details	310
Annexure Table 33: FIG Micro Finance.....	314
Annexure Table 34 : Vendor Details	314
Annexure Table 35: Income: Engagement in Economic Activity (by Farmer Category) Average Income per HH	315
Annexure Table 36: Income: Engagement in Economic Activity (by Social Class) Average Income per HH (A/Sample).....	315

Annexure Table 37: Comparison of Baseline and MidTerm LULC maps for 8 MWS	316
Annexure Table 38: Land use categories for Dewangad micro watershed	320
Annexure Table 39: Land use categories for Lathiyagad micro watershed	320
Annexure Table 40: Land use categories for Loharkhet micro watershed	320
Annexure Table 41: Land use categories for Paligad micro watershed	321
Annexure Table 42: Land use categories for Saintoligad micro watershed	321
Annexure Table 43: Land use categories for Sarugad micro watershed	321
Annexure Table 44: Land use categories for Sindhiyagad micro watershed	322
Annexure Table 45: Land use categories for Utrasu micro watershed	322
Annexure Table 46: Details of the revenue and expense of the farmer federations	323
Annexure Table 47: Year wise Afforestation Activity	324
Annexure Table 48: Year wise Horticulture Development	324
Annexure Table 49: Year wise intervention Oak ANR	324
Annexure Table 50: Cropped Area and Cropping Intensity (Economic & Financial Analysis)	325
Annexure Table 51: Productivity of Major Agri. Crops (Quintals/ha) (Economic & Financial Analysis)	325
Annexure Table 52: Productivity of Major Vegetable Crops (Quintals/ha) (Economic & Financial Analysis)	326
Annexure Table 53: Value (Rs. per ha) of Forest Services) (Economic & Financial Analysis)	326
Annexure Table 54: NDVI image of MWS (2019)	327

Executive Summary

Uttarakhand is one of the youngest states in India, which was carved out of northern Uttar Pradesh on 9th November 2000, emerging as the twenty seventh state of the country. Located at the foothills, middle and upper reaches of the Himalayan mountain ranges, it is largely a hilly state, with 92 percent of its area of 53,500 square kilometers having a rugged topography. The state is more vulnerable to severe soil erosion and landslides due to its location, topography and underlying geology. Watershed development is more relevant for the state of Uttarakhand than most other states in India considering the fragile Himalayan geology and ecosystem. Realizing this importance, an exclusive Watershed Management Directorate (WMD) was established in 1982 to bring all the watershed development projects under one umbrella for its comprehensive implementation and coordination with the relevant line departments, mainly Forest, Agriculture and Rural Development.

Sequel to the success of Gramya I implemented from 2004 – 2012, the Uttarakhand Decentralized Watershed Development Project – Phase II, also referred to as Gramya II, is being implemented with the financial assistance of World Bank. This project focusses mainly on development of rainfed agriculture through use of watershed development tools, particularly rainwater conservation and harvesting and natural resource management. Gramya II is built on the successful community-based approach of Gramya I and key learnings from the phase are being incorporated to ensure improved implementation and outcomes.

The Project Development Objective (PDO) of Gramya II is to *increase the efficiency of natural resource use and productivity of rain-fed agriculture by participating communities in selected micro watersheds of the Uttarakhand state*. The project duration is for seven years from 2014 to 2021. The total project cost is 170.0 million US\$ with IDA Credit of 121.2 million US\$ (71.3%), state contribution of 45.8 million US\$ (27.0%) and beneficiary contribution of 3.0 million US\$ (1.7%).

UDWDP II is being implemented in villages of 82 micro watersheds of middle Himalayas, lying between 700 m and 2700 MSL. The MWSs are selected following a scientific and meaningful set of criteria including but not limited to the following; location contiguous to Gramya I, not covered by any other similar projects, high vulnerability to soil erosion, degraded and marginal lands, low agricultural productivity and remoteness and inhabited by relatively more SC and ST, the socio-economically marginalized communities. The project covers 525 GPs and expected to benefit about 55,600 households. The key stake holders in the project are medium- and small-scale farmers, vulnerable groups, PRI institutions, line departments and Watershed Development Directorate, the nodal agency for implementing the project.

Implementation of Gramya II is based on involvement of three important stakeholder groups: (i) Village communities and GPs; (ii) WMD; and (iii) NGOs and other service providers. The key Panchayat level institutions involved in implementation of the project include Gram Sabha, Gram Panchayat, Water and Watershed Management Committee, Revenue Village Committee, Mahila Aam Sabha, Van Panchayat. The various field level stakeholders involved are the Multi-Disciplinary Teams (MDT), FNGOs, PNGOs, and Agribusiness Support Organization (ABSO) and District Level Watershed Committee. At the state level the Watershed Management Directorate headed by the Chief Project Director is responsible for overall planning, supervision, coordination and monitoring of the project. A State Steering Committee chaired by the Forest

and Rural Development Commissioner makes policy decisions, facilitates inter-Department coordination and provides required approvals. Gramya II is by far the largest, most inclusive and most comprehensive watershed development project implemented in the state of Uttarakhand.

About the Mid Term Review

The Mid-Term review focuses not only on results measurement but also impacts achieved till date which maybe intended or unintended. The aim of this review is to assess the progress against its targets and assess the process involved in achieving the results as measured by the relevant indicators stated in PAD. The approach is also to recommend changes in the project design and/or implementation arrangements to overcome identified bottlenecks if any. A comparative analysis of performance in the project areas as compared to the control areas under both “With Project” and “Without Project” scenarios has been undertaken in the Mid-Term review.

The evaluation design is based on a quasi-experimental model, wherein suitable counterfactual group was established for comparison with the project group. Control or counterfactual units were geographically selected and were in areas where no watershed development related activities had been conducted. For the mid-term household survey, it was decided to cover half of the project households covered under the baseline survey covering 2780 households in 54 revenue villages and 26 Gram Panchayats. In addition, to this after consultation with the Watershed Directorate an additional 20% new beneficiaries were added from the project villages covered under the baseline survey. As a result, the total sample of project households for Mid-Term survey is 3332. Regarding the control households, it was decided that all the 988 households in control villages covered in baseline survey shall be covered in the Mid-Term household survey.

Results Achieved

Soil and Water Conservation

The ICAR analysis shows that 6.71 percent of the area in the state (about 3,59,000 Ha) faces “moderately severe” (15 to 20 ton per hectare per year) soil erosion, while close to 9 percent (4,73,000 Ha) of the state is battling “severe” (20-40 ton per hectare per year) soil loss and the remaining a third of the area of the state (1,750,000 Ha) is experiencing soil loss at a rate of 40–80 ton per hectare annually, which is under “very severe” category. 29.72

Project in this context by Mid Term has undertaken several watershed treatments measures both at catchment and command areas to retain soil moisture regime through various activities, rejuvenate water sources and increase people’ participation in protect/ adopt similar measures and in turn gain benefits out of it. The progress of in this component has been apt showing remarkable early results in a holistic manner. 10,628 ha of land has been covered under natural resource conservation measures.

PDO 3:

Increase in rainfed area under irrigation
3252.8. Ha of additional rainfed area has been brought under irrigation making land reclaimed as 8514.8 Ha (baseline 5262 Ha) against target of 6050 Ha till mid-term, 40.7 percent more than the targeted area till MTR.

Result:

Fallow land under cultivation 1854.4 Ha of previously fallow land has been brought under cultivation through improved irrigation facilities

30.5 percent of total arable area (34745.9 ha) as against the target of 25 percent has been covered under such measures in 461 project gram panchayats. Project has an area coverage of 220,000 ha of non-arable land and intended to expand irrigation from 5262 ha to 7800 ha of arable rainfed land in the project area during the project duration. The measures undertaken under soil and water conservation, water harvesting structures and water source sustainability measures have helped in achieving almost 4 times the MTR target and bring 3252.8 Ha of Rainfed area under irrigation making the total irrigated land in the project area 8514.8 Ha already. This includes 1854.4 Ha of fallow land brought under cultivation by providing irrigation facilities and is now being utilized under orchard cultivation and agriculture.

Impact on Land Use Land Cover (LULC) also shows 3.6% percent increase in area under agriculture throughout the 8 micro sheds along with a 0.9% increase in the forest cover. There LULC also shows a good 2.5% reduction in the area with or without scrubs

The project identified 1882 traditional water sources until midterm and initiated the rejuvenation of 1522 structures through physical measures and recharge. The achievement of the Project stands at **78.9 percent at the midterm against a target of 10% in 5th year of the Project.** On an aggregate basis a 12.3 percent - 22.2 percent in pre-monsoon and 13.8 percent - 27.0 percent increase in post-monsoon water discharge has been recorded in 1485 structures against a projected target of 10% in Annexure 6 Economic and Financial Analysis of PAD document.

PDO 1: Increase in water discharge

Increase in water discharge by 12.3% to 22.2% in Pre-Monsoon and 13.8% to 27.0% in post monsoon has been achieved against a target of 10% by MTR.

Attributable activities leading to such changes in results could be seen in project area as demonstration activities have been taken up in large scale. The strategy of having a basket of intervention that are community adaptive has made it more successful. Activities such as agriculture mechanization, deep/shallow ploughing, soil testing in convergence with line department and by project, line sowing, organic mulching, seed treatment, seed replacement, IPM, INM, Base dose application, Intercropping, terrace repair were found to be successful intervention with a plausibility of having large scale adaption by farmers. The results reflect that about 65.1 percent of farmers are practicing minimum 5 of the 14 demonstrated technologies (soil and conservation technology). Farmers are now proactive in using Seed Treatment, Bio-compost and Mulching as it is seen to be most commonly followed practices. Deep Ploughing and Line Sowing are also popular as they are easy to implement and incurs low investment. About 90 percent of the households are practicing one or the other soil conservation technology in project area as against a 30 percent target in MTR which is a substantial outreach achieved by mid of the project period.

The progress made by Gramya II in implementation of water harvesting and source sustainability measures is satisfactory at the mid-term stage. Solar water lifting pump with solar panel and Pre-Fabricated Geo Membrane Water Harvesting Tank are new technologies introduced and has received tremendous community acceptance. Community feedback obtained during Midterm assessment phase, majority of them acknowledge the benefits of the interventions in increasing crop and fodder production.

Respondents in 31 percent of the villages reported improved availability of surface water due to soil and moisture conservation activities undertaken in treatment of MWSs. Community members in 24 percent of the villages reported improved stability of hill slopes and reduction in landslides due to various treatment measures. Beneficiaries in 48.9 percent of the villages reported improvement in crop and fodder production due to improved water availability, improved soil moisture retention and use of improved varieties of seeds. In 80.3 percent of the villages, farmers reported very less or negligible use of pesticides and over 52 percent of the households are using at least one of the two techniques- terrace or vegetative boundary for natural resource conservation.

Forestry

Forestry interventions under the project is primarily aimed at improving soil moisture regime by undertaking watershed treatment and land reclamation activities. However, the needs of the community for fodder, fuel wood, minor forest produce, timber, fruits and other edibles was given preference in selection of the species and types of plantations encouraged under the project.

Gramya II project area comprises of 1.42 lakh Ha of forest accounting for 53.9 percent of the total geographical area; 0.71 lakh Ha (26.9 percent) area under agriculture, while the remaining 0.51 lakh Ha (19.2 percent) is classified as blank / barren land.

Project has undertaken interventions such as afforestation activities, Assisted Natural Regeneration (ANR) of Oak trees, plantation for fodder and fuel wood. Implementation of these interventions was the shared responsibility of various stakeholders. Van Panchayats were a key stakeholder group who were primarily responsible for implementation of most of the plantation activities with support from Gram Panchayats, Multi-Disciplinary Teams and local communities.

The project has an indicative target of 18705 Ha of total plantation to be done¹ which includes 5446 Ha of afforestation plantation, 6001 Ha of silvipasture plantation, and 7258 Ha of fuelwood plantation in targeted area. The progress has been very encouraging with progress achievement of 85 percent in Afforestation, 82.4 percent in ANR, 107.5 percent in Horticulture and 107.7 percent in Fodder Plantation against the project end target of 10933.7Ha. This has in turn resulted in a positive change of 98.2 percentage point of increase in Biomass which is the second Project Development Objective. The impact was expected to show up from the year 4 of the project, to have a 10% increase by mid-term and 20% towards the end of the project. As per the current estimation at Midterm 2.93 t/ha, which is 10.58% of the baseline as compared to 2.05% in control areas. The project has achieved substantial increase in the biodiversity and richness. The treated plantation sites have higher values of diversity and species richness as compared to control sites. Increase in the species richness and diversity index were largely due increase in the moisture content through the various soil and water conservation structures.

PDO 2: Increase in Biomass

The increase in biomass has been reported to increase by 10.58% from 27.69 Tonnes /Ha to 30.62 Tonnes /Ha

Protection of the planting sites was reported to be good across project locations, while fire protection was reported to be satisfactory in 26.7 percent of the GPs. The fire protection measures in the remaining sites could be further enhanced through measures such as creating fire lines around reforested area keeping *Chir* zone clean during fire season.

Reportedly, 64.0 percent of the GPs have planted 10000 or more saplings per Ha, 27.9 percent planted 5000 saplings per Ha and 8.1 percent planted 3000 saplings per Ha. In 86 percent of the GPs, the members were reportedly satisfied with the planting of shrubs and grass in watershed treatment area. The overall average survival percentage within the surveyed sites was around 71% (varying from between 70% to 90% for timber species; 65% to 85% for fuel wood species; 75% to 95% for fodder species; and 65% to 100% for horticulture plant species) under the project.

¹ Annexure 6 Economic and Financial Analysis of PAD document

(Output) Increased Survival:

Overall average survival percentage is around 71%

Impacts: Reducing Drudgery

Decrease of Fodder load on forest by stalling open grazing, time spent on collection of fodder reduced from 2.5 hours to 2 hours per family per day

Results: Land Conversion

Reduction of 4.7 percent barren land in the project area attributable to forestry intervention

The other significant impacts reported are reduction of 4.7 percent barren land in the project area attributable to the forestry interventions; Increase in access to fodder and grass by households from their own land with an accompanying decline in grazing time; reduced time for fodder collection and reducing drudgery. Socially, women reported to have a greater say in development planning and in getting more employment opportunities linked to forestry activities.

Agriculture and Allied Sector

Agriculture is a mainstay of the economy of Uttarakhand. The estimated total cultivated area in the state is 768,000 ha, 54 percent of which is in the hills. About 80 percent of the population living in the hills depends on agriculture. The project area has 55,600 farmers, currently cultivating about 40,000 Ha of arable lands, of which, a vast majority for the cultivated area is rainfed accounting for 87 percent and only about 13 percent area is irrigated. Rainfed cropping patterns are dominated by cereal crops, millet, and pulse crops. Major crops are Ragi, Wheat, Paddy, Pulses, Rapeseed, and Mustard accounting for 75 percent of the cropped area in the project villages.

With a background of low and declining productivity in rainfed crops in Uttarakhand, the project design has included interventions keeping in mind the fragmented holdings of farmers in the terrain and is one of the project development objectives targeting to improve productivity to 5 percent for rainfed crops and 30 percent for irrigated crops by end of the project.

The MTR reveals that there has been a 37.2 percentage point increase in productivity of irrigated crops and a 27.2 percent increase in case of rainfed crops in Project area. The increase in productivity of irrigated crops is higher than the mid-term target of 30 percent. *The key factors contributing to an increase in productivity in irrigated crops are extensive field demonstrations of high yielding crops, proper crop husbandry practices especially nutrient management with integrated use of FYM, vermi-compost and green manure and adoption of improved techniques.*

Impacts: Increase in cropping intensity:

Cropping intensity for land under irrigation has increased to 225 from 171 percent in baseline. The cropping intensity for rainfed crops too has increased to 160 in midterm from 152 percent in baseline.

Result: Productivity Enhancement

37.2 percentage increase in productivity of irrigated crops and a 27.2 percentage point increase in case of rainfed crops.

The rise in productivity of rainfed crops at the mid-term stage is 27.3 percent and 27.9 percent for Kharif and Rabi seasons respectively compared to the baseline period. This is considerably higher than the target of 5 percent set for the mid-term stage of the project. For enhancing rainfed crop productivity, the main thrust has been given for adoption of improved varieties of crops, quality seeds, low water-requiring crops like Finger millet, Wheat, Maize, other Nutri-cereals, Pulses, and Oilseeds based on bio-physical and resource suitability. This is combined with improved crop husbandry and rainwater conservation practices, including life-saving irrigation with stored rainwater at critical stages of crop growth for maximizing productivity. Specific technologies and practices developed and/or recommended for Uttarakhand by GB Pant University of Agriculture and Technology (Pantnagar), the Central Soil and Water Conservation Research and Training Institute (Dehradun), Vivekananda Parvatiya Krishi Anusandhan Sansthan (Almora) and the Centre for Research in Dryland Areas are being promoted in the project area.

Along with high yielding and hill recommended crop varieties, yield is also attributed to appropriate crop husbandry, integrated nutrient management, adoption of improved crop production technologies and soil moisture conservation practices as recommended under the project. The Intermediate Indicator 5 (discussed further) shows that over 70% of the farmers in the project area practice seed treatment, 50% utilise Bio-compost, almost 40% use mulching in their fields. Crop production technologies such as deep ploughing and line sowing are also adopted by almost half the farmers and have proved to be beneficial. The extensive adoption of improved crop production technologies and soil moisture conservation practices has thus helped considerably in the manifestation of the genetic potentials of HYV in enhanced productivity at the demonstration and adoption plots. Continuous support through extension services that helped create awareness, adoption support and capacity building of the farmers resulting in farmers largely following the recommended package of practices.

The project has made important contributions to increasing the area under irrigation. With an additional 3252.8 ha of rainfed area (inclusive of fallow land) being brought under irrigation, the total irrigated area under the project is 8514.8 ha. This is attributed to establishment of irrigation sources in the region such as construction of irrigation tanks, installation of pipelines, solar lift irrigation systems, ponds, and gul. The interventions have helped bring fallow lands under cultivation besides bringing rainfed areas in to irrigated agriculture. The increase in area under irrigation has helped increase the cropping intensity substantially.

The MTR assessment shows that soil moisture conservation practices are now widely followed and 65.1 percent of the farmers in the treatment area are using at least five of the soil moisture conservation practices and crop production technologies. 99.9% farmers follow at least 1 of the 13 practices in project area of the sample.

UDWDP II promotes HYV of agricultural crops (cereal, pulses, millets etc.) and provides adoption support to increase yield through high yielding and climate resilient agricultural crop seeds with an aim to convert the subsistence level hill agriculture to sustainable and profitable one under rain-fed condition. The package under this component includes seeds, package of practices training and support for the select crops for an area of 600 square meters. Under adoption support for High yielding agriculture crops, assistance has been provided to 42,395 farmers.

Output: Crop Demonstrations

16,367 demonstrations for high yielding Agriculture crops have been conducted covering 2123.28 Ha till March, 2019. Similarly, 25,817 demonstrations for high yielding vegetable crops were conducted covering in area about 2056.4 Ha in the similar period.

A total of 25,817 demonstrations were conducted covering in area about 5163.4 Ha till March, 2019. Overall productivity of all vegetable crops stood at 103.75 Qtls/Ha during 2018-19 against the baseline productivity of 80.85 Qtls/Ha; while increase in Spice crops productivity was 77 Qtls/Ha during 2018-19 against the baseline productivity of 57.04 Qtls/Ha. The percentage increase in productivity of vegetable crops is between 13 and 50% and that for spice crops is between 16 and 51 %.

The community feedback obtained during MTR suggested that majority of them are convinced about the benefits of the recommended techniques and followed nutrient management recommendations as per the Soil Test Report and planting high yielding variety of crops, Bio-compost pits and vermicomposting have been found to be promising techniques. Homestead plantations under the project have been taken up by marginal farmers due to their feasibility in small land areas. Beneficiaries have appreciated the provision of tools and implements. A need to promote small sized gender friendly tools that are appropriate for use in the hilly regions has been recognized. Community members in some areas have expressed the need for small tractors, tools such as chaff cutters, etc. and this is being considered in the upcoming project period.

Animal Husbandry

Uttarakhand is well endowed with a variety of livestock, cattle, buffaloes, goats, and poultry. Gramya II has adopted an integrated approach of livestock development, which includes controlled breeding, adequate feeding, and proper health care management in order to enhance the lifetime productivity of the livestock. Under its livestock breeding program, the project supports natural breeding through establishing Natural Breeding Centres (NBC), Artificial Insemination (AI) through Para Vet Centres and Mass Artificial Insemination through convergence with Animal Husbandry Department.

Natural breeding is one of the preferred options for breed improvement by pairing of local non-descript milch animals with bulls of high genetic merit. The project has established Natural Breeding Centres (NBC) at strategic locations covering a cluster of 4-5 villages. Data from NBCs shows a success rate of 50-55 percent in case of cows (6 NBC) and buffaloes (105 NBC) and a success rate of 72% in natural breeding of goats (152 NBC) established under Gramya II.

The project undertakes rural extension services like AI and minor veterinary service for livestock development in comparatively inaccessible areas where the Animal Husbandry department is unable to provide services regularly. These services are being provided through Para Vets and local youth selected at the GP level. This intervention has provided local youth an opportunity to earn through providing AI and minor veterinary service in the community. The progress of AI in 34 Para Vet centres shows that out of 1366 coverings in Buffaloes, 801 progenies were born and out of 2784 coverings in cows, 1260 progenies were born showing a success rate of 45% - 58%. Once improved, female calves are recruited in production groups, the animal owner would have an additional income of about Rs. 1200 to Rs. 1500 per month per cow in terms of 6-8 times more milk, reduced age at first calving from 10-15 months, 4-6 months reduction in dry period etc. apart from the use of infrastructure facilities developed during the project period.

Under the mass A.I. program of the project in convergence with Animal Husbandry department, a number of animals in the cluster are induced to heat by the process of heat synchronization and ovulation through hormonal therapy. This is followed the mass AI of the cattle in heat with ordinary as well as female sorted sexed semen. Mass AI has been done for 1000 cows across the project area. Of these, 7 progenies have been born until May 2019 and the remaining progress is to be assessed.

Animal health care activity is one of the components envisaged by the project for the enhancement of milk production and to ensure that farmers do not incur economic loss by want of health care services. The

incremental difference in milk production for indigenous cows and buffaloes is 0.7 litre, 6.49 litre for high yielding cows and buffaloes, 0.5 litre for indigenous goats and 1.5 litre for high yielding goats. Attempts have also been made for the reduction in infertility of the livestock and spreading of awareness among cattle owners about the best practices of cattle rearing like proper nutrition and vaccination against contagious diseases.

Small-scale dairy farming under the stall-feeding management system has been promoted by the project as means of increasing farming system productivity in the area while at the same time ensuring environmental protection, especially protection of soil erosion from cattle grazing. The project has constructed 4604 mangers against the total target of 5685 i.e. 81 percent.

Animal housing is required to protect the animals from inclement weather and predator animals in addition to providing clean, comfortable stay for good health of animals and for efficient management. The project has constructed 6863 sheds against the project target of 6860. Animal Chari's have been constructed to provide clean and hygienic drinking water to animals, especially those grazing outside. The project has constructed 2383 Charis against the target of 2757.

As part of an attempt to increase fodder availability, a two-pronged approach has been adopted. Fodder mini kits for 2 Nali area have been distributed in both Kharif and Rabi seasons. The project has promoted the improved variety of Napier (hybrid Napier, IGFRI-7, 10 etc.) and tufts have been planted in the agriculture fields along the bundings and in common property barren and abandoned land. By adopting the recommended plan of growing green fodder with the help of Fodder Mini-kit, the availability of nutritious green fodder has increased by 25-30 percent. This has enabled the Improvement in quality fodder using fodder mini kits for last two seasons. Napier cultivation along the bunds as nonconventional forage production has been very effective intervention, which has helped the animal owners in compensating the fodder deficiency by 65-70 percent additionally.

Agri-business and Value Chain

The agri-business sector in Uttarakhand possesses certain inherent strengths. The state is a major supplier of off-season vegetables (OSV) to markets in north India and some of the major vegetables supplied are tomatoes, potatoes, peas, cauliflower, capsicum, cabbage and beans. The closeness to large markets such as Delhi further fuels supply. On the other side the state grapples with some constraints that affect growth of the sector. These include a difficult terrain with poor physical and mobile connectivity, inefficient landholdings, inadequate irrigation facilities, lack of expertise on new and emerging techniques and lack of a robust marketing infrastructure. Such constraints contribute to a reduction in market realization and lead to lack of adequate employment generation from the sector.

Agribusiness is an important intervention under the project that has reasonable chances of changing the life of community for betterment through direct increase in income. It promotes agribusiness development and support through formation and capacity building of FIGs and their consolidation into Farmer Federations, development of agribusiness plans and supply chains (including marketing support, collection, grading, packaging and processing centres) with technical backstopping by agribusiness support organizations; and capacity building of community-based institutions (FIGs and water harvesting structure user groups). Additionally, the project strives to encourage socio-economic inclusion by enhancing livelihoods opportunities for vulnerable groups. It is also engaged in supporting the Farmer Federations formed under the Gramya I to ensure their sustainability, scale up their agribusiness development and support the beneficiary groups.

Agribusiness activities under UDWDP-II focus on increasing production and strengthening capacities for processing, marketing infrastructure and trade. These activities are being supplemented by some external factors such as infrastructure development in form of all-weather roads and agricultural credit that has helped sustain a demand of OSV in North Indian markets. The crop varieties focused on under the project are vegetable crops (French beans, tomato, capsicum, green peas, beans, cabbage, garlic, cauliflower, colored capsicum and cucumber), agriculture crops (wheat, finger millet, maize, black gram, mandua, madira, Ramdana, gehat, paddy, maize, sorghum, lentil and mustard), aromatic plants (such as Echinacea and Tulsi) and spices (such as turmeric, chillies, garlic and ginger).

A cluster-based approach has been adopted for promotion of activities. As part of this approach farmers are being encouraged to undertake activities in a cluster of two or three villages. This is being done with a view to achieve economies of scale and develop compact supply chains. The project has engaged NGOs to function as Agri Business Support Organizations (ABSO) at the divisional level to assist divisions in implementing interventions. Six ABSOs namely Central Himalayan Environment Association (CHEA), Himalayan Environment Livelihood Promotion Society (HELP), Society of People for Development (SPD), Society for Uttaranchal Development and Himalayan Action (SUDHA), Appropriate Technology India (AT India) and Action for Social Empowerment and Economic Development (ASEED) have been engaged for working across various divisions. Most of the ABSOs have been able to complete the specific tasks allocated to them such as listing of farmers, provision of input support, federation with registration, developing linkages with financial institutions, creating processing center assets, provision of post-harvest technology support and capacity building to name a few.

Intermediate Results Indicator 7 relates to self-sustained Farmer Federations. The indicator is measured as the percent increase in production volumes marketed by Farmer Federations. A total of 12 federations have been established as part of the project and of these 6 have achieved self-sustainability. The 6 federations comprising of 452 FIGs and 4581 farmers have increased their profit margins through backward and forward market linkage provided by ABSOs. 50% of Farmer Federation have achieved sustainability through marketable produces and earned premium. The progress with respect to self-sustainability of the federations has been achieved in spite of the fact the federations are operating on capital raised solely through membership and business operations. The project design does not have provision for extending financial support to the federations in terms of loans; support is provided in terms of technical guidance and capacity building, exposure visits for members, input support for adoption and developing of value chains and marketing facilities.

One of the key activities undertaken is demonstrations and adoptions. Demonstrations are an effective tool for showcasing practices and are especially suited to the needs of the target group. A total of 56758 demonstrations which includes 15,774 demonstrations in Agriculture covering an area of 3273.4 ha and 40984 demonstration in Vegetable cultivation in an area of 3278.7 ha has been carried out. Demonstration of improved agricultural practices including organic techniques, marigold cultivation, farm mechanization, protected cultivation, Medicinal and aromatic plants (MAP's) and kiwi fruit cultivation are some of the highlights of the project.

Another key area of work is the formation of FIGs and a total of 1358 FIGs have been formed thus far with a membership of 15006 farmers. However, there is scope for improvement including need to increase the participation of members from the SC and ST communities. Good proportion of saving of Rs 149.53 lakhs has been done by 1358 FIGs. The FIG's are involved in sale of **102523.1 quintal** of agricultural produce (out of **123758.9 quintal produced**) to the tune of 2056.6lakhs.

The project has taken steps towards developing a brand under which farmers can sell their produce. The brand 'Gramyashree' has helped create visibility for the products and the project and provided a recognizable platform to project beneficiaries. *Gramyashree Mobile App*, has been pivotal in empowering the FIGs by direct selling of their harvested produce to vendors through Agribusiness Support Organization (ABSOS). Of the total sales of Rs. 304 Lakh, over 99 percent has been through the App with a negligible proportion of outlet-based sales.

Agribusiness Growth Centres has been helpful as it supports the farmers in exploring, developing, processing, marketing, knowledge sharing, information dissemination and financing of the bulk farm produce from the village clusters. The seven Agriculture Business Growth Centre centres established until Midterm encompass 325 revenue villages covering 2772 farmers. The Growth centres are important as they provide input and output support facilities to the farmers in the nearby village cluster

Capacity building has been a key theme, and this is being done primarily through trainings and exposure visits. Of the total number of trainings planned at the unit and division levels, 17 percent have been completed by the mid-term stage. Around 33 percent of exposure visits planned within the state have been completed and 28 percent of those planned outside the state have been conducted.

Responses from the members of the various FIGs revealed that all members had been trained on FIG formation and technical production aspects. All treasurers had also been trained on financial management. Positive feedback was also received with respect to access to seeds and agricultural tools. Members of FIGs are confident of being able to self- sustain their groups and endorse that democratic processes are followed during decision making. The project has also helped increase awareness levels and capacities of FIG members and more than three fourth members are aware of the places where OSVs can be sold. Most members share that have been able to improve their production through project activities.

A key achievement of the project is its success in involving women in income generating Agri business activities. While the proportion of women members in FIGs is low at 4.2 percent but the fact that women have started to engage is a positive sign and points towards potential for increased participation in the days to come.

The project has also contributed to helping farmers obtain better rates for the same produce. A study of farmers in Vikasnagar division reveals that the price for off season vegetables has increased in the range of 50 percent to 157 percent of the prices at the pre-project stage.

Environment and Social Safeguards

Considering the fragile bio-physical and socio-economic fabric of the region, an Environmental and Social Management Framework (ESMF) was developed. It provided for mitigation measures developed based on experience from previous projects, especially the UDWDP I. The purpose of the development and application of ESMF is to ensure that the impacts of project interventions are environment-friendly, socially acceptable, economically feasible and sustainable.

To ensure that Project is based on various environmentally sustainable and energy efficient approaches, practices such as organic farming, use of various alternate fuel-based devices, initiatives towards fuel switch, soil and moisture conservation activities to improve the moisture regime for agriculture are being demonstrated and promoted along with partly financing the adoption of environment-friendly energy sources such as biogas plants, solar power, and pine briquetting. Such alternate energy sources mean less exploitation of the forest resources and reduced drudgery for women.

The project does not envisage any significant, irreversible impacts due to the small scale of the proposed interventions. The interventions would in fact yield positive environmental and social impacts if planned, implemented and designed with environmentally and socially sound practices. It is in this context that relevant safeguards have been triggered. The environmental and social safeguards triggered by the project are Environmental Assessment (OP 4.01), Natural Habitats (OP 4.04), Pest Management (OP 4.09), Physical Cultural Resources (OP/BP 4.11), Indigenous Peoples (OP/BP 4.10) and Forest (OP 4.36). The Environmental and Social Guidelines (ESG) have to be an integral part of the GPWDP and sub-projects and the implementation of these guidelines spans across levels.

The cultivation of fodder and Napier grasses in the fields as a standalone crop and/or border plantation has provided the farmers with around the year feed for livestock reducing the reliance on forests or pastures. The fodder cultivation has reduced the effort of collection of fodder and grasses from the forest. Similarly, need for fuelwood has also considerably reduced due to solar cookers/pressure cookers and pine briquettes that are utilizing renewable resources. Promotion of renewable energy sources such as solar, pine briquettes, solar powered water lifting, biogas, etc. as well as the traditional ones such as the Gharat (hydro powered mill) has contributed to a reduced requirement of electric power. Biogas has not only helped in utilizing the cow dung and other organic material for energy generation but is also providing nutrients for farming through the output slurry. With increased acceptance of renewable sources of energy local communities stand to benefitting from faster and more efficient agro-processing services and a wider range of mechanized crop-processing machinery.

Farmers engaged in IPM at demonstration in the study villages are convinced to follow the use of organic insecticides, bioagents and the sticky and/or light traps to control pests/insects after the project completion. Demonstrations of Bio-compost, Vermi-compost and INM are received well by the farmers and over 30% of farmers have adopted the organic nutrient management practices along with soil testing based fertilizer application. Uncultivable wasteland brought under fruit orchards has helped reclaim the barren lands and improve its soil quality. Making livestock feed available through fodder plantation and woodless cooking units has reduced the pressure on forests for natural resources.

As part of the fourth round of PME which was carried out between 2017 and 2018, an assessment of awareness of community members on key project features and systems was undertaken. A specific indicator that was tracked as part of this exercise was the proportion of community members who were aware of screening of GPWDP activities on the basis of ESMF guidelines. It was encouraging to note that nearly 86 percent of respondents were aware of these aspects.

The ESMF and corresponding ESG focus upon ensuring that interventions are planned and undertaken in an environmentally and socially sustainable manner. The project adopts a highly participatory approach, involving communities in planning and designing of plans that conform to the ESG. Importantly, women form a core stakeholder group and are able to ensure that their voices are heard through institutions such as the Women Aam Sabha. The project also emphasizes the need to improve the condition of transhumant populations and ensure that they are able to access basic facilities such as healthcare and education to the extent possible during their period of residence in project areas.

While the project is ensuring that the ESMF is adhered to and ESG are followed while undertaking various interventions, there is a need to maintain this focus going forward as well. As the project reaches a mid-term stage, it is important to initiate refresher trainings on ESMF and related aspects for project staff and other stakeholders including the community.

Grievance Redressal Mechanism (GRM) is one of the important tools for project management which helps record and address the key issues faced by the community and other project stakeholders. The grievance redress process is continuous, transparent and participatory and is an integral part of the project's accountability and governance agenda.

Institutional Development and Capacity Building

UDWDP-II draws from the learnings of previous project giving greater emphasis to community participation and community ownership. The project is built to develop greater ownership, planning and management by community through participatory approach involving all stake holders at Gram Panchayat (GP) level. The project staff and project partners (Facilitating NGOs, Partner NGOs) have a facilitating role to play regarding planning, implementation and management of the project.

The institutions and the stakeholders whose capacities were built are entrusted with certain roles and responsibilities. The existing institutions have been strengthened and the newly formed institutions have been capacitated. The institutions at the level of community include the officials working at Gram Panchayat and Village level including the ABSOs and FNGOs. The institutions at the level of state include the officials and the committees formed for implementation of the project.

Result: Increased Women participation in project planning

Adult female participation in GPWDP preparation: 0 to 39.4 %

Female participation in project meetings: 41 to 47 %

Capacity building measures have been undertaken particularly at Gram Panchayat level aimed at building capacities for project management and social accountability, in particular, in preparing and implementing GP Watershed Development Plans (GPWDPs).

Key community level institutions under the project are Gram Sabha, GP, Water and Watershed Management Committee, Revenue Village Committee, Mahila Aam Sabha, Van Panchayat, Multi-Disciplinary Team, Field NGO, PNGO, ABSO and District level Watershed Committee. At the state level the Watershed Management Directorate and the State Steering Committee are the key bodies.

Knowledge Management and Project Coordination

Keeping in mind the criticality of ensuring that a strong project management bedrock is created, Gramya II focuses upon Component 4 which relates to Knowledge Management and Project Coordination. This component aims to ensure effective implementation of project activities and monitor and evaluate progress, outputs and outcomes.

A clearly defined implementation structure has been designed for implementation of Gramya II, which includes units at the Panchayat, district, and state levels. The project has well defined processes and guidelines for all functions such as procurement, financial management, MIS etc.

The project monitoring, learning and evaluation (MLE) framework has been designed to facilitate results-based management; learning and process enhancement; and impact evaluation. The project is monitored based on various result framework indicators and core indicators finalized for each component. The progress of each core indicator is tracked on a six-monthly basis. The MLE framework for the project comprises of three key components, namely Monitoring and Evaluation by an external agency, internal project monitoring and Participatory Monitoring and Evaluation (PME).

The total project expenditure over the period 2014-15 to 2018-19 is Rs 57, 296.14 Lakh of which 69.5% is IDA- World Bank financed, 25.3% is financed by the Government of Uttarakhand and the remaining 5.2% is financed through community contributions. There are five key heads of expenditure: social mobilization and participatory watershed planning, watershed treatment and rainfed area development, enhancing livelihood opportunities, knowledge management and project coordination and Government staff cost. On analysing the trend of expenditure across these five heads in the last five years, certain interesting observations can be made. The share of expenditure on watershed treatment and rainfed area development has steadily risen from 24.9 percent in 2014-15 to 63.2 percent in 2018-19. The expenditure on enhancing livelihood opportunities has similarly risen from 0.2 percent in 2014-15 to 11.6 percent in 2018-19. The expenditure on social mobilization and participatory watershed planning has on the other hand declined from 7.7 percent in 2014-15 to 5.7 percent in 2018-19. Knowledge management and project coordination expenditure has gone down from 27.8 percent of the total expenditure to 10 percent in 2018-19. This could reflect the fact that initially investments were made on establishing various systems and structures and this gradually stabilized once the project had taken off. In a similar manner Government staff cost expenditure also declined from 39.4 percent of total expenditure in 2014-15 to 9.5 percent in 2018-19.

The communication strategy is a vital element of the project and covers all aspects, namely implementation strategy and planning, interaction among project functionaries, interaction between the target communities and the project functionaries, preparation and execution of GPWDPs and sub-projects, gender sensitivity among project functionaries, training of various project functionaries, media outreach and involvement of external stakeholders. The project has defined the target audiences for specific messages during the various stage of the project. These include the social mobilization phase, implementation phase and the withdrawal phase.

The project has followed Suo moto disclosure policy on all important aspects of projects to ensure transparency and governance accountability of the project. Activities undertaken under Gramya II are disclosed to the community in several ways. Transparency boards are constructed containing all information related to the budget and timeline of completion. It is suggested that the disclosure of beneficiaries covered under various activities of the project also be undertaken through public notice or on the walls of the Panchayat.

Impacts of Gramya II

Gramya II activities are focused on an inclusion strategy which covers all the social groups including vulnerable groups and therefore have targeted interventions for promoting the same. Women Aam Sabha, has been initiated under the project to create greater participation of women in governance forums and voice out their concerns about the need for work in the village. The suggestions of the WAS are being given importance and these are being incorporated in the plans. Budget allocations for women centric plans have consequently gone up.

A study of membership of WWMCs shows that 59 percent of the members are women, underlining the equity focus of the project. Gramya interventions focus on encouraging the participation of women as well as other vulnerable groups in the training and exposure visits organized and it has been observed that participation of women has increased. Participation of women in trainings/workshops and exposure visits has increased from 43% in 2014-15 to 59% in 2018-19. There has also been an increase in participation by members of SC communities.

The greatest impact of Gramya II in the project region is on building gender responsive strategies, encouraging women leadership and their representation in governance. The WAS formation has enabled

women to voice their opinions and have given a platform to present their issues; concerns of women were given priority and a change has been observed in terms of understanding the women issues and problems at the panchayat level. Women are encouraged to take up leadership position and place in GPWDP plans supporting need for Women. Out of the total proposals raised by WAS nearly 76.6 percent proposals have been incorporated in GPWDP (9806 out of 12786).

The capacity building initiatives (training, workshop and exposure visits) have created awareness and enabled farmers to physically witness improved technologies in agriculture, horticulture, livestock and agribusiness and also given them a proven example of success. The level of interest in these exposure visits is high resulting in the high adoption rate of technologies and innovative interventions undertaken, especially in agribusiness can be attributed to the high number of training, exposure and workshops conducted under the project.

The overall quality and distribution of Individual Assets has focused on equitable distribution among various categories of project beneficiaries. The allocation of assets among 'C' category of beneficiaries is the highest with 45 percent of assets provided to this category, followed by category 'B' (36%) and category 'A' 19%.

The project has provided wage employment to the project beneficiaries to the extent of 7,01,731 man-days (Kumaun - 3,87,129 man-days and Garhwal - 3,14,602 man-days). This reflects that the project has been able to generate enough employment to meet the livelihood needs of the community in the project area to quite an extent.

The project also has a special component focused on transhumant population which has helped in providing day to day items of need to this population helping improve their quality of life. Health camps organized for both the humans as well as their livestock has impacted in improving their health by identifying and addressing the disease and administering curative as well as preventive measures. Assistance covered 12589 transhumant population in the entire project area at a financial cost of Rs. 159.06 lakhs.

The project provides for a Vulnerable Group Fund for supporting livelihood enhancement of vulnerable groups to ensure equity amongst vulnerable households. In the project, the 'C'- category households were identified through 'Wealth Ranking Exercise' carried out as part of participatory planning for preparation of Gram Panchayat Watershed Development Plans. The features characterizing these 'C' category/ vulnerable group households may vary from one Gram Panchayat to another depending upon the proximity of GP to the connecting road, availability of irrigated area, proximity to marketplace and other amenities. Households fulfilling above 2 to 3 criteria qualify as members of vulnerable group. Till March 2019, 4007 individual beneficiaries and 570 groups consisting of 3420 beneficiaries have been impacted through the VGA activities. With exception of Uttarkashi, 3770 beneficiaries have a net income of Rs 6,26,48,665.

Farm mechanization and assistance of farm tools have also helped in reducing the drudgery of women in farm labour and allowed ease of work. Assistance of animal husbandry input has considerably helped reduce the work especially for women who are the primary caregivers of livestock in rural homes. Fodder cultivation has ensured availability of feed for livestock around the year. The problems associated with fodder collection such as availability, carrying distance and time and effort are no more an issue. Energy conservation interventions like solar cookers and biogas has revolutionized the lives of rural women with a smokeless cooking tool that utilizes renewable energy. The time and effort spent in gathering fuelwood from the forest for cooking has significantly reduced.

Almost all farmers involved in high yielding agricultural crops (cereals, pulses, and millets etc.) are dedicating portion of their land holding under organic farming practices to produce the crops that are being used for self-consumption. Organic farming is also contributing to a nutrient rich diet for the farmers thus allowing a healthier lifestyle. The interventions have enabled FIG members to be more health conscious, as they perceive that bio-composting techniques, organic farming practices, vegetable cultivation and hygienic milk production would help in improvement of family health. Homestead plantations have allowed farmer families to include diverse nutrients in their diet with availability of various vegetables and cereals. MTR study has reflected that carbohydrate intake of farmer families in project area is 14.1% (for once a day) and 8.3% (for thrice a day) more than control areas. Similarly, protein intake of farmer families in project area is 7.1% (for once a day) and almost equal (for thrice a day) more than control areas.

Adoption of climate resilient agricultural practices under UDWDP II has helped achieve the natural resource conservation, especially soil and water. Almost all farmers engaged in IPM at demonstration in the study villages are convinced to follow the use of organic insecticides, bioagents and the sticky and/or light traps to control pests/insects after the project completion. The cultivation of fodder and Napier grasses in the fields as a standalone crop and/or border plantation has provided the farmers with around the year feed for livestock reducing the reliance on forests or pastures. The fodder cultivation has reduced the effort of collection of fodder and grasses from the forest.

Increase in yield of major crops, cropping intensity and inclination towards diversification has strengthened the agriculture-based economy. Farmers in study villages are now are conscious of profitability of various crops and there is a distinct attempt to shift to crops that are more profitable. Increased productivity and better crop management is directly proportional to the increased income for the farmers and better livelihood security. Increase in income from Agriculture/Horticulture crops has also provided surplus income which was absent previously and enabled the farmers to take risks for new crops of high commercial value thereby boosting the overall household income of FIG members. Fallow land has also been brought under cultivation thus increasing the available area for cultivation for the farmers and increasing the value of their asset land.

Almost all farmers engaged in IPM at demonstration plots and are convinced to follow the use of organic insecticides, bioagents and the sticky and/or light traps to control pests/insects after the project completion. Demonstrations of Bio-compost, Vermi-compost and INM are received well by the farmers and over 30% of farmers have adopted the organic nutrient management practices along with soil testing based fertilizer application. This has reduced the usage of inorganic measures of nutrition, and disease and pest management, curbing the degradation of soil. Inorganic measures are also less expensive, thus increasing the net profit of the farmers. Uncultivable wasteland brought under fruit orchards has helped reclaim the barren lands and improve its soil quality.

Promotion of renewable energy sources such as solar, pine briquettes, solar powered water lifting, biogas, etc. as well as the traditional ones such as the Gharat (hydro powered mill) has contributed to a reduced requirement of electric power. Biogas has helped in utilizing the cow dung and provides nutrients for farming through the output slurry. With increased acceptance of renewable sources of energy local communities stand to benefit from faster and more efficient agro-processing services and a wider range of mechanized crop-processing machinery, plus electrical services via an add-on generator, evening lighting, water heater, battery-charging, crop-drying, or irrigation pumping at night in the future.

Interventions in livestock and animal husbandry such as improved livestock breeds for Natural breeding as well as Artificial Insemination and health camps for livestock has contributed to better birthing rates in

livestock and healthy progeny. According to the MTR study, livestock ownership in the project region has doubled (increased from 2 in the baseline study to 4).

The increase in Household Income of the target beneficiaries has increased from an average of 1,40,616 to Rs 1,60,334 annually post project in the project area. The increase in household income by 14% for project area in comparison to 5 % for control reflects that Income Generation Activities undertaken in the project have positive results.

Economic and Financial Analysis

A total investment of \$170 million is envisaged for Gramya II. For the purpose of this economic analysis the exchange rate of Rupee vs Dollar has been taken at the average exchange rate pertaining to the calendar year 2013 which according to Reserve Bank of India was 60.5. Thus, in rupee terms total investment planned for the project is Rs. 1028.50 Crore. It may be noted that of the total investment approximately Rs 3 crores would be generated through contribution (in the form of Kind/Wage) from beneficiaries. Given the negligible quantum of beneficiary contribution at this stage, their opportunity cost has not been built into the economic analysis.

Economic project costs as estimated during project appraisal stands at Rs. 9,178 M after adjusting for transfers, taxes, subsidies, and converting financial prices to economic prices. Economic prices for internationally traded commodities (fertilizer, paddy, and wheat) are derived and used. While deviation between the parity prices and market prices for paddy and wheat is marginal (less than 8%), parity prices for fertilizer nutrient is two and half times that of market prices. This difference in economic and market prices for fertilizers and use of human labour by small farmers in the project area has resulted in economic rate of return (ERR) marginally lower than financial rate of return.

The economic analysis was conducted for a project period of 30 years. Cost and benefits were estimated at 2015-16 prices over 30 years with 12% opportunity cost of capital. Present value of discounted project financial benefits over the project life, due to project interventions were estimated at Rs. 15.29 billion. The estimated financial rate of return (FRR) for the project as whole was 21.3 percent at the end of project. The current (2018-19) net present value stands at Rs. 10.43 billion as against Rs. 7.9 billion anticipated at the end of the project. The economic analysis was conducted after making appropriate adjustments to financial benefits and costs. The estimated net present value (NPV) works out to Rs. 8.71 billion as against Rs. 6.6 billion estimated at the end of project in the PAD. The economic rate of return for the project as a whole is around 20.07 per cent as against 21.6 per cent expected at the end of the project.

To conclude, Gramya II is by far the largest, most inclusive, participatory, and comprehensive watershed development project ever undertaken in the state of Uttarakhand. Given the topography, location, vulnerability, fragile geology and ecosystem and diversity of communities the state of Uttarakhand, this project is found to be more suited and timelier as observed by the various stakeholders and experts. Gramya II as done extremely well until MTR about achieving not only the physical and financial targets but making the desired impacts as envisaged. The project has put all the necessary systems in place for smooth, transparent and efficient implementation of the project across divisions, project areas covering some of the remotest part of the state. All the Results and PDO indicators are achieved well beyond the stated targets. The financial and economic analysis gives a very significant IRR at the MTR stage which is only expected to increase as more impacts start showing up towards the end term. Though MTR has come out with suggestions in some areas, however there is no major course corrections measures being suggested. Gramya II like to achieve much beyond the envisaged targets and impacts if it continues to consolidate the achievements made so far and capitalise on the momentum generated.

SUMMARY OF RESULTS

Table 1: Summary of Results							
PDO Level Results Indicator	Unit of Measure	Mid Term Target	Baseline		Mid Term		
			Project	Control	Project	Control	
PDO 1. Increase in water discharge	%	10	0	-	Pre-Monsoon ² 12.29% to 22.2%	-	
					Post Monsoon ³ 13.8% to 27.0%		
PDO 2. Increase in Bio Mass	MT/Ha	10%	27.69	21.74	30.62 (10.58% increase) ⁴	22.28 (2.05% increase) ⁵	
PDO 3. Increased Ha of rainfed area under irrigation	Ha	6050	5262	-	8514.8 ⁶	-	
PDO 4. Increase in productivity of irrigated crops	%	30	-	-	37.2 ⁷	16.8	

² Increase in water discharge for 1485 structures during the time period of May-June (Pre Monsoon) for an aggregate of four years data increased in the range of 12.3% to 22.2%

³ Increase in water discharge for 1485 structures during the time period of Dec-Jan (Post Monsoon) for an aggregate of four years data increased in the range of 13.8% to 27.0%

⁴ An increase in biomass by 10.58% produced in arable and non-arable lands is observed in the Mid Term Review as compared to baseline in Project area

⁵ An increase in biomass by 2.05% produced in arable and non-arable lands is observed in the Mid Term Review as compared to baseline in Control area

⁶ An increase of 3252.8 Ha was accomplished over the baseline values of 5262Ha (conversion of rainfed area into irrigated area)

⁷ The achievement is compared with the Mid Term target directly as productivity of individual crops were taken during the baseline but in MTR it has been aggregated into rainfed and irrigated crops

Table 1: Summary of Results

PDO Level Results Indicator	Unit of Measure	Mid Term Target	Baseline		Mid Term					
			Project	Control	Project	Control	Project	Control		
<i>Increase in productivity of Rainfed crops</i>	%	5	-	-	-	-	27.2 ⁸	12.8		
			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	
Spice Crops										
<i>Garlic</i>	Qtls/Ha		-	40.2	-	39.9	-	60.8	-	47.1
<i>Vegetable crops</i>										
<i>Cauliflower</i>	Qtls/Ha		-	99.5	-	98.5		113.2		107.0
<i>Cabbage</i>	Qtls/Ha		-	86.4	-	85.3		128.7		102.6
<i>Green Pea</i>	Qtls/Ha		-	51.8	-	51.0		70.0		61.3
Increased productivity of Rainfed crops										
Spice Crops			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
<i>Ginger</i>	Qtls/Ha		84.7	-	84.2	-	113.9	-	98.4	-
<i>Turmeric</i>	Qtls/Ha		76.1	-	75.9	-	88.3	-	81.9	
<i>Onion</i>	Qtls/Ha		-	44.0	-	43.0	-	61.1	-	49.4
<i>Garlic</i>	Qtls/Ha		-	40.2	-	39.9	-	60.9	-	50.2
<i>Cereal crops</i>			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi

⁸ percent increase in case of rainfed crops in Project area

Table 1: Summary of Results

PDO Level Results Indicator	Unit of Measure	Mid Term Target	Baseline				Mid Term			
			Project		Control		Project		Control	
<i>Maize</i>	Qtls/Ha		13.0	-	12.3	-	15.8	-	14.1	-
<i>Wheat</i>	Qtls/Ha		-	12.6	-	12.0	-	15.7	-	14.0
<i>Rice</i>	Qtls/Ha		11.2	-	11.1	-	13.8	-	13.0	-
Nutri Crops										
<i>Finger Millet</i>	Qtls/Ha		12.1	-	11.5	-	13.8	-	12.6	-
<i>Barnyard Millet (Madira, Jhangora)</i>	Qtls/Ha		11.7	-	11.5	-	13.3	-	12.5	-
<i>Amaranthus (Ramdana)</i>	Qtls/Ha		6.1	-	5.8	-	7.3	-	6.3	-
Horticulture Crops/ Vegetable Crops			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
<i>Potato</i>	Qtls/Ha		90.1	-	89.8	-	106.7	-	98.2	-
<i>Tomato</i>	Qtls/Ha		105.4	-	105.2	-	137.8	-	123.4	
<i>French Bean</i>	Qtls/Ha		55.6	-	55.2	-	79.7	-	67.5	-
<i>Capsicum</i>	Qtls/Ha		58.5	-	58.1	-	81.9	-	62.0	-
<i>Cauliflower</i>	Qtls/Ha		-	99.5	-	98.8	-	112.0	-	105.0
Oilseed crops			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
<i>Mustard(Sarson)/Rapeseed</i>	Qtls/Ha		-	5.6	-	5.4	-	7.3	-	5.6

Table 1: Summary of Results

PDO Level Results Indicator	Unit of Measure	Mid Term Target	Baseline				Mid Term			
			Project		Control		Project		Control	
			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
<i>Pulse crop</i>										
<i>Lentils(Masoor)</i>	Qtls/Ha		-	7.3	-	7.1	-	9.5	-	7.5
<i>Black Soyabean</i>	Qtls/Ha		8.9	-	8.6	-	11.9	-	10.2	-
<i>Horse gram (Gehat)</i>	Qtls/Ha		-	6.8	-	6.7	-	6.5	-	6.7
PDO 5. Direct project beneficiaries, of which % of female	Number	30,000	0		-		49822 ⁹		-	

⁹ Calculated as #HH benefitting under GPWDPs net of HHs under Vulnerable groups (Intermediate indicator 8) with gender breakdown. This Includes beneficiaries of adoption Support + VGA

Intermediate Results Indicator	Unit of Measure	Mid Term Target	Baseline		Mid Term	
			Project	Control	Project	Control
Intermediate Result (Component 1): Social Mobilization and Participatory Watershed Planning						
Intermediate Indicator 1: (i) Percent of participating households in Gram Sabha meetings	%	80	67.2	58	88.5	38.2
(ii) % of which are female	%	50	62.4	54.3	63.4	36.7
Intermediate Result (Component 2): Watershed Treatment and Rainfed Area Development						
Intermediate Indicator 2: Hydrological monitoring systems fully installed and functional in sample MWS¹⁰	No.	8	-	-	8	-
Intermediate Indicator 3: Targeted traditional natural water sources rejuvenated	%	10	-	NA	78.9 ¹¹	-
Intermediate Indicator 4: Natural resource conservation techniques adopted in the targeted area	%	25	0	NA	30.5 ¹²	-

¹⁰ Comprised of Gramya II MWS taken up by WAPCOS

¹¹ Percentage of traditional water resources rejuvenate till March 2019

¹² Terraces with all soil water conservation practices

Intermediate Results Indicator	Unit of Measure	Mid Term Target	Baseline		Mid Term	
			Project	Control	Project	Control
Intermediate Indicator 5: Targeted farmers adopting soil moisture conservation and crop production technology	%	30	28.4	27	65.1 ¹³	41
Intermediate Indicator 6: Farmers organised into FIGs	No.	6000	0	-	15006	-
Intermediate Indicator 7: Self-sustained FFs	%	15	0	-	50 ¹⁴	-
Intermediate Indicator 8: Vulnerable HHs covered by the Vulnerable group activities under GPWDPs	No.	3110	0	-	7427 ¹⁵	-
Intermediate Result (Component 4): Knowledge Management and Project Coordination						
Intermediate Indicator 9: Targeted GPs with satisfactory social audit using PME	%	65	0	-	100	-
Intermediate Indicator 10: Targeted GPs with satisfactory financial audit report	%	80	0	-	100	-

¹³ Farmers adopting demonstrated technology in at least two cropping season

¹⁴ Functional Federation and has made profit in at least last two business cycles

¹⁵ # HHs considered to be vulnerable and benefitting from vulnerable group activities under approved GPTWDPs. Total Individual beneficiaries-4007 & Group beneficiaries -570 (equivalent to 3420 individual beneficiaries considering one group consists of 6 individual beneficiaries on an average)

SUMMARY OF FINDINGS OF PROJECT IMPACT INDICATORS					
Project Impact Indicators	Unit of Measure	Baseline Study		MTR	
		Project	Control	Project	Control
<i>1. Frequency of intake of protein and vitamin diet in food (None to at least once in a meal)- Diversity in consumption of food in last 1 year</i>		-	-	32.6	25.5
<i>2. Cropping Intensity</i>	%	154.2	-	173.4	-
<i>3. Percentage of HH's owning livestock</i>	%	79.8	78.3	82.7	80.1
<i>4. Annual Income of Household</i>	Rs	1,40,616	1,41,132	1,60,334	1,48,415
<i>5. Increase in percentage of household in higher quartiles of empowerment score</i>	%				
<i>(Poor) Q1</i>	%	2	2	1.7	9.8
<i>Q2</i>	%	63.7	65.7	31.2	27.3
<i>Q3</i>	%	34	32.1	48.3	47.9
<i>(Excellent) Q4</i>	%	0.3	0.2	18.8	15.0
<i>6. Increase in percentage of household in higher quartiles of social capital score</i>	%				
<i>(Poor) Q1</i>	%	4.5	1.4	0.5	3.8
<i>Q2</i>	%	52	43.4	28.8	26.9
<i>Q3</i>	%	40.1	49.3	62.4	58.0
<i>(Excellent) Q4</i>	%	3.4	5.9	8.4	11.2

SECTION 1

PROJECT BACKGROUND



1. Project Background

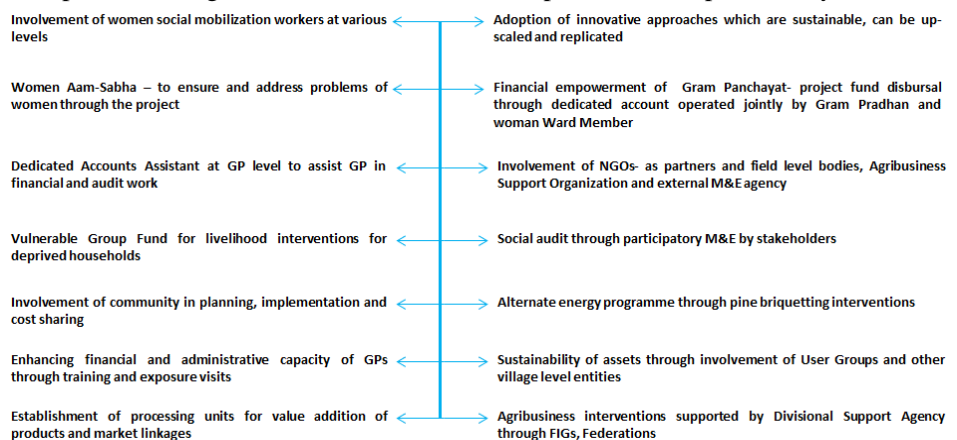
1.1 Watershed Development: An Overview

Uttarakhand was carved out of northern Uttar Pradesh on 9th November 2000, emerging as the twenty seventh state of the country. Located at the foothills of the Himalayan mountain ranges, it is largely a hilly state, with 92 percent of its area of 53,500 square kilometers having a rugged topography. The state witnesses’ frequent instances of landslides and soil erosion due to its topography. A huge landslide in 1970 created a lake on the river Alaknanda and caused severe damage to the downstream villages due to its burst. Another devastating flood caused by the river Bhagirathi in 1978 in Uttarkashi forced the then government of Uttar Pradesh to take remedial and corrective measures. It was in this context that a Watershed Management Directorate (WMD) was established in 1982 under the Forest Department to ensure strategic watershed management in hilly areas for conserving and sustaining the natural resource base and enhancing agricultural productivity.

A watershed is a hydrological unit from which runoff drains and is collected through a common outlet. The catchment area of a stream or river in which water is collected is also a watershed. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. Watershed development is necessary to be adopted for the conservation, regeneration and judicious use of the natural resources- land, water, plants and animals. Development activities can take place in a planned and efficient way if they are implemented at the watershed level which is also the naturally developed unit of human settlements. Watershed development projects comprise of interventions that focus on conserving soil and water for rainfed agriculture, recharging of underground water, and capturing surface runoff into ponds, trenches and other similar structures meant for water storage. Watershed development is a primary tool of the Government of India (GoI) to increase agricultural productivity and reduce rural poverty.

1.2 Learnings from UDWDP I

A decentralized watershed development project, Gramya I was implemented from 2004 – 2012. Gramya I was financed by the World Bank and was successfully implemented by the WMD. Based on the success of the project, the Uttarakhand Decentralized Watershed Development Project II (UDWDP II) also referred to as Gramya II is being implemented with a focus on rainfed agriculture development through use of watershed development tools, particularly rainwater conservation and harvesting and land resource management. Gramya II is built on the successful community-based approach of Gramya I and key learnings from this phase are being incorporated to ensure improved implementation and performance. Some of the key learnings that have been taken into account while designing and implementing Gramya II are indicated in the adjoining exhibit.



Based on learnings from previous projects implemented by the WMD, it was found to be imperative to make the community a primary driver of the project and involve it in most decisions related to planning and implementation.

1.3 About the Project Components

Gramya II focuses on micro watershed treatment of 220,000 ha of non-arable lands, which would enhance agricultural productivity on 40,000 ha of adjacent arable land. The project has four core components:

Component 1: Social Mobilization and Participatory Watershed Planning

The social mobilisation component focuses on mobilization of GPs in order to prepare integrated and coordinated Gram Panchayat Watershed Development Programs (GPWDP) including the identification of specific interventions to increase effective land use and water resource management and develop agriculture and income-generation activities; and development of watershed treatment plans to guide the preparation and implementation of GPWDPs. It focuses on increasing stakeholders' participation in GPWDP preparation especially participation of women by forming Mahila Aam Sabhas (also referred to as Women Aam Sabhas) and ensuring smooth functioning of the Watershed Management Committee and Revenue Village Committees.

Component 2: Watershed Treatment and Rainfed Area Development

This component is the core of the project, constituting 53% of total investment. The Component aims to enhance biomass production, increase productivity of rainfed and irrigated crops, and improve discharge from the identified water sources. This Component supports GPs in implementing GPWDPs through (a) Watershed Treatment and Water Source Sustainability; and (b) Rainfed Agriculture Development.

Sub-Component 2a - Watershed Treatment and Water Source Sustainability

This sub-component focuses on GPWDP implementation for effective management of land and water resources for improving groundwater recharge, reducing runoff and soil loss, and harvesting rainwater for irrigation through Watershed treatment initiatives & Water source sustainability.

The core objective under this sub-component is to carry out watershed treatment activities including construction and rehabilitation of check dams, ponds, irrigation channels and tanks, and roof water harvesting structures; preparation of agriculture terraces and vegetative field boundaries; and rehabilitation of bridle paths, small bridges and culverts. The sub-component also focuses on carrying out water source sustainability activities including, inter alia construction and/or rehabilitation of soil conservation structures; border plantation of grasses; carrying out of forestry activities; and promotion of alternative energy source practices.

Sub-Component 2b - Rain fed Area Development

This sub-component aims to increase the productivity of field and horticultural (mainly vegetables) crops grown in the project watersheds. It would also support the provision of improved seeds and promote innovative agronomic technologies in rainfed and irrigated areas.

This sub-component includes Demonstration of high yielding agricultural crops (for rainfed & irrigated area), Poly tunnel, poly house, vermi-compost, Orchard development, Homestead plantation & Seeds and Seedlings distribution.

Additionally, there is also a sub-component of Animal Husbandry programme, under which interventions are undertaken in Para vet (AI services), Animal Chari and Shelter/shed, Veterinary camps, Manger & Natural Breeding Centers along with a fodder production programme focused on Napier plantation.

Component 3: Enhanced Livelihood Opportunities

This component supports agribusiness development, improving livelihoods of vulnerable groups, and assist Gramya-I GPs in consolidating watershed development activities. The component has three sub-components: (a) Agribusiness Support; (b) Income-generating Activities; and (c) Consolidation of Gramya-I Activities.

Sub-Component 3a - Agribusiness Support

This sub-component promotes agribusiness development and support through formation and capacity building of FIGs and their consolidation into FFs, development of agribusiness plans and supply chains (including marketing support, collection, grading, packaging and processing centers) with technical backstopping by agribusiness support organizations; and Capacity building of community-based institutions (FIGs and water harvesting structure user groups). In the selected divisions, agribusiness activities are being phased in with emphasis on formation of viable FIGs, dissemination of technologies, production and distribution of quality seeds and seedlings, training through demonstrations and establishment of linkages.

Sub-Component 3b - Support for Vulnerable Groups

This sub-component promotes equity in project benefit through support to vulnerable transhumant, landless and marginal farmer households for improving their livelihoods. Income generating activities, e.g., carpet weaving, handicrafts; livestock rearing, etc. are supported through livelihood activities supported under the GPWDPs and the formation of vulnerable groups of marginal farmers owning less than 0.1 ha land.

Sub-Component 3c - Consolidation of Gramya I Activities

This sub-component focuses on the repair of the damaged assets created in Gramya I and strengthen the business planning and management capacity of Farmers Federations formed under Gramya I to develop them as sustainable producer businesses. The support for agribusiness development will be provided by local NGOs.

Component 4: Knowledge Management and Project Coordination

This component includes capacity development of all stakeholders for promoting convergence in selected micro watersheds. This component supports extensive interdepartmental consultation and planning exercises.

Sub-component 4a - Knowledge Management

This sub-component covers institutional strengthening and capacity development activities covering a variety of thrust areas ranging from natural resources management, agriculture systems, development, skill development, livelihood enterprise development, gender sensitization, governance, legal issues, institutional strengthening, general awareness building etc. for GPs, VPs, farmers, livelihood groups, project staff, NGOs and other stakeholders. The activities include training and workshops, skill development, exposure visits, farmer field schools, hands on demonstrations, etc. for different groups of stakeholders. Other institutional strengthening activities would include establishment of division-level

training cells and development of model micro-watersheds as on-site demonstration and training sites for training farmers, village communities and project functionaries.

Sub-component 4b - Project Coordination

This sub-component would finance the management and supervision of Project implementation. The Component would also support the management of project implementation including monitoring and evaluation through an ICT-based monitoring information system and social accountability and grievance redressal mechanism.

SECTION 2

PROJECT DESCRIPTION



2. Project Description

2.1 Project Details

Watershed development have had a paradigm shift in its approach where community participation and hydrology in combination has made the design of such programmes more people driven than scientific. UDWDP-II has been designed as a project to be well driven, owned, managed, planned and implemented by the community through participatory approach involving all stakeholders at various levels. The project has associated partner NGOs and the facilitators to undertake implementation activities involving planning, implementation and management of the project. Major investment is on catchment area treatment of about 220,000 ha of non-arable land in the hills, ranging in elevation from 700 m to 2,700 m above sea level. This is expected to rejuvenate the natural resource base by significantly reducing soil erosion and runoff loss of rainwater, improving ground water recharge, and reducing sediment load in the tributaries of the Ganges flowing through the state. The project will construct water harvesting structures and small irrigation systems on 40,000 ha of arable land, and disseminate new technologies for increasing productivity of cereal, pulse, and oilseed crops in these rainfed areas, and of high-value vegetables in the currently irrigated areas. It will develop value chains for selected agriculture and horticulture commodities in addition to building capacity of targeted Gram Panchayats (GPs) for developing and implementing sound watershed management plans

The Project Development Objective (PDO) of Gramya II is to *increase the efficiency of natural resource use and productivity of rain-fed agriculture by participating communities in selected micro watersheds of the Uttarakhand state.*

The project is being implemented over seven years from 2014 to 2021 spread across three phases of implementation. The first phase is the preparatory phase in which the project was in the planning stage and subsequently the implementation and Consolidation phase was implemented.

UDWDP-II is being implemented in villages of 82 micro watersheds of Middle Himalayas, lying between 700 m and 2700 m above sea level. The focus of this project is to develop and enhance productivity of rainfed areas by adopting a participatory watershed management approach therefore about 525 GPs of state which have maximum problems of erosion, poverty and lack of infrastructure facilities have been chosen for the implementation of the project.

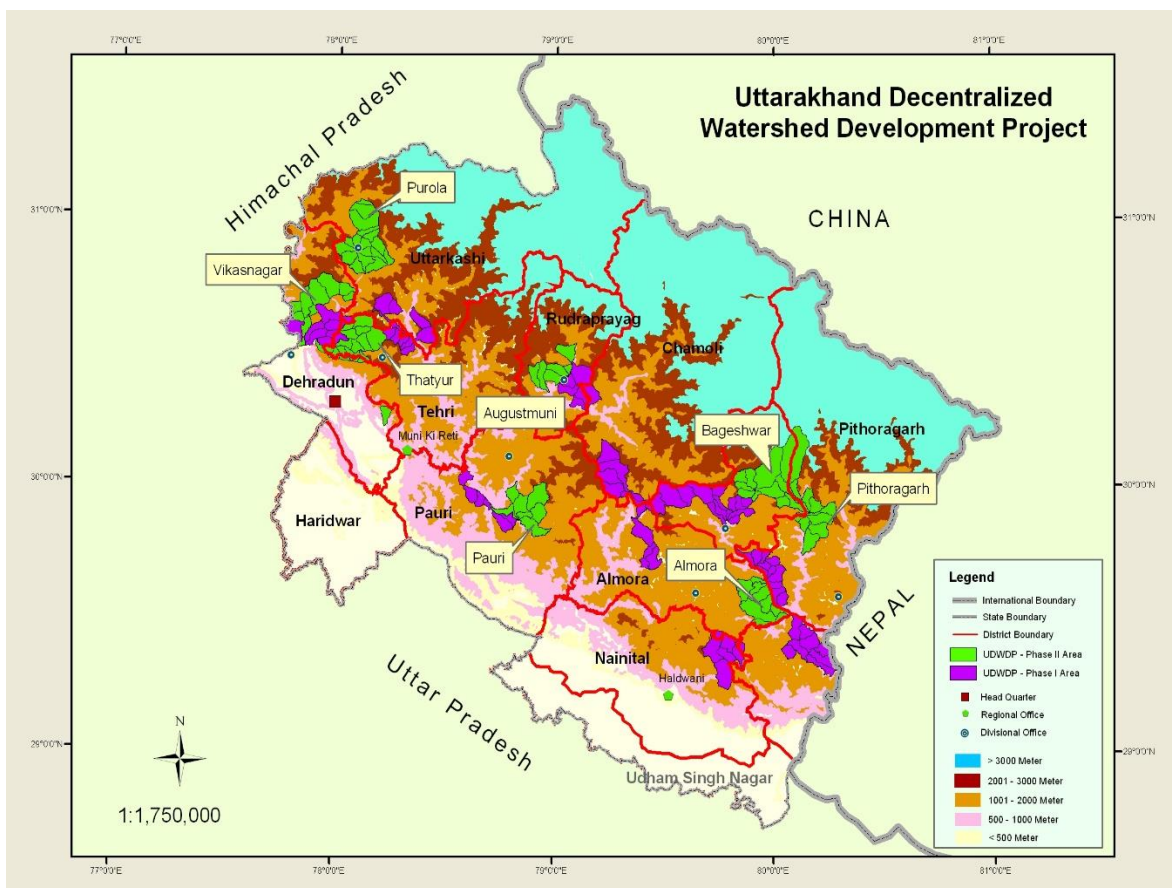


Figure 1: Coverage Area of UDWDP- II

Table 2: Details of Project Area under UDWDP II										
District	Development Blocks	No. of MWS	Area (Ha.)	Forest Area (Ha.)	Agriculture Area (Ha.)	Blank (Ha.)	Gram Panchayat			No of Revenue Villages
							No.	Area (Ha.)	Population	
Almora	Dhauladevi, Bhasiyanchana	9	28396	14987	12303	1106	87	24421.12	48642	188
Uttarkashi	Mori, Naugaon, Purola	17	45103	31233	9727	4143	68	9820.12	37918	120
Dehradun	Kalsi, Chakrata	9	29242	8778	8270	12194	56	21016.77	35794	76
Tehri	Jaunpur	13	31730	11977	8306	11447	78	17833.16	36577	143
Rudraprayag	Ukhimath, Jakholi, Augustmuni	6	19201	11609	7449	143	61	7885.40	45559	107
Pithoragarh	Munsyari, Didihat, Berinag	9	25739	17206	6350	2383	63	21791.12	30138	147

Table 2: Details of Project Area under UDWDP II

Table 2: Details of Project Area under UDWDP II										
Bageshwar	Kapkot	11	55296	35666	6672	12920	43	34456	33420	78
Pauri	Pokhara, Ekeshwar	7	26713	9373	10980	6360	62	12091.42	22046	175
Model MWS	Raipur	1	2417	1365	789	95	7	4023.41	2928	23
TOTAL	18	82	263837	142194	70846	50791	525	153338.5	293022	1057

The project is expected to benefit about 66,402 households and a population of almost 3 lakh individuals. By enhancing the natural resource base and improving sustainability, the proposed Gramya II would target 525 GPs, supporting following beneficiary groups:

- a) Medium- and small-scale farmers: will benefit from: (a) watershed treatment, in particular, rainwater conservation and water harvesting structures that would increase water availability and efficiency; (b) improved support services in agriculture, horticulture, and livestock, including rainfed agriculture development; and (c) agribusiness development and market linkages.
- b) Vulnerable groups (e.g., marginal landholders, landless, women, and transhumance): would benefit from: (a) improved livelihoods, mainly in the livestock and services sectors; and (b) supports of transhumance through a dedicated Transhumant Action Plan.
- c) PRI institutions, such as GPs: gains capacity in project management and social accountability, in particular, in preparing and implementing GP Watershed Development Plans (GPWDPs). The project also promotes the formation of community-based organizations, such as water user groups, farmer interest groups (FIGs), and FFs.
- d) Key institutional stakeholders in watershed development: benefits through expanded knowledge outreach to Partner NGOs, Field NGOs, agribusiness support agencies, six district headquarters, regional headquarters in each of the two regions of the State of Uttarakhand and the Watershed Management Directorate (WMD).

2.2 Project Budget Allocations

The project cost is 170.0 million US\$ with IDA Credit as 121.2 million US\$ (71.3%), State contribution as 45.8 million US\$ (27.0%) and beneficiary contribution as 3.0 million US\$ (1.7%).

Table 3: Project Budget Allocations

Project Components	Project Cost		IDA Financing		GoUK Financing		Beneficiary Contribution	
	Million US\$	%	Million US\$	%	Million US\$	%	Million US\$	%
1. Social Mobilization and Participatory Watershed Planning	30.0	17.6	13.9	46.4	16.1	53.6	0.0	0.0
2. Watershed Treatment and Rainfed Area Development	90.3	53.2	72.3	80.0	15.1	16.7	3.0	3.3

Table 3: Project Budget Allocations

Project Components	Project Cost		IDA Financing		GoUK Financing		Beneficiary Contribution	
	Million US\$	%	Million US\$	%	Million US\$	%	Million US\$	%
	3. Enhancing Livelihood Opportunities	18.7	11.0	14.9	80.0	3.7	20.0	0.0
4. Knowledge Management and Project Coordination	31.0	18.2	20.1	64.8	10.9	35.2	0.0	0.0
Total Project Cost	170.0	100	121.2	71.3	45.8	27.0	3.0	1.7

2.3 Institutional and Implementation Arrangements

The UDWDP-II is based on joint relationship among three entities: (i) Village communities and GPs; (ii) WMD; and (iii) NGOs and other service providers. All stakeholders are expected to fulfil their respective roles and responsibilities for the project to be successful. An overview of the roles of each stakeholder groups is provided in the following table.

Table 4: Panchayat Level Institutions

S.No.	Institution	Composition	Role	Accountable to
1.	Gram Sabha	All adult voters of the Gram Sabha	<ul style="list-style-type: none"> To discuss & approve all major decisions related to GPWDP Ensure inclusion of disadvantaged groups such as women, poor, SC/ST, transhumant Monitoring the working of GP and Implementers 	Village community
2.	Gram Panchayat	Gram Pradhan & All Ward Members of GP	<ul style="list-style-type: none"> Sign all necessary and appropriate agreements related to the project with WMD or its representative Convene Gram Sabha meetings Assist NGOs in mobilization of village communities Initiate and complete the preparation of GPWDP as per project guidelines Open project bank account & judiciously manage project funds and expenditure as per AWP of GPWDP Ensure complete transparency & accountability by all GP-level institutions & individuals involved in the project 	Gram Sabha and WMD

			<ul style="list-style-type: none"> • Ensure the Collection of Beneficiary Contribution 	
3.	Water & Watershed Management Committee (WWMC)	A Committee of GP headed by the Gram Pradhan	<ul style="list-style-type: none"> • Assist NGOs in mobilization of village communities • Lead the process of planning, preparation & implementation of GPWDP • Manage the Vulnerable Groups Fund • May delegate responsibility for implementation of Village Watershed Development Plans to RVCs (this will include financial management and procurement responsibilities) • Submit timely monthly and annual financial reports to WMD • Ensure the audit of GP annual accounts on a timely basis and submission of the audit report to the WMD 	Gram Panchayat
4.	Revenue Village Committee (RVC)	RVC will be headed by Gram Pradhan/ Ward Member and consist of remaining ward members of that revenue village, members from SHG, Mahila/ Yuvak Mangal Dal and other village level institutions. At least 50% of the members of RVC will be women.	<ul style="list-style-type: none"> • Lead the process of preparing RVC Proposals • If contracted by the GP, implement GPWDP activities at the village level • Ensure equity for all, especially the disadvantaged groups 	Gram Panchayat
5.	Mahila Aam Sabha	All adult Women voters of GP	<ul style="list-style-type: none"> • Ensure incorporation of Mahila Aam Sabha proposals into the GPWDP 	Gram Panchayat
6.	Van Panchayat (VP)	A committee constituted as per provisions of Uttarakhand Van Panchayat Act 2005	<ul style="list-style-type: none"> • Preparation of inter GP space plan • Implement all plantation related activities under the project • Coordinate with concerned Forest Department office for technical and management issues. 	Gram Panchayat
7.	Women Motivator	Designated woman at the revenue village level, having passed at least High school or equivalent examination.	<ul style="list-style-type: none"> • Mobilize women of the village to ensure their effective participation in the project through Mahila Aam Sabha. 	RVC & MDT

			<ul style="list-style-type: none"> Facilitate formation of livelihood groups of vulnerable households & extending all possible support to them 	
8.	Co-Signatory WWMC	Elected Women ward member nominated by the GP as co-signatory for operating project account	<ul style="list-style-type: none"> Act as co-signatory along with Gram Pradhan to operate the Watershed Development Project account 	GP
9.	Panchayat Secretary (Village Development Officer)	Employed by the State Government and Member Secretary of WWMC	<ul style="list-style-type: none"> Convening of Gram Sabha meetings and upkeep of minutes of the meeting Record the assets created under the project in the asset register prescribed under Panchayat Raj Act. 	Gram Sabha and GP.
10.	Account Assistant (AA)	A person having passed at least Intermediate with accounts/mathematics and nominated by GP and trained by project	<ul style="list-style-type: none"> Maintain all accounts books and records related to the project Make all vouchers & prepare cheques Collect dues from beneficiaries & issue receipts Prepare all financial documents & reports as required by the project Assist RVCs and other beneficiaries in preparation of bills, formats, and other accounts related documents of the project 	GP for Project reporting system to WMD.

Table 5: Field Level Institutions

S.No.	Institution	Composition	Role	Accountable to
1.	MDT	4-5 experts from Forest, Agri/Horti, Animal Husbandry, Civil engineering, and Facilitators from FNGO	<ul style="list-style-type: none"> Provide technical guidance to GP & village communities for planning and preparing GPWDP and Inter GP space plans, their consolidation into MWS plans and implementation of these plans Ensure compliance of ESMF at all levels of planning and implementation of GPWDP and MWS plans. 	WMD & GP

Table 5: Field Level Institutions

S.No.	Institution	Composition	Role	Accountable to
			<ul style="list-style-type: none"> • Sign running and final bills & completion reports of activities after due verification along with member of the RVC and Chairperson. 	
2.	FNGO	Hired by WMD	<ul style="list-style-type: none"> • Mobilize village communities & provide complete information on the project • Facilitate PRAs with MDT at the Revenue Village and GP levels; focus on gender sensitization & social equity as per the ESCP • Assist GP to plan and implement the project • Facilitate conduction of women Aam Sabha, formation of livelihood enhancing vulnerable groups • Conduction of PME • Ensure Monitoring of project interventions and timely reporting to WMD. 	DPD/PD and WMD
3.	Unit officer	Appointed by WMD	<ul style="list-style-type: none"> • Coordinate between MDT, FNGOs and GPs • Provide technical guidance to GP & village communities; ensure compliance of ESCP guidelines in all project interventions. • Ensure proper verification of bills and required reports on activities • Ensure signing of bills and reports by concerned persons. • Coordinate between different stake holders in the development of MWS plans for inter- GP spaces. • Field appraisal of GPWDPs and MWS plans during preparation stage and its compliance. • Technical review and implementation of GPWDP and MWS plan. 	DPD

Table 5: Field Level Institutions

S.No.	Institution	Composition	Role	Accountable to
4.	PNGO	Hired by WMD for project implementation in certain project areas	<ul style="list-style-type: none"> • Mobilize village communities & provide complete information on the project • Facilitate PRAs at the Revenue Village and GP levels; focus on gender sensitization & social equity as per the ESCP • Assist GP to plan and implement the project • Provide technical guidance to GP & village communities • Sign bills & completion reports of activities after due verification • Coordinate between different stakeholders in the development of MWS plans for inter- GP spaces. • Technical review and implementation of GPWDP and MWS plan. • Ensure Monitoring of project interventions and timely reporting to WMD • Administrative and financial head at the division level will be responsible to plan implement and monitor project at division level. • Represent project at all district level committees • As member secretary, convene district level Watershed Committee meetings at district levels and recording its proceedings. 	WMD Responsible to follow a contract agreement as per TOR
5.	Agribusiness Support Organization (ABSO)	Hired by WMD	<ul style="list-style-type: none"> • To facilitate formation of FIGs and FFs in the project area and provide technical support for agribusiness activities in the project. • To provide marketing support for agribusiness activities. • Ensure compliance of ESCP in all Agribusiness interventions. 	WMD Responsible to follow a contract agreement as per TOR

Table 5: Field Level Institutions

S.No.	Institution	Composition	Role	Accountable to
			<ul style="list-style-type: none"> • Ensure Monitoring of Agribusiness interventions and timely reporting to WMD. 	
6.	Deputy Project Director (DPD)	Appointed by WMD	<ul style="list-style-type: none"> • Responsible to plan, implement and monitor project at division level as Administrative and financial head • Technical review and approval of GPWDP and MWS plan as per ESCP guidelines • Ensure implementation of GPWDP &MWS plans as per project guidelines • Provide technical support to MDT, FNGOs and ABSO. • Sign project agreements with GPs and transfer project funds to it. • Conflict resolution among GPs, MDTs and FNGOs. • Ensure timely submission of all project level and other reports to WMD. • Represent project at all district level committees • As member secretary, convene district level Watershed Committee meetings at district level and recording of proceedings. 	WMD
7.	District Level Watershed Committee	Comprises district level officers, chaired by the Zila Panchayat Chairperson and member secretary concerning DPD	<ul style="list-style-type: none"> • Facilitate inter-departmental coordination and convergence with other programmes. 	State Government

Table 6: Field Level Institutions

S.No.	Institution	Composition	Role	Accountable to
1.	Project Director (PD)	Appointed by WMD	<ul style="list-style-type: none"> • Overall supervision, approval of proposals & direction, coordination, and monitoring at regional level • Monitoring the progress of project activities. • Timely submission of reports to WMD 	WMD
2.	Watershed Management Directorate (WMD)	Headed by Chief Project Director	<ul style="list-style-type: none"> • Overall planning, supervision, approval of proposals & direction, support, coordination, and monitoring of the project at state level. • Ensure capacity building of project staff, GPs, RVCs, UGs and individuals to ensure effective implementation of the project as per its objectives • Coordinate with external stakeholders such as the State Government and the World Bank • Resolve all disputes placed before it 	State Government
3.	State Steering Committee	Comprises Secretary level officers and concerning Head of Department, Chaired by the Forest, and Rural Development Commissioner (FRDC) Govt. of Uttarakhand	<ul style="list-style-type: none"> • Facilitate inter-departmental coordination, policy decisions • Overall approval to work plans of WMD 	State Government

SECTION 3

SCOPE OF MTR REVIEW



3. Scope of Mid Term Review

3.1 Scope

The Mid-Term review focuses not only on assessing the progress of the project till date and the implementation process used but also the impact of the activities. The aim of the review is to recommend adjustments in the project design and/or implementation arrangements to overcome identified bottlenecks. A comparative analysis of performance in the project areas as compared to the control areas has been done under the Mid-Term review. The evaluation focuses on the following aspects:

- Assessing the attribution of the project activities to improving natural resource management, incomes and livelihoods, employment and job creation, empowerment and capacities of the GPs and villagers, local development and operation and maintenance of community assets.
- Identifying the approaches and activities that have worked best in meeting the project objectives and any deficiencies in planning and implementation or any unintended consequences of specific project activities.
- Assessing equity issues and distributional impacts of project investments (the inclusiveness of project interventions) and the distribution of benefits across different socio-economic groups.
- Addressing the potential poverty impact of the project.
- Assessing the cost-effectiveness of innovative approaches adopted.
- Assessing the quality of participatory processes and support to strengthening local self-government organizations particularly the Gram Panchayat.

3.2 Methodology and Sampling

The evaluation design for Gramya-II is based on a mixed method approach, wherein suitable counterfactual group were established for comparison with the project group. The control or counterfactual units were geographically selected and were located in areas where no watershed development related activities had been conducted. Control areas were selected from 4 different micro-watersheds from where 22 control villages were drawn. A total of 80 project villages and 22 control villages were covered during the baseline survey. During the baseline survey 5,486 households in project villages and 988 households in the control villages were covered.

Household Sampling – The household survey covered about half of the project households as covered in the Baseline survey i.e. 2780 households in 54 revenue villages and 26 Gram Panchayats. In addition, to this after consultation with the Watershed Directorate additional 20% new beneficiaries were added from the project villages covered under the baseline survey. As a result the total sample of project households for Mid-Term survey is 3332. With regard to the control households, it was decided that all of the 988 households of control villages covered in the Baseline shall be covered again in the Mid-Term household survey.

Sectoral Sampling- Usually, the response rate is considered to be 50% or 0.5. This is the expected result for each question. However, since project households are being covered, we have hypothesized this value to be more than 50%. Assuming, the hypothesized value to be 60% or 0.6 means that expected proportion of the population that supports the outcome under investigation is 60%. The difference of 0.1 is the smallest significant impact of the intervention that one would like to detect. Given this, one has calculated the standard error for sample calculation.

Standard Error:

$$\frac{\sqrt{0.6(1 - 0.6)}}{\sqrt{0.6 \times 0.4}}$$

0.49

Taking a confidence interval of 95% and power of 80% one has calculated the parameter for power and significance level. The deviate for 95% confidence interval is 1.96 and for 80% power is 0.84. So, the parameter for power and significance level is $(1.96 + 0.84 = 2.8)$.

The 95% significance level means that on average only in 5% of the cases will there be a significant difference when in reality the difference is due to sampling variation. The significance level is aimed at reducing the probability of Type I error which is rejecting the null hypothesis of “no significant difference” when in reality it is true.

The power of the sample size estimation is aimed at reducing the chances of Type II error, in other words as the power is increased the chances of concluding no effect when in reality there exist a significant effect goes down. Here the use of 80% power means that there is 80% chance of achieving statistical significance, if the true difference is 0.1. The concept of power is that, the study has a high chance of detecting a difference between groups if it exists, consequently, if the study demonstrates no difference between the groups, the researcher can reasonably be confident in concluding that none exists.

Sample size: $((2.8 \times 0.49) \div 0.1)^2$: 188. This minimum sample size was covered for the respondents in each of the sectoral interviews across all Divisions. This will be in addition to the 3336 HH respondents (treatment). The sectoral questionnaire include the following;

- (1) *Agriculture & Horticulture tool*
- (2) *Institutional Assessment tool*
- (3) *FIG Tool*
- (4) *VGA Tool*
- (5) *Animal Husbandry Tool*
- (6) *NRM Tool*

3.3 Tools for MTR

The Mid Term Review included quantitative methods through a set of nine survey tools were administered. The quantitative survey tools included the household level tool, the GP level tool and the village level tool which were administered through CAPI while Agriculture & horticulture tool. Institutional assessment tool, FIG tool, VGA tool, Animal husbandry tool and NRM Tool which were administrated through structured questionnaires. The qualitative tools included the Key Informant Interview schedule. The household data collection tool had comprehensive sections covering income, debt, savings, membership in community institutions, land use, asset ownership, social capital, etc. The GP schedule on the other hand focused on procedural details on implementation including levels of awareness, meeting schedules, nature of participation, monitoring processes followed.

The detailed tools are attached as Annexures.

3.4 Process of the Mid-Term Survey and Data Analysis

1. Composition of Field Research Team

Division level supervisors were recruited based on their technical and geographical experience. The recruitment of field survey supervisors and researchers for the assignment was completed after the finalization of tools.

Surveyors were selected from the sample divisions to ensure smooth functioning in interaction with households, familiarity with location of villages, local language and culture. An attempt was made to provide training to more researchers than actually needed so as to have replacements. Researchers were selected and assessed on the basis of their performance during the training sessions, both in the classroom and in the field. The trainings were conducted by core team members with the support of the supervisors.

Apart from Field Managers and Division supervisors, internal team members were also engaged in quality monitoring from the beginning of the survey. It was ensured that processes were adhered to and flow of activities was smooth along with quality monitoring.

2. Pre-Testing of Tools

Pre-Testing was carried out in PMU Model in Dehradun and Vikasnagar division in Chakrata, and Bageshwar. The core team of Sutra along with the state supervisors visited one village in each division and covered two households in each of the villages, along with Gram Pradhan, Account assistants and Motivators to assess the situation. The pre-testing was undertaken to ascertain the following aspects of the research tool:

- Relevance of the questions used in the tool
- Whether the language used in the question is easy enough to capture the mandated response even if the researcher is unable to probe properly
- Appropriateness of coded response
- Time taken to complete each section in the tool
- Sections seeking assumptive responses such as extent of recall period used so as to check accuracy and reliability of the information.
- Checking style of questioning of a particular type of question which may elicit politically correct responses and not a thoughtful response. These questions, related to household consumption and well-being, may provide either over reported or under reported information from the poorest of the poor families
- Time taken to complete the entire schedule
- Feasibility of interviewing different stakeholders under one schedule such as in a household schedule where sections on consumption targets interviews with women in the household.

3. Translation of Tools

The translation of tools was done in Hindi from English. It was a strict necessity to thoroughly comprehend the original (source) message and field test it before finalizing the translated versions of the questionnaire. The first draft translation was reviewed during the supervisors training and rectified after that. This second draft was again reviewed by bilingual individuals not connected with the survey, to verify the correctness of the translation – both words/phrases and structuring of the sentences. The third draft was reviewed during the training program of the supervisors and field researchers & from experience of the piloting of the tools.

4. Training of Supervisors and Surveyors

Training of supervisors and surveyors was conducted in Dehradun for a duration of 5 days followed by field exposure. The purpose of this training was to understand the purpose of the tools, technical concepts involved and to discuss with them strategies to be adopted to overcome challenges. Role play exercises were conducted for difficult sections in the questionnaire.

Trainings were composed of two major components – Classroom Training and Pilot Testing. The researchers were trained adequately on the context, techniques and use of survey tools. A short training manual was also designed for this purpose which includes conceptual issues on research, overview of the project processes and institutional arrangement, basics of field research, sample selection, field guides of do's and don'ts, explanation on using various instruments, guidelines on taking field notes and other research planning and management issues.

5. Quality Assurance

Field supervisors along with the internal team member were responsible for data collection and quality assurance. All data collected during the survey was checked for consistency at the field level and necessary corrections were immediately incorporated. Each day, after completion of the field survey, the supervisors did a manual scrutiny to identify incomplete questionnaires and redundant observations and had them rectified. In addition, 5 percent of the questionnaires were checked by the internal project team members during monitoring visits to field locations.

In addition to this, the use of CAPI ensured that core team of Sutra was able to check the data on daily basis to ensure that the data quality is maintained at the highest standard.

6. Data Entry and Analysis

To enter the data from household, village, GP questionnaires and software package was developed in CS Pro. The software was designed with operator controlled mode based on the nature of questions in survey tools. The following activities have been done with regard to the preparatory phase of the software testing:

- Range and validation rules were decided and included in each applicable cell of the software.
- The range and validation rules were ratified by taking feedback from all supervisors.
- Multiple testing exercises were conducted on the software with a small set of completed questionnaires in order to check all validations at different points in the software.

Data entry operators and supervisors were trained before the data entry work started. Data from all the sectoral questionnaires was entered directly to MS-Excel. For the purpose of minimizing the scope of errors and to improve data quality, double data entry option was availed of in which the same data was entered twice by different data entry operators. Later, the two sets of similar data were compared to identify unmatched values. The final dataset has been produced after correction of all such unmatched errors.

3.5 Sample Description

From a topographical perspective 47.5 percent of total 80 project villages come under Middle category, while the share of Ridge and Valley is 17.5 percent and 35.0 percent respectively. However, within each districts the distribution is not uniform. For instance, while all the project villages in Dehradun-II (PMU-Model) come under Middle category, 40

percent of project villages in Almora come under Ridge category. So, it was decided to consider the topography of the project villages while selecting the sample project villages in each of the 9 districts. Topography wise distribution of the sample project villages is shown in the table below.

Table 7: Distribution of the Sample Project Villages by Topography				
Districts	Middle	Ridge	Valley	Total
Almora	3	3	1	7
Bageshwar	1	0	7	8
Dehradun	1	3	3	7
Dehradun-II (PMU-Model)	1	0	0	1
Pauri	4	1	1	6
Pithoragarh	5	0	1	6
Rudraprayag	3	1	1	5
Thatyur (tehri)	5	2	4	11
Uttarkashi	1	1	1	3
Total	24	11	19	54

Middle topography accounts for the majority of the households in both the project and control areas. However, share of Valley among control households is less than 10 percent as compared to about one-third among the project households. Moreover, it can be seen from the table below that the households within each district are spread across different topographies. For instance, in Bageshwar almost all of the project households fall under Valley topography, while in Pauri almost all project households fall under the Middle topography.

Table 8: Distribution of Sample by District and Reach									
S No	District	Project (Nos)				Control (Nos)			
		Ridge	Middle	Valley	Total	Ridge	Middle	Valley	Total
1	Almora	327	244	74	645	223	16	239	
2	Bageshwar		38	462	500	68	8	76	
3	Dehradun	103	78	120	301	49	53	102	
4	Dehradun-II (PMU Model)		49		49		42	42	
5	Pauri		359	62	421	12	75	87	
6	Pithoragarh		250	39	289	21	50	71	
7	Rudraprayag	128	337	193	658	42		33	75
8	Tehri	26	153	103	282		11		11
9	Uttarkashi	53	65	69	187	174	106		280
	Total	637	1573	1122	3332	298	628	62	988
	%	19.1	47.2	33.7	100.0	30.2	63.6	6.3	100.0

Profile of the Sample Households according to Farmer Category

On studying the distribution of the sample households according to the landholding pattern, it is seen that the distribution of the households in project and control areas is similar with large farmers accounting for more than half of the households followed by small farmers. However, within districts the pattern is not similar, as while about 60 percent of the sample project households in Dehradun belong to small farmers the share of small farmers in control areas is a little more than

one-third in Dehradun. Similarly, in Pauri, Tehri and Uttarkashi the share of large farmers in project households is close to three-fourth.

Table 9: Distribution of Sample by District and Farmer Category

S No	District	Project (%)			Control (%)				
		Landless	Large farmer (More than 5 Nali)	Small farmer (1 Nali to 5 Nali)	Total	Landless	Large farmer (More than 5 Nali)	Small farmer (1 Nali to 5 Nali)	Total
1	Almora	0.0	59.5	40.5	100.0	0.0	56.5	43.5	100.0
2	Bageshwar	0.0	63.6	36.4	100.0	0.0	46.1	53.9	100.0
3	Dehradun	0.3	39.2	60.5	100.0	1.0	62.7	36.3	100.0
4	Dehradun-II (PMU Model)	0.0	55.1	44.9	100.0	0.0	42.9	57.1	100.0
5	Pauri	0.0	71.3	28.7	100.0	0.0	57.5	42.5	100.0
6	Pithoragarh	0.0	48.4	51.6	100.0	0.0	75.0	25.0	100.0
7	Rudraprayag	0.3	49.7	50.0	100.0	0.0	40.0	60.0	100.0
8	Tehri	0.0	72.3	27.7	100.0	0.0	72.7	27.3	100.0
9	Uttarkashi	0.0	70.1	29.9	100.0	0.0	70.7	29.3	100.0
	Total	0.1	58.5	41.4	100.0	0.1	60.2	39.7	100.0

Gender Profile of the Sample Households

Male headed households constitute the overwhelming share of the sample households with three-fourth households in project villages and more than 80 percent households in control villages being male headed. However, within the district the share is not uniform as while a little more than half of the project households in Pithoragarh are male headed, while the share of male headed households among project households in Dehradun and Tehri is more than 90 percent. Moreover, in Almora, Bageshwar and Pauri the share of female headed households is close to one-third. Similar, is the case in control villages as while overall more than 80 percent of the households are male headed, their share in Bageshwar is little more than half.

Table 10: Distribution of Sample by Gender

S No	District	Project (%)			Control (%)		
		Male	Female	Total	Male	Female	Total
1	Almora	65.4	34.6	100.0	77.4	22.6	100.0
2	Bageshwar	67.2	32.8	100.0	55.3	44.7	100.0
3	Dehradun	93.4	6.6	100.0	98.0	2.0	100.0
4	Dehradun-II (PMU Model)	89.8	10.2	100.0	100.0	0.0	100.0
5	Pauri	69.6	30.4	100.0	71.3	28.7	100.0
6	Pithoragarh	56.4	43.6	100.0	60.5	39.5	100.0
7	Rudraprayag	81.6	18.4	100.0	88.0	12.0	100.0
8	Tehri	91.1	8.9	100.0	72.7	27.3	100.0
9	Uttarkashi	83.4	16.6	100.0	97.1	2.9	100.0
	Total	74.7	25.3	100.0	83.3	16.7	100.0

Socio-Economic Profile of the Sample Households

A little more than half of the total project households belonged to general category while in the case of control households general category accounted for half of the total households. However, while in project households scheduled caste (SC) accounted for the second highest share, other backward classes (OBC) accounted for the second highest share among the control households.

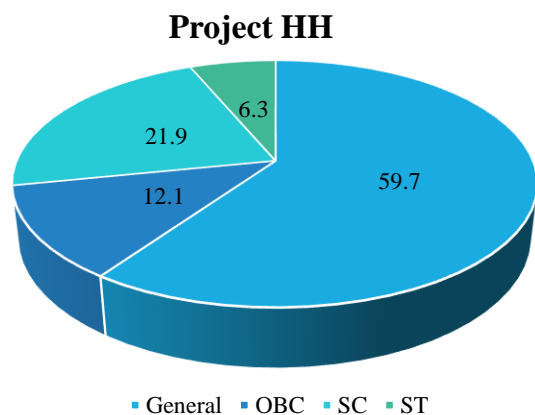


Figure 3: Distribution of Sample by Social Group (Project)

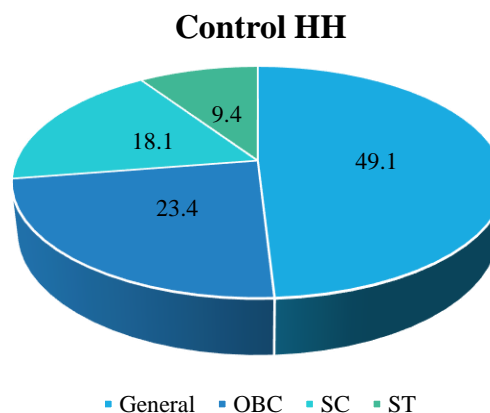


Figure 2: Distribution of Sample by Social Group (Control)

Table 11: Distribution of Sample by Social Group											
S No	District	Project (%)					Control (%)				
		General	OBC	SC	ST	Total	General	OBC	SC	ST	Total
1	Almora	75.8	2.5	21.4	0.3	100.0	83.3	0.4	16.3	0.0	100.0
2	Bageshwar	76.6	0.8	22.6	0.0	100.0	100.0	0.0	0	0.0	100.0
3	Dehradun	4.0	7.0	23.6	65.4	100.0	0.0	0.0	12.7	87.3	100.0
4	Dehradun-II (PMU Model)	91.8	0.0	8.2	0.0	100.0	97.6	0.0	2.4	0.0	100.0
5	Pauri	87.2	0.7	12.1	0.0	100.0	73.6	0.0	25.3	1.1	100.0
6	Pithoragarh	59.2	17.3	22.1	1.4	100.0	44.7	26.3	28.9	0.0	100.0
7	Rudraprayag	75.5	0.8	23.3	0.5	100.0	90.7	0.0	9.3	0.0	100.0
8	Tehri	8.2	74.1	17.7	0.0	100.0	0.0	100	0.0	0.0	100.0
9	Uttarkashi	0.5	50.3	46.5	2.7	100.0	1.1	71.1	26.8	1.1	100.0
	Total	59.7	12.1	21.9	6.3	100.0	49.1	23.4	18.1	9.4	100.0

If one considers the caste distribution within each district then one can see that in Tehri OBC accounted for three-fourth of the total project households which is different from the overall pattern. Similarly, among the control households, while overall half of the households belong to general category, in Bageshwar all the households are from general category and general category constitutes overwhelming share in districts like Rudraprayag, Almora and PMU Model.

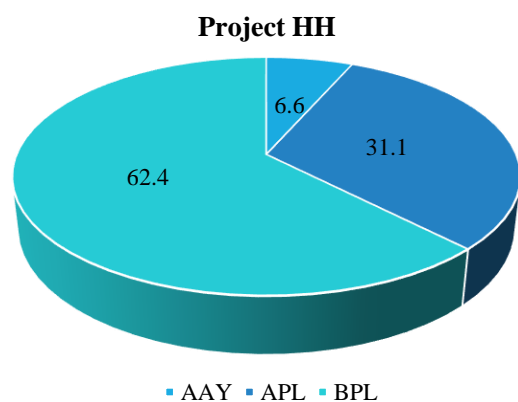


Figure 4 : Distribution of Sample by Poverty Group (Project)

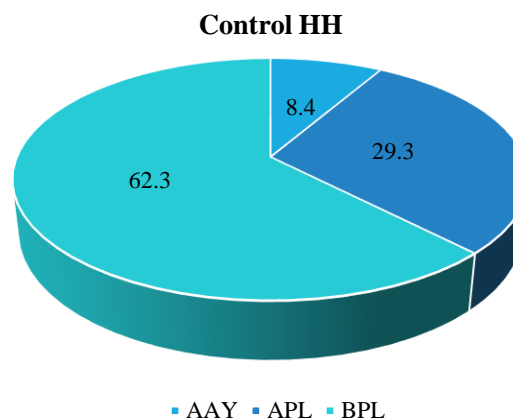


Figure 5: Distribution of Sample by Poverty Group (control)

The share of below poverty line (BPL) households is similar among the project and control households, followed by above poverty line (APL) households. Antayodaya Anna Yojana (AAY) households accounted for the lowest share (below 10 percent) among both the control and project households.

Table 12: Distribution of Sample by Poverty Group

S No	District	Project (%)				Control (%)			
		AAY	APL	BPL	Total	AAY	APL	BPL	Total
1	Almora	9.5	22.6	67.9	100.0	5.0	15.9	79.1	100.0
2	Bageshwar	7.2	36.6	56.2	100.0	9.2	44.7	46.1	100.0
3	Dehradun	1.0	14.0	85.0	100.0	3.9	22.5	73.5	100.0
4	Dehradun-II (PMU Model)	20.4	14.3	65.3	100.0	7.1	9.5	83.3	100.0
5	Pauri	5.5	36.8	57.7	100.0	1.1	49.4	49.4	100.0
6	Pithoragarh	11.4	34.3	54.3	100.0	10.5	30.3	59.2	100.0
7	Rudraprayag	3.3	38.4	58.2	100.0	5.3	41.3	53.3	100.0
8	Tehri	1.1	38.3	60.6	100.0	72.7	27.3	0.0	100.0
9	Uttarkashi	15.0	22.5	62.6	100.0	12.9	32.1	55.0	100.0
	Total	6.6	31.1	62.4	100.0	8.4	29.3	62.3	100.0

However, in some districts the pattern is not similar to the overall pattern. For instance, share of AAY households among the project households in PMU model is one-fifth, which is significantly higher than the overall share of the AAY households. Similarly, while BPL households account for 62.4 percent of the total project households; their share in Dehradun is more than 80 percent. With regard to the control households, while the overall share of AAY households is less than 10 percent, they account for about three-fourth of the households in Tehri.

SECTION 4

PROJECT RESULTS



4. Project Results

4.1 Soil and Water Conservation

Soil and water conservation in Uttarakhand are of critical importance owing to the topography of the state comprising mostly of hills with fragile soils, steep to very steep slopes that are prone to soil erosion, problems of water erosion because of medium to heavy rainfall, weak geological formations, active seismicity and increasing deforestation for human habitation. According to ICAR-National Bureau of Soil Survey and Land Use Planning, close to 50 percent of the state's area is above the tolerance limit of 11.2 ton per hectare per year of soil loss. The ICAR analysis shows that 6.71 percent of the area in the state (about 3,59,000 Ha) faces “moderately severe” (15 to 20 ton per hectare per year) soil erosion, while close to 9 percent (4,73,000 Ha) of the state is battling “severe” (20-40 ton per hectare per year) soil loss and the remaining a third of the area of the state (1,750,000 Ha) is experiencing soil loss at a rate of 40–80 ton per hectare annually, which is under “very severe” category.

Deforestation, burning, clearing and dibbling of seeds cause about 4.1 ton/Ha/year of soil material to roll down towards foothills due to steep to very steep slopes. The increased vulnerability of the topsoil being washed away and accumulation into the natural drainage channels occasionally blocking it and breaching / altering the channel morphology and spilling the silt load on to the village lands and human habitations threatens the entire natural ecosystem. Uttarakhand is endowed with several traditional drinking and irrigation water systems like *Naula* (subsurface water harvesting), *Dhara* (springs), *Gadhera* (small river tributaries), *Gul* (traditional irrigation canals), *Chal* and *Khal* (artificial ponds on hilltops), which are also under severe stress. The magnitude of the problem compounded by the increasing degradation of natural environment has reached a stage which is now beyond the natural resiliency of nature and requires human interventions to arrest further damage to the natural ecosystem.

One of the main interventions of Gramya II is watershed treatment using various soil and water conservation measures and forestry activities in micro watersheds selected in project districts to enhance the productivity of natural resources through protection of fertile soil, improved availability of water and moisture and enhanced agricultural yield consequently.

4.1.1 Project Interventions

The ‘Watershed Treatment and Rainfed Area Development’ component under Gramya II focusses on implementation of the GP Watershed Development Plans prepared with community participation. The Watershed Treatment and Water Source Sustainability interventions aims to increase the efficient use of natural resources on about 220,000 Ha of non-arable land and expand irrigation from 5262 Ha to 7,800 Ha of arable rainfed land in the project area.

The key watershed treatment activities include:

- i. Construction and rehabilitation of check dams, recharge pits, ponds, irrigation channels and tanks, and roof water harvesting structures;
- ii. Reparation of agriculture terraces and vegetative field boundaries;
- iii. Rehabilitation of bridle paths, small bridges and culverts; and
- iv. Implementation of water source sustainability activities like:
 - a) Construction and rehabilitation of soil conservation structures and vegetative structures;
 - b) Border plantation of Napier and other grasses;

- c) Implementation of forestry activities; and
- d) Promotion of alternative energy source practices.

The soil and water conservation measures including drainage line treatment activities under Gramya II includes

- i) Construction of dug out ponds
- ii) Recharge pits
- iii) Digging of trenches
- iv) Construction of dry-stone check dam
- v) Construction of crate wire check dam
- vi) Construction of vegetative check dam
- vii) Protection wall
- viii) Diversion drain
- ix) Construction of spur
- x) Retaining Wall
- xi) Construction of Cross Barrier
- xii) Construction of vegetative check dam
- xiii) Vegetative treatment
- xiv) Roadside erosion control & other soil conservation work
- xv) Land Slide Treatment

The Water Harvesting interventions being implemented under the project includes

- i. Irrigation Channel
- ii. HDP Irrigation Pipeline
- iii. Irrigation Tank
- iv. Roof Water Harvesting Tank
- v. LDP Tank
- vi. Solar Energy (Solar pump/Lifting Pump)
- vii. Pre-Fabricated Geo Membrane Water Harvesting Tank
- viii. Village Irrigation Pond

The water Source Sustainability activities under the project includes

- I. Dugout Ponds (Village Pond)
- II. Recharge pit
- III. Digging of trenches
- IV. Construction of Tal/Naula/Khaula
- V. Renovation of existing Tal/Naula/Khaula

4.1.2 Institutional structure for implementation

The preparation of Gram Panchayat Watershed Development Plan (GPWDP) is participatorily undertaken with the involvement of GP members, community and women village members through Women Aam Sabhas (WAS). A Water & Watershed Management Committee (WWMC) has been constituted at the GP level which is headed by the Gram Pradhan to assist FNGOs in mobilization of village communities, lead the process of planning, preparation & implementation of GPWDP, to manage the Vulnerable Groups Fund, to delegate responsibility for implementation of Village Watershed Development Plans to Revenue Village Committee (RVC) and ensure the audit of GP annual accounts, etc. The Revenue Village Committees are responsible for identifying treatments on arable and non-arable lands and preparation of RVC proposals, which are integrated into Gram Panchayat Watershed Development Plans (GPWDPs).

4.1.3 Key Results

The soil and water conservation interventions undertaken for treatment of micro watersheds including forestry activities in the project area is expected to achieve three Project Development Objectives:

PDO 1: Increase in Water Discharge in perennial water sources treated in Micro Watersheds

PDO 2: Increase in Biomass in Arable and Non-arable land

PDO 3: Increase in Rainfed area under irrigation

The progress towards achieving PDO 2 is analyzed in detail under the Forestry section (Section 4.2) and the progress towards achieving PDO 1 and PDO 3 is presented below.

Increase in Water Discharge (PDO 1)

The project has identified 1882 depleting water sources (those that are 50 percent dried up) out of which monitoring, treatment and rehabilitation of 1522 depleting water sources by the Divisions had been proposed under the project. However, considering the principle of rejuvenation of water sources, it is not only impacting the proposed treatment structures but is positively impacting the other identified structures at the onset of the Project. Hence all the 1882 depleted water sources have been considered for the effectiveness of the intervention. Reportedly, all 1485 perennial water sources have already been treated with positive discharge until Midterm.

The increase in water discharge measured through flow change in liters per minute (LPM) in water sources treated or under treatment in project shows encouraging improvement. On an aggregate basis a 12.3% to 22.2% in pre-monsoon and 13.8% to 27.0% increase in post-monsoon water discharge has been recorded in 1485 structures. The project has clearly exceeded the target of 10 percent improvement in water discharge in rejuvenated water sources till mid-term. The table below shows the changes in water discharge in water sources treated / under treatment Division-wise both in pre-monsoon and post monsoon between Year 1 (2014-15) and Year 4 (2018-19).

Table 13: Water sources Rejuvenated - Average Pre monsoon (Dec-Jan) Discharge of water (In lpm)

S.No.	District	No of sources	2015	2016	2017	2018	2019	Differentials (Y4-Y1)	Change in Water discharge (%)
1	Dehradun	12	0.48	5	0.505	0.515	0.55	0.07	13.86
2	Pithoragarh	258	2.65	2.8	3.05	3.1	3.2	0.55	18.03
3	Bageshwar	72	10.1	11.32	11.35	11.38	11.9	1.8	15.86
4	Pauri	171	1.06	1.09	1.15	1.23	1.27	0.21	18.26
5	Tehri	381	3.97	3.98	4.13	4.36	4.54	0.57	13.80
6	Uttarkashi	129	6.9	7.32	7.32	7.40	7.80	0.90	12.29
7	Almora	362	0.36	0.37	0.36	0.40	0.44	0.08	22.22
8	Rudraprayag	100	4.1	4.18	4.28	4.55	4.86	0.76	17.74
Total		1485							

Table14: Water sources Rejuvenated - Average Post monsoon (May-June) Discharge of water (In lpm)

S.No.	District	No of sources	2014-2015	2015-2016	2016-2017	2017-2018	2018 - 2019	Differentials (Y4-Y1)	Change in Water discharge (%)
1	Dehradun	12	1.1	1.05	1.39	1.4	1.41	0.31	22.36
2	Pithoragarh	258	5.1	5.19	5.5	5.9	5.92	0.82	14.91
3	Bageshwar	72	17.5	19.4	19.45	19.5	20.5	3	15.42
4	Pauri	171	2.9	2.98	2.9	2.9	3.3	0.4	13.79
5	Tehri	381	10.2	11.01	11.24	11.67	11.9	1.7	15.12
6	Uttarkashi	129	10.7	10.77	12.59	13.50	14.10	3.4	27.01
7	Almora	362	0.6	0.65	0.65	0.70	0.72	0.12	18.59
8	Rudraprayag	100	7.67	8.2	8.35	8.54	9.165	1.495	17.90
Total		1485							

Table 15: Summary of Water sources Rejuvenated under Gramya II

Intervention	8 Pilot micro watersheds		82 micro watersheds	
	Structures	Output/year	Structures	Output/year
Water Augmentation structures				
Source augmentation (pre monsoon)	159	15% to 22.7%	1485	12.3% to 22.2%
Source augmentation (post monsoon)	159	17% to 29%	1485	13.8% to 27.0%

The table above shows that the change in discharge is being observed in over 70% of the structures. This also includes some second and third level streams that were not yet treated but have shown improvement due to treatment of parent streams. The change in discharge needs to be monitored more holistically, and over more frequent interval of time. The data collected for pre-monsoon and post-monsoon discharge also needs to be analyzed in relation to the rainfall of the season. Instead of a before and after difference in change as calculated above Y1-Y4), a year on year difference and its average should be considered to give a better understanding of the change in discharge due to project activities.

Source augmentation activities need to continue in all the identified streams during the project, including those that have shown positive discharge to ensure that the treatment is sustainable and effective for a longer period.

Increase in Rainfed Area under Irrigation (PDO 3)

The water harvesting measures undertaken in the project include construction and rehabilitation of rain water harvesting tanks, irrigation tanks, LDP tanks, irrigation channel, irrigation pipeline, Tanks with solar pumps, village pond and geo membrane tanks which will enhance the irrigation potential in the project area resulting in increase in rainfed area brought under irrigation.

So far 3252.8 Ha of additional rainfed area has been brought under irrigation which makes the total land reclaimed as 8514.8 Ha (baseline 5262 Ha) against the target of 6050 Ha till the mid-term giving an achievement of 140.7%. It is observed that 20.3 percent of the additional rainfed area brought under irrigation is in Vikasnagar division followed by Almora at 19.1 percent, which are relatively better in comparison to other divisions.

On closer analysis it is observed that increased rainfed area brought under irrigation in Vikasnagar is attributed to irrigation channels, irrigation pipelines, and Irrigation tanks. In Almora it is a combination of the activities which has contributed to the change in area increase under irrigation. Uttarkashi, on the other hand has been least progressive district in this matter. This might be attributed to the slow pace of work in Soil and water conservation structures in the district.

Table 16: Increase in rainfed area brought under irrigation in Gramya II

SL.NO	Division	Irrigation Channel - Increased Area (Ha.)	Irrigation Tank - Increased Area (Ha.)	Solar Energy (Solar pump/Lifting Pump) - Increased Area (Ha.)	Total Village Irrigation Pond Increased Area (Ha.)	HDP Irrigation Pipeline - Increased Area (Ha.)	LDP Tank Area coverage as per Irrigation potential (Ha.)	Pre-Fabricated Geo Membrane Water Harvesting-Area coverage as per Irrigation potential (Ha.)	Rainwater harvesting tanks - Area coverage as per Irrigation potential (Ha.)	Total (Division-wise)
1	Pauri	32.0	36	4.4	3	63.9	9	0	9.5	157.8
2	Rudraprayag	189.18	22.6	0	2	8.9	0	0	5.6	228.3
3	PMU	7.26	15.2	5	4	98.6	0	0	4.6	135.1
4	Thatyur	109.6	112.8	10	15	101.8	5	14	28.3	396.9
5	Vikasnagar	83.9	166.4	0	26	374.5	0	0	7.9	658.8
6	Almora	182.8	196	10	2	16.4	141	0	71.5	620.0
7	Bageshwar	109.86	49.6	1.5	2	39.2	128	0	12.7	342.9
8	Pithoragarh	268.434	103.2	33	8	123.2	18	10	15.5	579.7

Table 16: Increase in rainfed area brought under irrigation in Gramya II

SL.NO	Division	Irrigation Channel - Increased Area (Ha.)	Irrigation Tank - Increased Area (Ha.)	Solar Energy (Solar pump/Lifting Pump) - Increased Area (Ha.)	Total Village Irrigation Pond Increased Area (Ha.)	HDP Irrigation Pipeline - Increased Area (Ha.)	LDP Tank Area coverage as per Irrigation potential (Ha.)	Pre-Fabricated Geo Membrane Water Harvesting-Area coverage as per Irrigation potential (Ha.)	Rainwater harvesting tanks - Area coverage as per Irrigation potential (Ha.)	Total (Division-wise)
9	Uttarkashi	62.82	60.8	0	8	1.6	0	0	0.0	133.2
Total (Intervention-wise)		1045.9	762.6	64	70	828.2	301	25	155.7	3252.8

The Intermediate Results expected from Watershed Treatment and Rainfed Area Development includes the following:

Intermediate Indicator 2: Hydrological monitoring systems fully installed and functional in sample MWS

Intermediate Indicator 3: Targeted traditional natural water sources rejuvenated

Intermediate Indicator 4: Natural resource conservation techniques adopted in the targeted area

Intermediate Indicator 5: Targeted farmers adopting soil moisture conservation and crop production technology

Hydrological monitoring systems fully installed and functional in sample MWS

(Intermediate Indicator 2)

Micro Watershed (MWS) is a small hydrological unit of the region that leads to a common drainage outlet. It is a hydrological area generated to create water balance in the regions of acute water shortage like remote hilly regions where water availability is scarce. Development of Micro Watershed improves the socio economic and demographic structure of the region.

To reverse the trend of environmental degradation and ensure sustainable livelihood to the people, the Uttarakhand Decentralized Watershed Development II Project (GRAMYA II) has been introduced with a view to developing Micro Watersheds in the remote hilly areas of the regions. The key thrust of this approach is to seek the active and effective participation of community as a major stakeholder in conservation, regeneration and the judicious use of all the natural resources - land, water, plants and animals within a watershed.

WAPCOS, the Technical consulting firm has been entrusted for installation and functionality of hydrological Monitoring systems in eight micro-watersheds. The area and Gram Panchayat details of the eight micro watersheds is as follows;

Table 17: Area Details of 8 MWS

S. No.	District	No. of Micro Watersheds	Area (ha)	Gram Panchayat	Revenue Villages
1	Almora	9	28,396	85	186
2	Uttarkashi	17	45,103	67	119
3	Dehradun	9	29,242	49	74
4	Tehri	13	31,730	72	151
5	Rudraprayag	6	19,201	65	119
6	Pithoragarh	9	25,739	59	137
7	Bageshwar	11	55,296	48	82
8	Pauri	7	26,713	57	185

Table 18: Gram Panchayat Details of 8 MWS

SN.	Name of Division	Name of MWS	MWS area (ha)	Block	No. of GP	No. of streams	RV Pop.
1	Almora	Sidhiyagad	7,850	Dhuladavi	22	1	15,871
2	Bageshwar	Loharkhet	13,562	Kapkot	14	1	8,958
3	Pithoragarh	Lathiyagad	4,503	Didihaat	22	2	9,047
4	Pauri	Saitholigarh	4,400	Ekeshwar	20	2	6,285
5	Tehri	Paligad	5,972	Jaunpur	15	1	2,768
6	Dehradun	Dewangad	7,118	Chakrata	13	1	8,280
7	Uttarkashi	Sarugad	7,135	Mauri	6	1	4,828
8	Rudraprayag	Uttarsu	3,710	Augustamuni, Jhakuli	16	1	12,736

WAPCOS is responsible for using the hydrological monitoring system to undertake real time data analysis of runoff, sedimentation and water discharge. The hydrological monitoring system has been installed in 8 MWSs by the project, which was the targeted result till mid-term. The hydrological monitoring systems have been installed in the following sites:

1. Dewangad (Dehradun)

The Dewangad – Micro watershed falls under district Dehradun. Dewangad lies between 30° 42' 0.4" (30.7001°) north Latitude and 77° 53' 52.1" (77.8978°) east Longitude at the elevation of 1,350 meters (4,429 feet) above sea level. The Dehradun district is situated in the north-west corner of the state. It is bounded on the north and to some distance in the north-west by the district of Uttarkashi. In the east by the district Tehri Garhwal and Pauri Garhwal and in the south by the district of Haridwar and Saharanpur (Uttar Pradesh).



Automatic Weather Station (AWS) installed at Kandhar

An Automatic Weather Station (AWS) was installed at Sawara and 2 Rain Gauges had been installed at Kandhar, Tiger Fall for collection of data. The automatic weather station offers a select set of top-quality sensors to cover a wide array of meteorological measurement needs. AWS is consisting of Data logger enclosed in weather-proof enclosure, Metrological sensor and mast to mount the sensors. They are:

AWS Sensors	The device generates the data with the following parameters	Data logger
<ul style="list-style-type: none"> • Temperature Sensor • Humidity Sensor • Soil Moisture Sensor • Evaporation Sensor • Rainfall Sensor 	<ul style="list-style-type: none"> • Ambient Temperature • Ambient Relative humidity • Atmospheric pressure • Soil Moisture • Wind Speed • Wind Direction • Solar Radiation • Rainfall 	<ul style="list-style-type: none"> • Robust, standalone data logger with the inbuilt display. • Keypad for Data logger configuration. • 16 Bit Resolution. • Inbuilt Real Time Clock for real time operation & display in the standalone mode • Configurable windows-based software. • User Definable allocation of memory size & mode. • Capable of displaying different parameters in different channels simultaneously. • Power supply – 230V, 50Hz as standard or 12V DC on customer request. • Digital Input Output Channels: 4 Nos. <ul style="list-style-type: none"> • LCD Display for Interfacing. • Data Back up: for 1-3 months (SD card based) • Data available in .csv/txt format • Communication through

AWS Sensors	The device generates the data with the following parameters	Data logger
		USB pen drive <ul style="list-style-type: none"> • Maximum Input Voltage: 0 ± 2.5, 0 - ±2.5V. • Accuracy: 0.1% of full scale • The internal storage capacity of 2MB • Data can be store direct to PC • Facility for excitation to the sensor with 5/10 V. • Configurable sampling rate up to 200 samples/sec • Provision for GPRS communication

2. Lathiyagad (Pithoragarh)

The Lathiyagad Micro watershed falls in the Pithoragarh District. Pithoragarh having its entire northern and eastern boundaries being international assumes a great strategic significance and obviously is a politically sensitive district along the northern frontier of India. The district lies between 29.4° to 30.3° North latitude and 80° to 81° East longitude along the eastern and southern part of the central Himalayas with the Indo-Tibetan watershed divide in the north and the Kali River.

Two Rain Gauges have been installed at villages Dayokhali and Kholimali for the collection of data. Rain Gauge System (RGS) weather instrument is being used for measurement & monitoring rain rate/intensity and total rainfall. It is constructed of high impact UV protected plastic to provide reliable and low-cost solution. It consists of rain gauge sensor integrated with data logger. The rain collected by a mouth of calibrated diameter gauge, is driven via a one-piece funnel to the internal receiver which discharges onto a tilt bucket. System is supplied with rain gauge software to configure with easy operation. The specifications include;

- Sensor : Tipping bucket rain gauge.
- Accuracy : better than + 5%
- Operating Temperature : -40 °C to + 50 °C
- Rim Diameter : 203 mm
- Collecting Area : 325mm².
- Robust, standalone data logger with 16-bit resolution and inbuilt LCD display
- Keypad for Data logger Configuration
- Inbuilt Real Time Clock for real time operation & display in stand-alone mode
- Configurable Windows Based Software
- Power supply – 230V, 50Hz as standard or 12V DC on customer request

Various Input channels

- Analog Input
 - Speed sensor, proximity / optical encoder type (1024 pulse/min max.) for measuring flow rate and belt speed: 1 No
- Digital Input Output Channels: 4 Nos
- LCD Display for Interfacing
- Data Backup for 1-3 months (SD card based)
- Data available in .csv/txt format
- Communication through USB pen drive
- Maximum Input Voltage: 0 ± 2.5 , $0 - \pm 2.5V$
- Accuracy: 0.1% of full scale
- Internal storage capacity of 2MB
- Data can be stored direct to PC.



Rain gauge Installed at Dayokhali and Kholimali

3. Loharkhet (Bageshwar)

The Loharkhet Micro watershed falls under district Bageshwar. Bageshwar lies between 29° 50' 14.6" (29.8374°) N Latitude and 79° 46' 17.8" (79.7716°) E Longitude at the elevation 882 meters (2,894 feet) from sea level. The district of Bageshwar is located in the northern parts of Uttarakhand. In east lies the district of Pithoragarh bordering Tibet and in its west lays the district of Chamoli and its North lie the Great Himalayas and, in the South, there is the district Bageshwar.



Two Rain Gauges have been installed at Patiyasar and Chauda sites

4. Paligad (Thatyur)

The Paligad Micro Water Shed falls in the Tehri District. The district lies between the parallels of 30.3` and 30.53` north latitude and 77.56` and 79.04` east longitude. The district of Tehri Garhwal stretches from the snow-clad Himalayan peaks of ThalaiyaSagar, Jonli and the Gangotri group all the way to the foothills near Rishikesh. The gushing Bhagirathi River which runs through seems to divide the district into two, while the Bhilangna, Alaknanda, Ganga and Yamuna rivers border it on the east and west. Its neighboring districts are Uttarkashi, Chamoli, Pauri, Rudraprayag and Dehradun.

Two weather stations have been installed at Bangsil and Thatyur for measuring hydro metrological observations.

5. Saitholigarh (Pauri)

Pauri Garhwal, a district of Uttarakhand state encompasses an area of 5230 sq. km and situated between 29° 45' to 30°15' Latitude and 78° 24' to 79° 23' E Longitude. This district is ringed by the districts of Chamoli, Rudraprayag & Tehri Garhwal in North, Bijnor & Udham Singh Nagar in South, Almora & Nainital in East, Dehradun & Haridwar in West. The District is administratively divided into ten tehsils, viz., Pauri, Lansdown, Kotdwar, Thalısain, Dhumakot, Srinagar, Satpuli, Chaubatakkal, Chakisain & Yamkeshwar and fifteen developmental blocks, viz., Kot, Kaljikhal, Pauri, Pabo, Thalısain, Bironkhal, Dwarikhal, Dugadda, Jaihrikhal, Ekeshwar, Rikhnikhal, Yamkeshwar, Nainidanda, Pokhra & Khirsu.

An Automatic Weather Station (AWS) was installed at Village Ransoli and 2 Rain Gauge sites have been installed at Villages Sunna and Toli Sites for collection of weather data.



Automatic Weather Station (AWS) installed at Ransoli

6. Sarugad (Uttarkashi)

The Sarugad Micro watershed falls under district Uttarkashi. Uttarkashi lies between 30.7299° North Latitude and 78.4434° East Longitude at the elevation 1,147 meters (3,763 feet) from sea level. It sprawls in the extreme north-west corner of the state over an area of 8016 sq. km. in the rugged terrain of the mystic Himalayas. On its north lie Himachal Pradesh State and the territory of Tibet and the district of Chamoli in the east.

Automatic rain gauges are installed for the collection of data at Nanai and Binsari, AWS is installed at Kharsari



AWS system in Kharsari, Uttarkashi

7. Sidhiyagad (Almora)

The Sidhiyagad Micro watershed lies between 29.5971° N 79.6591° E in Almora district of Uttarakhand. Almora is situated at 365 km north-east of the national capital New Delhi and 415 km south-east of the state capital Dehradun. It lies in the revenue Division Kumaon and is located 63 km north of Nainital. It has an average elevation of 1,861 m (6,106 ft.) above Mean Sea Level. Almora district comprises 9 Tehsils viz. Almora, Ranikhet, Bhikyasen, Sult, Dwarahat, Chaukhutia, Manoli, Someshwer and Jaiti. There are 11 developmental blocks namely Takula, Hawalbagh, Lamgara, Bhaisia Chhana, Dhaula Devi, Dwarahat, Chaukhutia, Sult, Bhikyasen, Syaldey and Tarikhet. The total number of villages in the district is 2282 out of which 102 villages are uninhabited due to out migration. The district has 1146 Gram Panchayats.

Automatic Weather Station installed at Gurudabaj and rain gauges at Gunaditya and Kheti



AWS installed at Gurudabaj

Rain Gauge installed at Gunaditya



Automatic Rain Gauge installed at Kheti

8. Uttarsu (Rudraprayag)

The Uttarsu– Micro Watershed falls under in Rudraprayag. Uttarsu lies between (30° 22' 30 N and 78° 56' 30 E) to (30° 26' 0 N and 79° 4' 0 E) at the elevation of the 2,181 meters (7,156 feet) above Mean Sea Level. The Rudraprayag district is situated in the just above the center of the state lie exactly between the confluence of two rivers Alaknanda and Mandakini. The district occupies an area of 2439 sq. km. Rudraprayag town is the administrative headquarters of the district. The district is bounded by Uttarkashi District on the north, Chamoli District on the east, Pauri Garhwal District on the south, and Tehri Garhwal District on the south.

Rain Gauges have been installed at Siso and Chaka sites for collection of rainfall data.



Rain gauge Station installed at (Chaka) Uttarsu



Rain gauge Station installed at (Siso)

Intermediate Indicator 3: Targeted traditional natural water sources rejuvenated

The project has completed the treatment of all the 1522 traditional water sources targeted for monitoring under the Divisions until the mid-term stage. However, considering the fact that 1882 traditional water sources had been identified at the onset of the project and in some way have been impacted under the rejuvenation works, the MTR has taken all the structures into consideration.

For this result indicator, the results framework target has been set from 5th year onwards, however the project till mid-term has rejuvenated 78.9 percent of the identified water sources (functional sources/sources with positive discharge) for which the treatment plan is proposed under the project till date against a target of 10%.

Table 19: Traditional water sources rejuvenated in Gramya II

Sl. No.	Name of Division	No. Of Water Sources as per PRA	No. Of Water sources identified till date	No. Of water sources for which treatment plan is proposed	No. Of water sources Treated so far	No. Of Functional sources / sources with positive discharge
1	Almora	485	362	284	284	362
2	Bageshwar	110	74	71	71	72
3	Pithoragarh	359	309	227	227	258
4	Dehradun	252	187	187	187	12
5	Tehri	479	381	311	311	381
6	Pauri	273	171	171	171	171
7	Rudraprayag	222	204	100	100	100
8	Uttarkashi	269	129	129	129	129
9	MWS (PMU)	89	65	42	42	0
	Total	2536	1882	1522	1522	1485

Intermediate Indicator 4: Natural resource conservation techniques adopted in the targeted area

The adoption of natural resource conservation techniques among farmers / households is measured based on area covered under vegetative boundaries or terraces used as soil conservation measures to conserve natural resources. The baseline value of the indicator was zero and control values were not applicable as the adoption of these technologies were induced through project interventions only.

Considering all the natural resource conservation techniques used in the project, approximately 10628 Ha of land is currently under natural resource conservation measures, which is approximately 30.5 percent of the total arable area (34745.9 Ha) under 461 project Gram Panchayats where such measures have been taken.

Table 20: Total area impacted through natural resource conservation techniques till March 2019

Sl. No.	Name of Division	GP area	Total arable Land	Terrace Repair/ Vegetative Field Boundary	Construction of vegetative check dam	Construction of dry-stone check dam	Construction of crate wire check dam	Construction of spur (river training work)	Construction of Cross Barrier	Vegetative treatment	Road Side erosion control & other Soil Conservation work	Recharge pit	Digging of trenches	Renovation of existing Tal/Khal	Napier Plantation	Crate Wire Check Dam	Dry Stone Check Dam	Earth Pond	Retaining Wall
1	Almora	24096.1	8141.9	2302.9	0.9	0	0	0	0	435.6	412.5	0	316.7	11	0	0	0	0	0
2	Bageshwar	36153.5	4532.7	2.5	7.3	0	0	0	0	158.9	194.8	14.7	556.1	24.3	124.6	181.8	130.7	5.4	0
3	Pithoragarh	21531.7	4340.3	0.0	0.5	0	0	0	0	0.0	4.5	184.0	109.2	212.6	0.0	0.0	0	0	0
4	Pauri	12091.4	4714.5	2.7	1.3	0.0	0.0	0.0	0.0	0.9	1466.5	415.5	25.9	0.0	0.0	0.0	0	0	0
5	Thatyur	17833.2	4934.8	138.2	0.0	72.9	127.9	4	4.2	0.0	187.9	138.4	162.0	0.0	0.0	0.0	0	0	270.2
6	Dehradun	20909.0	3856.5	0.0	0.0	0	0	0	0	0.0	93.8	87.2	99.9	3.3	0.0	0.0	0	0	0
7	Rudrapur	7885.4	3823.7	0.1	0.0	0	0	0	0	0.0	8.1	2.7	1796.8	0.0	0.0	0.0	0	0	0
8	PMU	4023.4	447.9	8.0	0.0	0	0	0	0	5.4	63.3	36	11.7	2.0	0.0	0.0	0	0	0
TOTAL		144523.8	34745.9	2454.4	10.0	72.9	127.9	4	4.2	600.8	2431.4	878.6	3078.3	253.2	124.6	181.8	130.7	5.4	270.2

Intermediate Indicator 5: Targeted farmers adopting soil moisture conservation and crop production technology

The indicator is a composite indicator that measures farmers adopting soil moisture conservation practices and crop production technologies together. Although the indicator was measured separately for soil moisture conservation practices and crop production technologies for the Baseline study, during the MTR study it has been calculated combined as one indicator.

The various soil conservation and crop production technologies demonstrated and applied in watershed treatment in the project includes Seed Treatment, Bio-compost, Vermi-compost, Mulching, IPM (Bio Pesticides, Yellow Strip, Insect Trap), Deep Ploughing, Zero Tillage, Line Sowing, and INM (Organic Manure, Cow Urine, Bio Fertilizer). The demonstrations have encouraged farmers to a great extent and adoption by farmers / households when measured for at least one of the techniques showed a result of 99.9 percent in the MTR survey.

The table below shows that the project attribution in adoption of soil and conservation technology is about 65.1 percent practicing minimum 5 of the demonstrated 14 technologies. The project intended to capture soil moisture conservation measures and crop production technologies practiced by farmers in at least one cropping season. The MTR study shows that such practices are now widely followed and Seed Treatment, Bio-compost and Mulching are the most commonly followed practices. Deep Ploughing and Line Sowing are also popular as they are easy to implement and low investment. About 90 percent of the households are practicing one or the other soil conservation technology in project area and the results target till mid-term of 30 percent farmers is well exceeded.

	Baseline		Mid Term		Difference between Project & Control
	Project	Control	Project	Control	
soil moisture conservation practices	28.4	27.0	65.1	41.0	
crop production technologies	13.3	11.7			NA

The table presented below shows the percentage of households practicing different soil moisture conservation techniques in project and control area selected for MTR.

	Project (%)	Control (%)
Seed Treatment	71.5	32.2
Bio-compost	50.5	21.7
Poly Mulching	38.3	23.1
Vermi-compost	10.7	10.5
Organic Mulch	14.3	10.5
Bio Pesticides	9.2	1.5
Deep Ploughing/Zero Tillage	49.7	5.1
Line Sowing	49.8	9.6
Mix Cropping	34.3	33.1
Yellow Strip	32.7	11.4
Insect Trap	33.5	13.8
Cow Urine	24.7	17.7
Bio Fertilizer	20.0	13.4

Progress in implementation of soil and water conservation measures in treated MWSs

The implementation of soil and water conservation measures in treated MWSs covered i) Drainage line treatment & River / Nala training work; ii) Soil conservation measures; iii) Terrace repair/Vegetative field boundary; and iv) Water harvesting and source sustainability measures. The progress of these implementation is presented below with regards to end of project targets to be achieved in Gramya II.

Progress of Drainage Line Treatment & River / Nala training work

It is evident that robust progress has been made by the project in implementation of drainage line treatment & River / Nala training work till mid-term with an exception of progress made in construction of spur. However, considering the fact that the construction of spur is a need-based intervention, it is expected to be taken care till the end term of the project as per the GPWDP plan.

Project Intervention	Unit	End of project target	Progress till MTR	Progress (%)
Drainage Line Treatment				
Construction of dry-stone check dam	Cum	110014.7	107236.0	97.5
Construction of crate wire check dam	Cum	269029.0	251321.0	93.4
River / Nala training work				
Construction of spur	Cum	3536.1	818.0	23.1
Retaining Wall	Cum	193729.4	134053.8	69.2
Construction of Cross Barrier	Cum	650.0	423.0	65.1

Progress in implementation of Soil Conservation measures

As far as progress of soil conservation measures is concerned, good progress has been made by the project in implementation of road side erosion control measures and land slide treatment till mid-term, while construction of vegetative check dam, vegetative treatment and implementation of diversions drains needs to be accelerated in the remaining project period.

Vegetative treatment is an important component of watershed development. Currently, the achievement so far has been slow (12.2%) against the target set. Therefore, this aspect needs to be given more attention and expiated

Table 24: Progress in implementation of Soil Conservation Measures

Soil Conservation Measures	Unit	End of project target	Progress till MTR	Progress (%)
Construction of vegetative check dam	No.	11073.0	2959.0	26.7
Vegetative treatment	Sqm	123456.7	15102.0	12.2
Road-Side erosion control & other soil conservation work	Cum	73027.0	63777.0	87.3
Land Slide Treatment	Cum	38162.3	21811.4	57.2
Diversion drain	km	55.1	9.6	17.4
Protection wall	Cum	-	3665.0	-

Progress in implementation of Terrace repair / Vegetative field boundaries for natural resource conservation

The progress in implementation of terrace repair / vegetative field boundaries till mid-term is presented below and it is evident that project would have to focus more on the implementation of this activity in remaining project period.

Table 25: Progress in implementation of Terrace repair / Vegetative field boundaries

Project Intervention	Unit	End of project target	Progress till MTR	Progress (%)
Terrace repair/Vegetative field boundary	Cum	88514.2	19357.0	21.9

Progress in implementation of Water Harvesting & Source Sustainability measures

The table below presents the progress made by Gramya II in implementation of water harvesting and source sustainability measures, which seems to be satisfactory at the mid-term stage. However, the project may make efforts in expediting implementation of LDP tank, Village irrigation pond and renovation of existing Naula.

Solar water lifting pump with solar panel and Pre-Fabricated Geo Membrane Water Harvesting Tank show over achievement as it is one of the most important need based and community demand driven initiatives. Farmers have shown greater interest and participation in implementation.

Table 26: Progress in implementation of Water Harvesting & Source Sustainability measures

Project Intervention	Unit	End of project target	Progress till MTR	Progress (%)
<i>Water Harvesting</i>				
Irrigation Channel	Km	282.7	174.3	61.7
HDPE Irrigation Pipeline	Km	407.9	204.2	50.1
Irrigation Tank	No.	1586.0	953.0	60.1
Roof Water Harvesting Tank	No.	9445.0	7787.0	82.4
LDP Tank	No.	778.0	301.0	38.7
Solar water lifting Pump with solar panels	No.	3.0	6.0	200.0
Pre-Fabricated Geo Membrane Water Harvesting Tank	No.	3.0	56.0	1866.7
Village Irrigation Pond	No.	87.0	28.0	32.2
<i>Source Sustainability</i>				
Dugout Ponds (Village Pond)	No.	330.0	309.0	93.6
Recharge pit	Cum	25254.0	23323.0	92.4
Digging of trenches	No	574543.0	297113.0	51.7
Renovation of existing Tal/Naula/Khaura	No.	5991.0	4197.0	70.1
Renovation of existing Naula	No.	268.0	106.0	39.6

Progress in preparation of Soil Health Cards

Till mid-term 2983 soil health cards have been prepared in convergence with agriculture department. During 2018-19 Smart Agriculture demo kits which enables monitoring of soil health was purchased by Vikasnagar, Almora, Bageshwar, Pithoragarh and Tehri divisions. A total of 442 soil health cards were prepared by the project mobile teams, while 2541 soil health cards have been prepared with the help of agriculture department under convergence till mid-term. The table below presents the progress made by Gramya II in preparation of soil health cards in different divisions.

Table 27: Progress in preparation of Soil Health Cards

PMU	Pauri	Rudraprayag	Almora	Bageshwar	Pithoragarh	Vikasnagar	Tehri	Total
135	473	283	195	1208	315	314	60	2983

Progress in implementation of Inter GP Fund Activities as per MWS Plans in Reserve Forest Areas

Progress in implementation of Inter GP Fund Activities as per MWS Plans in Reserve Forest Areas is presented below. There are no targets (end of project) for activities undertaken under GP fund as per MWS plan; however, the progress till mid-term has been included in progress data of respective activities as presented below.

Table 28: Progress in implementation of Inter GP Fund Activities as per MWS Plans in RF Areas			
Soil and Water conservation	Unit	Target	Progress till MTR
Construction of dugout Pond	No.	LS	25
Recharge pits	cum	LS	4226
Digging of trenches	No.	LS	17337
Drainage Line Treatment			
Construction of vegetative check dam	No.	LS	0
Construction of dry-stone check dam	Cum	LS	8366
Construction of crate wire check dam	Cum	LS	3868
Protection wall	Cum	LS	610
Diversion drain	Km.	LS	0

Progress in implementation of Inter GP Fund Activities as per MWS Plans within Gram Panchayat Areas

Progress in implementation of Inter GP Fund Activities as per MWS Plans in Gram Panchayat Areas is presented below. There are no targets (end of project) for activities undertaken under GP fund as per MWS plan, however the progress till mid-term has been included in progress data of respective activities presented earlier.

Table 29: Progress in Implementation of Inter GP Fund Activities as per MWS Plans within GP area			
Soil and Water conservation	Unit	Target	Progress till MTR
Construction of dugout Pond	No.	LS	116
Recharge pit	Cum	LS	3523
Digging of trenches	No.	LS	96462
Renovation of existing Tal/Khoola	No.	LS	1468
Drainage Line Treatment & Soil Conservation			
Construction of vegetative check dam	No.	LS	605
Construction of dry-stone check dam	Cum	LS	19726
Construction of crate wire check dam	Cum	LS	28076
Protection wall	Cum	LS	3055

4.1.4 Beneficiary and Community Response to Interventions

During the MTR, feedback from the Gram Panchayat members, beneficiaries and the MDT team was captured through group consultations in 54 revenue villages across the eight project districts to assess the quality of the interventions and its perceived impacts.

- **Impact on surface water**

Respondents in 31 percent of the villages reported improved availability of surface water due to soil and moisture conservation activities undertaken in treatment of MWSs. Beneficiaries were of the opinion that the water availability for both drinking and irrigation purpose has improved in the village. However, in 16.9 percent of the villages the respondents were articulate that the full treatment of MWSs has not been completed as yet and hence the impact on surface water is yet to be realized.

- **Siltation in existing or treated water bodies**

Gram Panchayat members and beneficiaries in 8.5 percent of villages reported that siltation is occurring in existing or treated water bodies. The community suggested that the project must tackle the siltation problem to ensure that existing and newly created water bodies do not get silted up.

- **Controlling soil erosion**

Riverbank protection measures, protection wall, land slide protection, road-side erosion control and check dam structures have been very effective in controlling soil erosion. Community members in 38 percent of the villages reported significant improvement in controlling soil erosion due to various treatment measures implemented.

- **Stability of hill slopes and reduction in landslides**

Landslide treatment, vegetative treatment and other measures have ensured that the stability of the hill slopes and occurrence of landslides has reduced significantly. Community members in 24 percent of the villages reported improved stability of hill slopes and reduction in landslides due to various treatment measures.

- **Improvement in Soil Moisture regime**

Community members are quite satisfied with the improvement in soil moisture regime after the treatment of MWSs in villages. In villages where treatment of MWSs is underway, the community reported that the benefit of improved soil moisture regime is yet to be seen.

- **Agriculture production**

Beneficiaries in 48.9 percent of the villages reported improvement in crop and fodder production due to improved water availability, improved soil moisture retention and use of improved varieties of seeds. In 80.3 percent of the villages, farmers reported very less or negligible use of pesticides and in remaining 19.7 percent villages, the usage of pesticides was normal or used as earlier (as per recommendation/recommended norms). Farmers reportedly were of the opinion that reduced use of pesticides has a positive effect on their health.

4.1.5 Impacts

- **Adoption of Natural Resource Conservation techniques**

The MTR study indicates over 52 percent of the households are using at least one of the two techniques-terrace or vegetative boundary for natural resource conservation. The table gives details of adoption percentages in different divisions.

Table 30: Percentage of Households adopted natural resource conservation techniques			
Division	Household using Vegetative Boundaries	Household using Terraces	Household using at least one of the two technique
Almora	26.0	30.7	48.7
Bageshwar	29.0	35.6	53.6
Dehradun	26.2	27.6	46.2
Dehradun-II (PMU Model)	22.4	20.4	40.8
Pauri	31.8	39.0	54.4
Pithoragarh	45.3	32.2	61.6
Rudraprayag	34.7	35.4	54.4
Tehri	27.0	34.0	48.9
Uttarkashi	35.3	28.9	54.0
Total	31.2	33.3	52.4

- **Increase in crop productivity**

The increase in crop productivity of cereals, pulses, oilseeds, vegetables, horticulture crops, spices and nutri-cereal crops in both rainfed and irrigated areas is a result of rainfed area brought under irrigation, improved water discharge of rejuvenated traditional water sources and adoption of better crop production technology. The improvement in crop production attributable to this project has been analyzed in Section 4.3.1 Agriculture and Horticulture later in this report.

- **Improved water yield and availability**

The improved water yield and availability to households for irrigation and drinking purposes is quite evident from numerous success stories of the project.

- **Cost-effectiveness of soil/water conservation investment**

The total arable area under the project is 45,050.00 Ha. In the baseline year (2015-16) the total rainfed area was 34,689 Ha, 5406 Ha was Irrigated area and 4,956 Ha was total fallow land. In 2018-19 the additional area brought under irrigation was 3253 Ha increasing the area under irrigation to 8515 Ha through various DLT works done under water harvesting and source sustainability measure.

Per Ha income from irrigated crops (vegetables & spices) have doubled by the Mid Term. Per Ha income has increased from Rs.1, 03,916 in 2015-16 to Rs.2, 27,608 by 2018-19. Per Ha investment in creating

irrigation potential is 1.8 Lakhs giving a net benefit of Rs 47,608.0 per Ha. The cost benefit ratio indicates that the investment made per Ha yields about 1/3rd of net returns which seems to have given considerably good return given the fact that this is almost first year of irrigation potential created.

Table 31: Yield of Irrigated Crops and Income Impacts (With Project)

Project level Crop Yield	Unit	Base line	Mid Term	% increase
Paddy	t/ha	1.17	1.52	30
Wheat	t/ha	1.40	1.57	12
Potato	t/ha	9.01	10.67	18
Vegetables	t/ha	8.08	9.84	22
Financial Income	Rs/ha	1,03,916	2,27,608	119

Table 32: Progress in implementation of Water Harvesting & Source Sustainability measures

Project Intervention	Unit	End of project target	Progress till MTR	Progress (%)	Financial Expenditure till March 2019 (in lakh)	Area (Ha)
<i>Water Harvesting</i>						
Irrigation Channel	Km	282.7	174.3	61.7	1793.03	1045.9
HDPE Irrigation Pipeline	Km	407.9	204.2	50.1	1048.37	828.2
Irrigation Tank	No.	1586	953	60.1	986.22	762.6
Roof Water Harvesting Tank	No.	9445	7787	82.4	1882.47	155.7
LDP Tank	No.	778	301	38.7	64.45	301
Solar water lifting Pump with solar panels	No.	3	6	200	67.86	64.2
Pre-Fabricated Geo Membrane Water Harvesting Tank	No.	3	56	1866.7	42.8	25
Village Irrigation Pond	No.	87	28	32.2	53.96	70.1
TOTAL					5939.16	3252.7
					Per Ha Cost (In Lakhs)	1.8

- **Reduction in Soil Loss**

According to ICAR-National Bureau of Soil Survey and Land Use Planning, close to 50 percent of the state’s area is above the tolerance limit of 11.2 ton per hectare per year of soil loss. The ICAR analysis shows that 6.71 percent of the area in the state (about 3,59,000 Ha) faces “moderately severe” (15 to 20 ton per hectare per year) soil erosion, while close to 9 percent (4,73,000 Ha) of the state is battling “severe” (20-40 ton per hectare per year) soil loss and the remaining a third of the area of the state (1,750,000 Ha) is experiencing soil loss at a rate of 40–80 ton per hectare annually, which is under “very severe” category.

Deforestation, burning, clearing and dibbling of seeds cause about 4.1 ton/Ha/year of soil material to roll down towards foothills due to steep to very steep slopes. The increased vulnerability of the topsoil being washed away and accumulation into the natural drainage channels occasionally blocking it and breaching / altering the channel morphology and spilling the silt load on to the village lands and human habitations threatens the entire natural ecosystem.

The hydrological interventions of water conservation, water harvesting and water augmenting interventions results in both tangible as well as intangible benefits. The perceived slow, delayed, and often limited sediment yield reduction at the outlet of large watersheds as a result of upstream conservation practices can be attributed to several conservation programme implementation factors.

The impacts could be:

- Increased soil moisture
- Root zone water availability for afforestation, fodder crops, cash crop and other horticultural activities
- Replenish water sources downstream.
- Arresting the sheet flows there by reducing soil erosion
- Enhanced water availability
- Some of the barren land converted to crop land

The Sediment yield calculated in the midterm is compared with baseline results. The project interventions has helped in impacting reduction in soil erosion and the mid-term study results shows considerable progress been made. The sediment yield of the catchment has considerably reduced. The table below shows the micro-watershed wise average sediment yield of baseline as compared to mid-term study.

Table 33: Micro watershed wise sediment load (t/ha/year) with % variation				
MWS	District	Baseline	Midterm	% Reduction
Lathiyagad	Pithoragarh	3.5	2.8	18.6
Sarugad	Uttarkashi	10.5	8.7	17.5
Dewangad	Dehradun	22.4	18.1	19.4
Saintoligad	Pauri	28.9	24.8	14.2
Sindhliyagad	Almora	38	32	15.8
Uttarsu	Rudraprayag	75	62.8	16.3

Table 33: Micro watershed wise sediment load (t/ha/year) with % variation				
Paligad	Tehri	187	146	21.9
Loharkhet	Bageshwar	207.3	179.6	13.4

Soil Loss categories as per ICAR-National Bureau of Soil Survey and Land Use Planning

Dark Red: Extremely severe (>80 t/ha/year)

Red: Very Severe (40-80 t/ha/year)

Orange: Severe (20-40 t/ha/year)

Yellow: Moderately severe (15-20 t/ha/year)

Green: Moderate (10-15 t/ha/year)

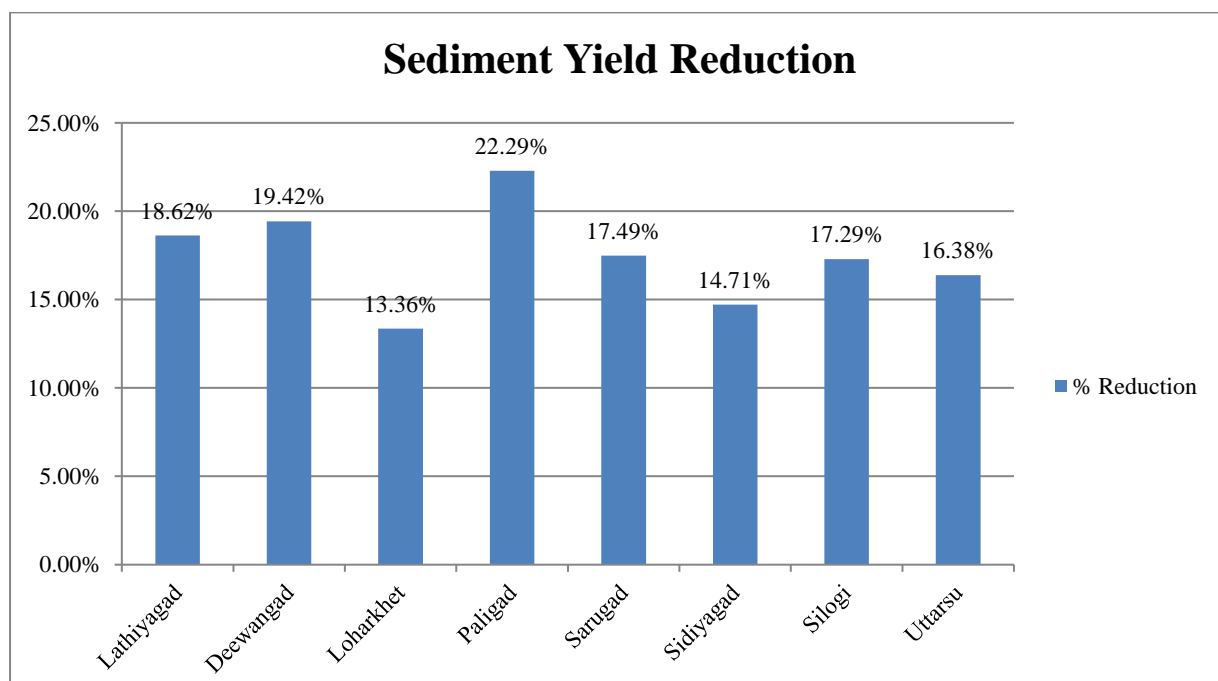


Figure 6: MWS wise sediment yield reduction

The Micro watershed wise reduction in sediment yield is as hereunder:

- Highest reduction in sediment yield of 21% was observed in Paligad micro watershed
- Lowest reduction in sediment yield of 13% was observed in Loharkhet micro watershed.

Success Story 1: Increased water for Irrigation

Upstream areas in hilly ecosystem which are predominantly under forests, conserve rainwater which flows underground as subsurface flow and subsequently appears downstream in the form of springs (Dhara) and streams (Naula). Locals almost depend on this water for their entire drinking needs and agriculture. In fact, these Dharas and Naulas are intertwined in the social, cultural and religious milieu of local communities from time immemorial. Thus, the health of the downstream water resources depends on the preservation and upkeep of upper catchments. Often this fact is overlooked, resulting in decline of water discharge or even drying of water springs which are being widely experienced in the hilly regions.

A very good example of integrated watershed management was seen at village Kagthun in Patisain Unit of Pauri Division. Here, out of the total catchment area of 25 hectares, 9 ha area had been treated during 2015-16 with afforestation comprising of different species of Banj Oak (5000 no.), Siris (Albizia lebbeck) (2000 no.), Aonla (Phyllanthus emblica) (1500 no.), Jamun (Syzygium cuminii) (500 no.) and Napier grass along with various soil and water conservation measures viz. recharge pits (400 no.), contour trenches (2400 no.) and khals (5 no.).

This has created a recharge capacity of about 40 lakh liters of water for every effective rainfall event.

The water recharged from the upper catchment area appears downstream in the form of a water spring (Dhara) which is utilized by villagers for their drinking, domestic and irrigation requirements. The discharge of water during the winter (December) was about 20 liter per minute and during the lean period (June) the discharge recorded was about 5 LPM. The water from this source is carried to a water tank of 34000-liter capacity constructed nearby. The water is lifted from this tank by a solar water pump of 5HP capacity to the agricultural land 45 meter vertically through a pipeline of 200 m length.

A Water User Association named Pumping Upbhokta Samuh, Kagthun, has been formed comprising 26 members. Farmers are utilizing the water for growing of high value vegetable crops like Onion, Garlic, French bean, Cabbage, Cauliflower, etc. A Self-Help Group (SHG) is also formed in which members are each contributing Rs. 50 per month, deposited in a bank account and have made a total saving of 36,269/- (as on 15.04.2019).

The villagers who were somewhat skeptical about the utility of soil and water conservation measures taken up in the catchment area are now fully convinced about their importance in sustaining the water discharge. This example of success, showing the importance of natural resource management can be beneficial in the area where many of the water sources have dried up due to mismanagement of catchment areas and change in rainfall pattern, possibly due to climate change effects. The catchment is the 'water spring sanctuaries' for the sustainability of the water resources and availability.



Success Story 2: Cost Effective Technology for Irrigation

Hilly regions are typically afflicted with the paradox of adversity in plenty in the matter of water resource availability and utilization. Though they are bestowed with numerous rivers and glaciers yet most of this water is not available for use to the local population for drinking and agriculture. The groundwater is also beyond reach of extraction and the only available and accessible water is from springs and streams. These are serious limitations and hence most of the hill agriculture is rainfed and irrigation facility is hardly available. However, irrigation is crucial for growing vegetables and high-value crops.

Irrigation development is distinct and challenging in the hills and requires innovative approaches and solutions. In the hill ecosystem water is generally available in the streams and rivers down below. However, lifting water by conventional pumps is not feasible as electricity and fuel are not readily available in these remote locations. In the Gramya II solar water lift pumps (3-5 HP) have been used successfully to lift water up to 100 m vertical height in Almora and Bageshwar districts at village Chamuwa, Khalsa, Dhaspad, Kafli and Liti. Geomembrane tanks (20,000 liter capacity and LDP tanks (10,000 to 15,000 liter capacities) have also been installed and are working efficiently.

LDPE tanks have been installed as a low-cost alternative to conventional cement tanks. Some LDP tanks constructed by ICAR – VPKAS in Almora, 7 - 8 years earlier were seen in working condition at Gram Panchayat Chaura, Almora. In village Indroli, Chakrata (Dehradun district) irrigation development through laying a pipeline (1500 m) and construction of water tank encouraged the farmers to cultivate vegetable crops in otherwise fallow land involving 7 farmer families through cluster approach.

The harvested water in the hills is precious and, therefore, should be used most judiciously by employing water saving devices like drip and sprinkler for higher water use efficiency. At Liti village (Bageshwar) sprinkler system is being used effectively to irrigate vegetable crops. It is a general observation that wherever irrigation facility was created, farmers shifted to cultivation of vegetable and cash crops. One farmer Shri Hukum Singh Karki of village Chamuwa Khalsa, Dhaura Devi block in Almora district who had migrated to Haldwani has again come back to his village after creation of irrigation facility and cultivating different vegetable crops and earning 50-60 thousand rupees per season. Imitating him, other people who had migrated for want of adequate income in the village have started coming back to the village. Many such examples were seen in villages Dhaspad, Kafli, Bhagad and Tola. In Almora and Badi Paniyali, Liti, Panora in Bageshwar irrigation development has helped in reversing the out-migration trend.

Success Story 3: Controlling Lantana

A 'surgical strike' against Lantana (*Lantana camara*) which is one of the world's most invasive weed was carried out in RV Baltir, (Pithoragarh) under Gramya II, which had grown into impenetrable thickets over 15 Ha of private land belonging to 22 families and has remained uncultivated for almost 4 decades. Moreover, these thickets became a protected habitat for wild animals causing total depredation of whatever little produce was being grown under rainfed conditions in adjoining areas. Patchwork efforts were made by the aggrieved community to remove Lantana to contain the aggressive weed but it simply proved to be beyond their capacity and the efforts had to be abandoned.

Fortuitously, the plight of the community came to the notice of Gramya II team and they intervened to change the situation. Heavy earth moving machinery (JCB, etc.) were hired to uproot the extensive Lantana thickets and the land cleared of Lantana infested areas has been regraded into agriculture fields and provided with irrigation by conveyancing water from a perennial water source (Hatta Dewal) through a 2 km HDPE pipe line and creating on site storage consisting of one community irrigation tank of 50,000 L capacity and 4 MLCL/ LDP lined dug ponds having 18,000 L storage capacity. Further to conserve, water sprinklers have been provided initially over 1 Ha. In addition to agriculture, the project also envisages promoting commercial Pisciculture, Floriculture (3000 liliun and 35,000 gladiolus bulbs), growing off-season vegetables and horticulture crops (including 275 pineapple plants). Napier grass has been planted along the field bunds, which has shown good growth and can serve as a nursery for further propagation.

It is a replicable success story of converting 'green Lantana unculturable areas' into wide range of commercial crops with ready markets and this may be developed as one of the models that can be implemented in other project location.

4.2 Forestry

Uttarakhand has 24,295 sq. km of forest, which is approximately 45.43 percent of the total geographical area (State of Forest Report, 2017). According to the land use classification, 63.42 percent of the total land in the State is classified under forest. The UDWDP II project area comprises of 1.42 lakh Ha of forest which is 53.9 percent of the total geographical area under the project. The project area under agriculture is 0.71 lakh Ha (26.9 percent), while the remaining 0.51 lakh Ha (19.2 percent) is classified as blank / barren land.

The forest area in the state is classified as Reserve forest, Civil-soyam forest and Van panchayats. The project area primarily falls under the middle Himalayan range with altitudes varying from 1000 m to 2000 m. The

forest in the project area primarily comprises of subtropical pine forest (below 1500m) and Himalayan broadleaf forest (between 1500m to 2600m) comprising primarily of Chir pine (*Pinus roxburghii*) and Oak (*Quercus leucotrichophora*) as either pure stands or mixed with other species.

The emphasis of the forestry interventions under the project was primarily aimed at improving soil and water conservation, watershed treatment and land reclamation and improving soil moisture content. However, the needs of the community for fodder, fuel wood, minor forest produce, timber, fruits and other edibles was given preference in selection of the species and types of plantations encouraged under the project. Majority of the forestry plantation were undertaken through the Van Panchayats through funds received by project Gram Panchayats.

4.2.1 Project Interventions

Based on the experience of Gramya I, the Project Appraisal Document (PAD) indicates that 21734 Ha of plantation possibly can be targeted in the Gramya II project comprising of afforestation, silvipasture and fuel wood plantations. According to the PAD, 5446 Ha of afforestation plantation, 6001 Ha of silvipasture plantation, and 7258 Ha of fuelwood plantation is targeted during the project duration, totalling to 18705 Ha of total plantation.

Table 34: Targeted Plantation Area in Project Appraisal Document	
Plantation Target in PAD	Area (Ha)
Targeted Area for Afforestation in PAD	5446
Targeted Area for Silvipasture plantation in PAD	6001
Targeted Area for Fuel wood plantation in PAD	7258
Total Target Area for Plantation	18705

The WMD based on the requirement of Gramya II and local needs have undertaken the following forestry and vegetative regeneration interventions.

i) Afforestation

The afforestation plantation of 5446 Ha was targeted through new plantation both through direct project interventions as well as through investments in inter GP plans in reserve forest (RF) and Gram Panchayat (GP) area. Some of the main species that has been planted under afforestation / reforestation are Devdar / deodar / cedar (*Cedrus deodara*), Oak (*Quercus leucotrichophora*), Kachnar (*Bauhinia variegata*) or Orchid, Chir Pine (*Pinus roxburghii*), Sal (*Shorea robusta*), Sagun / Teak (*Tectona grandis*), Bakain (*Melia azedarach*), Bheemal (*Grewia optiva*), Shisham (*Dalbergia sissoo*), Flyanta, Queraal, Ringal (*Arundinaria falcata*), Kesia (*Cassia fistula*), Rubenia, etc.

ii) Assisted Natural Regeneration of OAK trees

A total of 255 Ha of assisted natural regeneration of OAK trees has been planned under the project as one of the supportive reforestation activities.

iii) Horticulture plantation

The horticulture plantations implemented by the project was aimed at Orchard Development, Homestead Plantation, and Seed & Seedling for orchard cluster development which ensures twin benefit of improving bio-mass and ensuring food and nutritional benefits to communities. Some of the common horticulture species planted during the project are Mango, Lemon, *Malta* (Blood Orange), *Amla* (Indian Gooseberry), *Harad* (*Chebolic myrobalan*), *Sehtoot* (Mulberry), *Tejpatta* (Bay Leaf), Apple, Walnut, Guava, Kiwi, etc.

iv) Fodder plantation

The fodder plantation undertaken by the project was primarily through Napier crop border plantation and Forage row plantation, besides plantation of several multipurpose species like Banj Oak (*Quercus leucotrichophora*), Bheemal (*Grewia optiva*), etc. Supplementary Agave plantation to check soil erosion along slopes was also undertaken in various treated micro watersheds. The project has promoted the improved variety Napier (hybrid Napier, IGFRI-7, 10 etc.) and the tufts were planted in the agriculture terraces and abandoned land, in the villages. The Grass Tufts were procured from the Forest Department Nurseries, U.L.D.B. centres, KVK centre or Kisan Nurseries.

v) Fuel Wood Plantation

Fuel wood plantation was undertaken as an interspersed plantation activity to enhance availability of fuel wood for the local communities. The project consciously did not demark dedicated fuel wood plantation area, but was mixed with other plantation activities to enhance species diversity while reducing pressure on natural forests for fuel wood requirement. Species like Banj Oak (*Quercus leucotrichophora*), Bheemal (*Grewia optiva*), Khaural (*Bauhinia variegata*), Manipuri Oak, Bakain (*Melia azedarach*), Khair (*Acacia catechu*), Angu (*Fraxinus micrantha*), etc. was planted. Some of the species planted for timber under afforestation interventions such as Kachnar (*Bauhinia purpurea*), Chir Pine (*Pinus roxburghii*), Ringal (*Arundinaria falcata*), etc. also supports local fuel wood requirement.

4.2.2 Implementation Framework

Van Panchayats are primarily responsible for implementation of majority of the plantation activities with support from Gram Panchayats, Multi-Disciplinary project teams and local communities. The skills and capacities of the Van Panchayats were strengthened through various training and exposure visits to improve the quality of project interventions. Gram Panchayats were responsible for ensuring timely availability of funds to Van Panchayats and coordinating and supervising the work of Van Panchayats. Forest department has the responsibility of approving Micro Watershed Plan in the reserve forest area and coordinating the implementation of activities in RF areas. Local communities were actively involved through various participatory approaches used in the project, particularly in field preparation, maintenance of plantation, fencing and boundary establishment, fire protection and for restricting open grazing of animals.

The planting materials for horticulture plantation was sourced from authorized Govt nurseries, forestry plantation through Forest department nurseries & authorised private nurseries from forest department, while fodder planting material was procured from Kisan nurseries (farmers nurseries).

4.2.3 Key Results

i) Improvement in Biomass (PDO2)

The key results indicators pertain to the second Project Development Objective (PDO 2) that captures the improvement in the biomass as a result of the project. The above five intervention would result in an overall increase in plantation and vegetative cover in the forest and watershed area leading to improvement in biomass.

The result is measured on the basis of the NDVI data that captures changes in the Biomass calculated through GIS methods. The change in Biomass is measured in project and control sites and different time intervals (Before project, during project and at end of project) to gauge the incremental difference.

The approach adopted during baseline study was used for estimation of sediment loss using the RUSLE model. It has been observed that soil, vegetation cover and topographic characteristics of an area also play a major role in rate of soil erosion, apart from the rainfall intensity and surface runoff. Therefore, given the variation of these characteristics within various sub areas of the catchment, it is desirable to identify smaller homogenous units of catchment for estimating the soil loss. RUSLE method was followed as it is a simple approach to analyze soil losses and it can provide an accurate assessment of the soil loss over smaller surface areas.

It assumes a linear relationship between various parameters. This model is based on five parameters i.e. annual average soil loss, rainfall- runoff erosivity, soil erodibility, slope (length and steepness), and land cover management and conservation practice.

Biomass Estimation: The quantification is done at the level of forest, pasture and fallow. The estimation is done using remote sensing technology by the use of NDVI. However since the NDVI technique is not completely reliable, field based methods are also adopted for biomass estimation. The field based methods for estimation of forest and pasture is done using indirect measurements instead of the earlier suggested harvest method for pasture.

Soil Moisture Estimation: Soil moisture is a very important parameter for a variety of applications in hydrology and agriculture. Soil moisture is essential for agricultural studies given its significance in irrigation scheduling, plant stress and improving plant yield. Hence, quantification of soil estimation is required for better planning of agricultural management and hydrological applications.

Change Detection: From midterm onwards, when two season data is available, change detection of watershed will be carried out. This will be carried out by using supervised classification of LISS IV satellite images.

The project targets and end target of 20% change over baseline in Biomass through various plantation activities.

Table 35: Annual Targets Of PDO 2										
PDO Level Results Indicator	Unit of Measure	Baseline Study		YR 1	YR 2	YR 3	YR 4 (MTR)	YR5	YR6	YR7
		P	C	14-15	15-16	16-17	17-18	18-19	19-20	20-21
PDO 2 Increase in Bio Mass	MT/Ha	27.69	21.74	-	-	-	10%	10%	15%	20%

ii) Biomass Estimation

UDWDP II is currently one of the major watershed programmes of the state. Its objective was to treat 82 micro watersheds spread over eight 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. Forestry activities such as afforestation and soil conservation works were carried out in Van Panchayat and Civil and Soyam forests under the project. Forestry interventions were expected to help in soil and water conservation, land reclamation, and increase in moisture content of the soil.

Afforestation activity has been carried out in all the eight divisions. Total 957454 saplings were planted in 3830 ha area within the sampled GPs of these divisions. Division wise, maximum plantation area was covered in Bageshwar division (699.62 ha), followed by Vikasnagar (546), Pithoragarh (483), Thatyur (451 ha), Almora (406.19 ha), Pauri (307.5 ha), Uttarkashi (270.5 ha), and Rudraprayag (66 ha). Details of the afforestation activities are provided in Annexure –Table No 45, 46 &47.

The present chapter deals with the details of forestry interventions under the project, its impact on forest and biodiversity of the sampled GPs and provides increase in biomass on the basis of remote sensing and techniques and field survey.

iii) Interventions under the project

In Gramya II, 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 etc. All the interventions have been undertaken in the sampled areas. Detail of the interventions in the sampled GPs is provided in the Annexure 1.

In this regard it must be noted that forestry interventions started relatively late in the project. These interventions were undertaken between 2015- 2018.

- ***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*).

- ***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 useful materials like bamboo and fiber to local communities.

iii) Methodology

- ***Biomass Estimation Using Remote Sensing:***

Micro-watershed wise Biomass incremental assessment was made using field survey in combination with image processing technique. 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 SUTRA for further analysis. The satellite data sets of 2013-2014 and 2018-2019 provided by NRSC were geo rectified and mosaicked (stitched together).

The satellite image was classified using spectral characteristics into different land cover type's viz. forest, water body, built up, agriculture and barren land etc. Tonal and textural variation plays a major role in the creation of land cover type map. From the field a number of quadrants were laid to study the biomass availability and species distribution. The field data was also used as ground truth to differentiate between various vegetation compositions. The field base sampling has provided with the quantification of biomass in terms of th^{-1} . The field values were later evaluated with reference to NDVI values. The correlation of field sampled values with NDVI values helps in the development of regression equation to assess biomass in terms of NDVI values using satellite image.

To assess the increment in biomass, biomass baseline data of 2013-2014 was created. A number of field plots (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 1 to 2 years. Similarly, within the treated areas, due to afforestation, maintenance, fencing and protection against grazing and over exploitation, though the natural vegetation (bushes, shrubs and grasses etc.) will grow and accumulate.

The biomass value from the baseline study estimated through field data collection and satellite image of 2014 were compared with the biomass value in midterm study estimated on the basis of field survey and satellite image of year 2019. Further a linear fit equation was developed correlating the biomass values with the NDVI values of same coordinates (pixel) in both years (2014 and 2019) 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 twelve revenue villages of six development blocks located within six districts of Uttarakhand state. All these were selected from the overall sample of 36 Gram Panchayats (GPs). Four blocks (Jaunpur, Kalsi, Ekeshwar and Augustmuni) from the Garhwal region were identified for field data collection, while two blocks (Kapkot and Dhauladevi) were selected from the Kumaon region. The selected revenue villages from Garhwal region are Quasi, Dilau, Sanj, Dudhau, Khjarbi, Kyarigad, Pali, Rayari, Dankot, Falai, and Patisen. All the selected villages fall within an altitudinal range of 300 m to 2000 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 surveyed in the month of June to July, 2019. To assess the standing biomass, quadrant sampling method developed by Misra (1968) was used in all the selected eleven villages. At all the selected sites, quadrants of size 20 x 25 m for trees, 5 x 5 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 quadrants were laid within each treated plantation site.

On the basis of the field data, standing biomass stock was calculated. 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 (2014 and 2019). The linear fit equation further provides the biomass values of the entire project area. The comparative assessment of biomass change in each micro watershed are listed in Table 29.

iv) Result

Overall it was observed that the biomass of the treated areas has increased by 10.58% from 2014-2015 to 2019-2020. 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 owing to the protection against grazing and over usage. Since the planted saplings are very young (hardly 3 to 4 years old) is the increase in the biomass on account of plantations relatively low, this is evident by field survey values of plantation sites. However, biomass accumulation through natural regeneration that has occurred through protection is likely to have contributed to the overall biomass increase. In this regard, contribution of soil conservation structures and drainage line treatment (DLT) is acknowledged as important project interventions which contribute to increase in biomass by preventing soil erosion and conserving the moisture regime not only in and around agricultural land but also around structures such as water channels and irrigation tanks.

In addition, bringing of additional land under irrigation (land which was previously fallow), increase in cropping intensity (discussed later in Section 4.3) and fodder cultivation are the contributing factors to increase in Biomass throughout the treated areas. These are the newly added sector of Biomass in the treated areas.

Table 36: Biomass estimation Baseline vs Midterm

Sectors	Baseline Biomass (tons)	Midterm Biomass (Tons)	% increment
---------	----------------------------	---------------------------	----------------

Biomass from arable and non-arable areas as per NVDI maps	4098995	4421896.80	7.88
Biomass from agricultural production in converted fallow land	NA	11624.8	0.285
Added Biomass from Agriculture increased Cropping intensity	NA	2544.3	0.062
Biomass from Pasture (Napier & other fodder cultivation)	NA	96780.8	2.361
Total Biomass	4098995	4532846.7	10.58
Biomass MT/Ha	27.69	30.62	

The total biomass in the treated areas has increased from 4098995 tons i.e. 27.69 MT/Ha in Baseline to 4532846.7 tons i.e. 30.62 MT/Ha at the time of Midterm. There is also Biomass that has not been calculated here. This is the biomass conserved in the forests due to non-utilization of fodder and fuelwood from the forests. This biomass could be equivalent to the biomass of fodder that was cultivated in the fields instead of being procured from the forests. Additionally, the biomass from the agricultural residues is also excluded here which is equivalent to 20-60% of the total agriculture production biomass (differing from crop to crop). This conserved Biomass can be calculated only with a more in-depth study of the area and the population habits.

Table 37: Crop Wise Contribution to Biomass of Fallow Land

Crop	Area (Ha)	Production Biomass (tons/ha)	Biomass from Production
Bottle Gourds	2.58	45	116.1
Brinjal	2.02	12	24.2
Radish	48.28	8	386.2
Lentil	5	0.713	3.6
Potato	95.53	22.14	2115.0
Pea	103.8	13.53	1404.4
Onion	28.91	11.46	331.3
Broccoli	70.54	3	211.6
Cabbage	123.19	11.65	1435.2
Cauliflower	60.76	1.872	113.7
Cucurbits	66.5	3	199.5
French Bean	11.84	5.98	70.8
Garlic	73.8	15	1107.0
Tomato	124.41	1s7.27	2148.6
Chili	6.96	0.5	3.5
Cucumber	1	3	3.0
Lady's Finger	7.9	7.1	56.1
Pumpkin	2	3	6.0
Capsicum	14	3	42.0

Table 37: Crop Wise Contribution to Biomass of Fallow Land			
Crop	Area (Ha)	Production Biomass (tons/ha)	Biomass from Production
Radish	8.56	3	25.7
Leafy (Rai, Spinach, Fenugreek, Coriander)	16.72	3	50.2
Wheat	633.32	2.376	1504.8
Toria/Rape Seed/Mustard	283.97	0.579	164.4
Lentil	142.88	0.713	101.9
Total	1934.47	196.88	11624.8

As of June 2019, almost 1934 Ha of land previously fallow land has been brought under cultivation of different crops (agriculture and horticulture). Contribution of fallow land under cultivation of different crops in Rabi as well as Zaid in project area too is a considered crucial to assess the overall biomass increment.

The increment in biomass due to project interventions owing to increased soil moisture leading to enhanced contribution from herb and shrub can be exemplified by biomass growth in agroforestry, plantation and open forest. In the sampled micro-watersheds, the highest growth of 6% been observed in Kyarigad whereas the biomass increment in Bhanwargad Micro-watershed is nil, though variation of -2% to 11% in different strands was observed in Bhanwargad.

Table 29 provides information on change in biomass in each of the micro watersheds. In this regard it has to be noted that the biomass in the micro watersheds belonging to Rudraprayag, Bageshwar, Pauri and Pithoragad division shows considerable increase, whereas biomass increment in Dehradun, Tehri and Uttarkashi divisions are nominal. It is evident from NDVI Figures annexed at the end of this chapter as well as Annexure I, that due to soil and water conservation measures the biomass of the treated MWS has increased. In the NDVI image it can visually interpreted that vegetation cover has increased over time which is supported by the increase vegetation health as shown in NDVI image.

Table 38: Micro watershed wise change in Biomass					
Development Block	MWS	Avg. Biomass (t h-1) 2014-15	Avg. Biomass (t h-1) 2019-20	% Change	Total Biomass (t) 2019-2020
1. Dehradun Division					
Chakrata	Gothragad	28.51	28.225	-1%	76960.6
Kalsi	Kalsi	23.45	22.981	-2%	68520.8
	Khatwagad	23.13	22.320	-3.5%	138297
	Aragad	22.25	22.695	2%	48460.8
	Dewangad	23.83	24.545	3%	170919.6
Total Biomass Dehradun					503158.5
2. Thatyur Division					
Jaunpur	Patalgad	13.01	13.791	6%	21916.8
	Kyarigad	27.31	27.583	1%	77737.7

Table 38: Micro watershed wise change in Biomass					
	Paligad	33.20	32.868	1%	194893.3
	Ringaligad	21.59	22.670	5%	49980.7
	Tunethagad	19.93	20.528	3%	46343.3
	Mandigad	26.02	26.671	2.5%	60512.8
	Diwangad	27.99	27.150	-3%	50700.9
	Pantwarigad	32.19	33.156	3%	62959.7
	Maind	23.62	24.092	2%	21497.3
	Total Biomass Thatyur				586542.4
3. Pauri Division					
Pokhra	Chargad	40.489	43.728	8%	121988.2
Ekeshwar	Silogi	29.87	32.853	10%	140722.4
	Patisen	34.41	38.536	12%	261277.7
	Chandol	28.88	30.038	4%	80819.1
	Total Biomass				604807.4
4. Uttarkashi Division					
Mori	Miyagad	25.5	26.265	3%	119317.8
Purola	Moltadi	25.07	26.073	4%	47817.9
Naugaon	Koti	32.28	31.634	-2%	92493.7
	Barkot	26.53	26.928	1.5%	21391.9
	Total Biomass Uttarkashi				259629.5
5. Rudraprayag Division					
Ukhimath	Rawanganga	34.54	38.684	12%	159451.2
Agastmuni	Dangi	36.55	41.118	12.5%	121821.8
	Uttarshu	33.92	37.651	11%	136577.8
Jakholi	Kwila	33.157	34.483	4%	92225.2
	Total Biomass Rudraprayag				510076
6. Pithoragarh Division					
Berinag	Jhiniyagad	30.49	33.537	10%	42195.2
Munsyari	Patligad	26.28	29.173	11%	95255.6
	Dhaulagad	27.926	30.300	8.5%	77534.8
Didihat	Lathiyagad	30.114	34.631	15.5%	73961.3
	Ranikhet	32.267	33.235	3%	136117.3
	Bhanarigad	32.134	32.455	1%	182243.7
	Total Biomass Pithoragarh				607307.9
7. Bageshwar Division					
Kapkot	Saran gadhera	31.786	37.126	16.8%	457975.9
	Loharkhet	29.97	32.66	9%	446144.7
	Gogina	20.096	23.311	16%	444180.5
	Revatiganga	27.63	31.22	13%	143017.6
	Kheti	29.763	32.441	9%	85224.9
	Bamsera	27.155	27.833	2.5%	24791.9
	Total Biomass Bageshwar				1601335.5
8. Almora Division					
Dhauladevi	Bhanwargad	26.265	27.578	5%	108051.8
	Khannigad	32.38	33.675	4%	46301.2

Table 38: Micro watershed wise change in Biomass					
	Galligad	25.771	27.575	7%	85633.5
	Kiroriganga	28.44	30.687	7.9%	149715.9
Bhaisia Chana	Thatgad	30.874	31.338	1.5%	136461.9
	Total Biomass Almora				526164.4

The following Table 30 provides the detail of the available biomass in different stratum as assessed in midterm analysis.

Table 39: Stratum Wise Biomass Distribution					
Development Block	MWS	Avg. Biomass (t h-1) 2019-20	Tree Biomass (t h-1)	Herb + Shrub biomass	Total Biomass (t) 2019-2020
1. Dehradun Division					
Chakrata	Gothragad	28.225	27.802	0.423	76960.56
Kalsi	Kalsi	22.981	22.636	0.345	68520.57
	Khatwagad	22.32	21.985	0.335	138297
	Aragad	22.695	22.355	0.340	48460.77
	Dewangad	24.545	24.177	0.368	170919.6
	Total Biomass Dehradun				503158.48
2. Thatyur Division					
Jaunpur	Patalgad	13.791	13.584	0.207	21916.57
	Kyarigad	27.583	27.169	0.414	77737.71
	Paligad	32.868	32.375	0.493	194893.3
	Ringaligad	22.670	22.330	0.340	49980.76
	Tunethagad	20.528	20.220	0.308	46343.33
	Mandigad	26.671	26.271	0.400	60512.78
	Diwangad	27.150	26.743	0.407	50700.91
	Pantwarigad	33.156	32.659	0.497	62959.69
	Maind	24.092	23.731	0.361	21497.33
	Total Biomass Thatyur				586542.41
3. Pauri Division					
Pokhra	Chargad	43.728	43.072	0.656	121988.2

Table 39: Stratum Wise Biomass Distribution					
Ekeshwar	Silogi	32.853	32.360	0.493	140722.4
	Patisen	38.536	37.958	0.578	261277.7
	Chandol	30.038	29.587	0.451	80819.12
	Total Biomass				604807.4
4. Uttarkashi Division					
Mori	Miyagad	26.265	25.871	0.394	119317.83
Purola	Moltadi	26.073	25.682	0.391	47817.99
Naugaon	Koti	31.634	31.159	0.475	92493.67
	Barkot	26.928	26.524	0.404	21391.95
	Total Biomass Uttarkashi				259629.5
5. Rudraprayag Division					
Ukhimath	Rawanganga	38.684	38.104	0.580	159451.2
Augastmuni	Dangi	41.118	40.501	0.617	121821.8
	Uttarshu	37.651	37.086	0.565	136577.8
Jakholi	Kwila	34.483	33.966	0.517	92225.19
	Total Biomass Rudraprayag				510076
6. Pithoragarh Division					
Berinag	Jhiniyagad	33.537	33.034	0.503	42195.2
Munsyari	Patligad	29.173	28.735	0.438	95255.63
	Dhaulagad	30.300	29.846	0.455	77534.77
Didihat	Lathiyagad	34.631	34.112	0.519	73961.3
	Ranikhet	33.235	32.736	0.499	136117.28
	Bhanarigad	32.455	31.968	0.487	182243.69
	Total Biomass Pithoragarh				607307.87
7. Bageshwar Division					
Kapkot	Saran Gadhera	37.126	36.569	0.557	457975.9
	Loharkhet	32.660	32.170	0.490	446144.71
	Gogina	23.311	22.961	0.350	444180.48

Table 39: Stratum Wise Biomass Distribution					
	Revatiganga	31.220	30.752	0.468	143017.61
	Kheti	32.441	31.954	0.487	85224.943
	Bamsera	27.833	27.416	0.417	24791.819
	Total Biomass Bageshwar				1601335.5
8. Almora Division					
Dhauladevi	Bhanwargad	27.578	27.164	0.414	108051.8
	Khannigad	33.675	33.170	0.505	46301.174
	Galligad	27.575	27.161	0.414	85633.512
	Kiroriganga	30.687	30.227	0.460	149715.88
Bhaisia Chana	Thatgad	31.338	30.868	0.470	136461.98
	Total Biomass Almora				526164.35

e) Progress in Implementation of Plantation

The project has shown very good progress of plantation activities so far and needs to maintain the same pace of implementation in the remaining project duration. The table below gives the end of project target in terms of area to be covered under the following interventions and the achievement of the project till mid-term.

Table 40: Progress Plantations under Gramya II					
S.N.	Plantation	Unit	End of project target	Progress till MTR	Progress (%)
1	Afforestation	Ha	4263.0	3624.0	85.0
2	Assisted Natural Regeneration of OAK	Ha	255.0	210.0	82.4
3	Horticulture Plantation	Ha	3495.0	3756.0	107.5
4	Fodder Plantation	Ha	455.0	453.2	99.6
	Total Plantation	Ha	8468.0	8043.2	94.9

Against the projected target of 8468 Ha of total plantation by end of the project, the project has achieved 8043.2 Ha of plantation till mid-term, which is 95 percent of the target. The project has so far completed 85 percent of the afforestation plantation based on their target. However, if the afforestation target of PAD (5446 Ha) is considered, the project has achieved 66.5 percent of the target so far. The area covered under afforestation plantation also included plantation undertaken through inter GP fund, both in Gram Panchayat and Reserve Forest area.

A very high progress of fodder plantation achieved by the project is due to Napier Crop Boarder Plantation as evident from the table below. The table also provides detailed break-up of achievements made by project so far. The progress of vegetative treatment needs to be hastened as so far, only 15102 m² (1.5 Ha) of area has been covered under vegetative treatment, which is about 12.2 percent of the total project target.

Table 41: Detailed Progress of Plantations in Gramya II				
Plantation Activity	Unit	End of project target	Progress till MTR	Progress (%)
Forestry				
Afforestation (1000 plants/ ha.)	Ha	4263.0	3597.0	
Afforestation - Inter GP Fund in RF Areas	Ha	-	25.0	
Afforestation - Inter GP Fund in GP Areas	Ha	-	2.0	
Total		4263.0	3624.0	85.0
ANR of Oak Trees				
Assisted Natural Regeneration of Oak Areas	Ha	255.0	95.0	
ANR of Oak - Inter GP Fund in RF Areas	Ha	-	115.0	
ANR of Oak - Inter GP Fund in GP Areas	Ha	-	0.0	
Total		255.0	210.0	82.4
Fodder Plantation				
Napier Crop Border Plantation	Ha	274.0	299.2	109.2
Forage row plantation	Ha	181.0	154.0	85.1
Total		455.0	453.2	99.6
Horticulture Plantation				
Homestead plantation (250 Plant)	Ha	1718.5	1312.0	76.3
Orchard Development (250 Plant/ha.)	Ha	1776.5	1879.0	105.8
Seeds and Seedlings (Orchard Cluster Development)	Ha	-	565.0	
Total		3495.0	3756.0	107.5
Vegetative treatment	Ha	12.3	1.5	12.2

The forestry activities were undertaken in two phases by the project. First, advance soil work is undertaken at least six months prior to the plantation and involves land preparation, pit digging and creation of saucers around the pits for water conservation. After the advance soil work is completed plantations takes place mostly during rainy season. It can be observed that the project has made good progress in completing advance soil work for undertaking plantation. It can be observed that only 18 percent progress has been made in establishing farmer nurseries, which must be taken forward in right earnest in the following months.

Table 42: Progress of Advance Soil Work and Nursery Establishment in Gramya II				
Project Intervention	Unit	End of project target	Progress till MTR	Progress (%)
Afforestation (1000 plants/Ha)				
Advance soil work	Ha	4263	3749	87.9
Advance soil work - Inter GP Fund in RF Areas	Ha	-	45	-
Advance soil work - Inter GP Fund in GP Areas	Ha	-	12	-
Total		4263	3806	89.3
Farmer Nursery Establishment (10,000 plants)	No.	37	7	18.92
Assisted Natural Regeneration of Oak Areas				
Advance soil work	Ha	255	113	44.3

Advance soil work - Inter GP Fund in RF Areas	Ha	-	105	-
Advance soil work - Inter GP Fund in GP Areas	Ha	-	10	-
Total		255	228	89.4

vi) Land Use Land Cover (LULC)

The land use and land cover in the Micro Water Shed areas has been assessed for baseline and Midterm and changes have been observed. The analysis of the data shows that there is a total of 3.6% increase in area under agriculture throughout the 8 micro water sheds along with a 0.9% increase in the forest cover. There LULC also shows a 2.5% reduction in the area with or without scrubs. These achievements are directly linked to the project interventions of bringing fallow as well as rainfed land under irrigation and afforestation efforts undertaken in the different part of the watershed.

The increase in land under agriculture is showing very little change since majority of the intervention is focused on the irrigation of rainfed areas (meaning that the land was rendered as agriculture in the baseline itself). The other aspect of bringing fallow land under cultivation is evidently seen, both through the increase in land under agriculture as well as the decrease in land under scrubs.

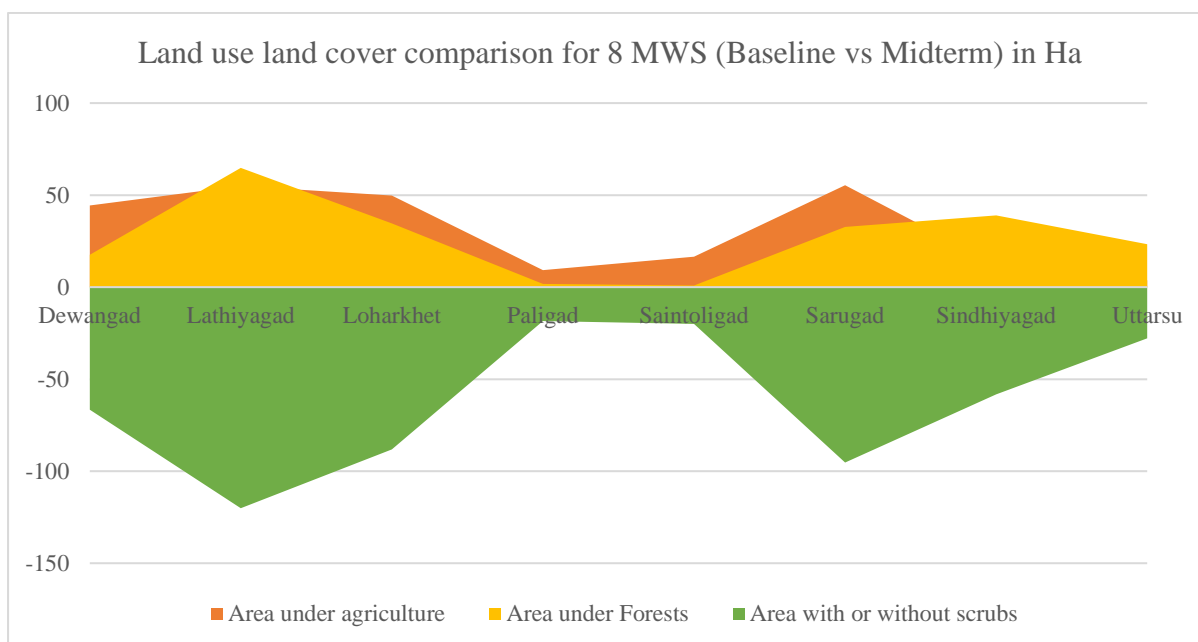


Figure 7: Land use land cover comparison for 8 MWS (Baseline vs Midterm) in Ha

As per the data from the 8 MWS, the absolute increase in area under agriculture in the 8 micro watersheds is 246.06 ha and under forests is 214.78 Ha. The area under forests can be better ascertained at the end of the project. The area with or without scrubs has decreased by 494.66 ha.

Table 43: Category wise Land Use and Land cover for Micro water sheds					
Land Use category	Unit	Baseline Area	Midterm Area	Difference in Area	% Change
Built up	Ha	118.73	143.8	25.07	21.1

Agriculture	Ha	6872.94	7119	246.06	3.6
Forest	Ha	25042.22	25257	214.78	0.9
Water	Ha	1717.05	1722.5	5.45	0.3
Land with or without scrub	Ha	19961.56	19666.9	-494.66	-2.5
Road	Ha	198.24	199.9	1.66	0.8

Table 36 to Table 43 in Annexures show the category wise land use land cover of the 8 Micro watersheds for Baseline and Midterm showing change in coverage for Land use under Built up, Agriculture, Forest, Water, Land with or without scrub and under transportation.

Table 36 to Table 43 in Annexures show the category wise land use land cover of the 8 Micro watersheds for Baseline and Midterm showing change in coverage for Land use under Built up, Agriculture, Forest, Water, Land with or without scrub and under transportation.

The results are not as prominent in the satellite images due to the project being in its nascent stage and will require a maturation period to show significant achievement in the satellite maps. Table 37 in annexure shows the change in LULC maps for different MWS in the project area from Baseline to Midterm.

4.2.4 Beneficiary and Community Response to Interventions

During the MTR feedback from the Gram Panchayat members, beneficiaries and the MDT team was captured through group consultations in 86 GPs across the eight project districts to assess the quality of the project interventions and services provided for afforestation, silvipasture development and orchard plantation.

i) Forestry and Silvipasture Development

Across locations the GP members and beneficiaries were satisfied with the appropriateness of the site selected for the species planted for afforestation and silvipasture and the site development activities undertaken. The main species selected for plantation were Devdar / deodar / cedar (*Cedrus deodara*), Oak (*Quercus leucotrichophora*), Kachnar (*Bauhinia variegata*) or Orchid, Chir Pine (*Pinus roxburghii*), Sal (*Shorea robusta*), Sagun / Teak (*Tectona grandis*), Bakain (*Melia azedarach*), Bheemal (*Grewia optiva*), Shisham (*Dalbergia sissoo*), Ringal (*Arundinaria falcata*), Kesia (*Cassia fistula*), Khaural (*Bauhinia variegata*), Manipuri Oak, Bakain (*Melia azedarach*), Khair (*Acacia catechu*), Angu (*Fraxinus micrantha*), etc.

The community were overall satisfied with the site development activities undertaken in the project such as clearance, demarcation of boundary, retaining indigenous varieties in pasture development, etc. Among several activities' GP members are particularly satisfied with the boundary and fencing of sites whether it was vegetative boundary or stone and/or wire boundary.

In 60.5 percent of the sites visited, the GP members and the MDT teams reported that digging of pits were appropriately undertaken and in the remaining GPs the activity was considered to be of acceptable quality, but could have been done better. In 54.6 percent of the GPs visited the use of local villagers in digging of pits was reported and in 29.0 percent of the sites the mulching and trench system was reportedly ensured. In all the sites the filling of pits was considered to have been done properly

Protection of the planting sites was reported to be good across project locations, while fire protection was reported to be satisfactory in 26.7 percent of the GPs. The fire protection measures in the remaining sites could be further enhanced through measures such as creating fire lines around reforested area and keeping *Chir* zone clean during fire season.

Selection of species for plantation as per the altitude was reported to be good in 60 percent of the GPs visited, while in the remaining GPs, GP members and MDT teams were of the opinion that it could have been better considering the survival rate of different species. Planting of saplings with regard to timing of planting of saplings and size of sapling selected for the species was considered to be have been done properly in all the sites visited. Reportedly, 64.0 percent of the GPs have planted 10000 or more saplings per Ha, while 27.9 percent reported planting of 5000 saplings per Ha and 8.1 percent reported planting of 3000 saplings per Ha. Replacement of dead saplings / plants was reported in two third of the GPs, which ideally should be ensured in all the GPs. The main reason cited for poor survival of plantation in some GPs was lack of proper attention during planting, weeding and other works. Other factors reported for low survival in some GPs were wrong selection of species according to the altitude, planting of weak and damaged saplings, untimely planting of saplings, carelessness in cartage of plants, lack of supervision at the time of planting, and issues related to shifting, grading and root cutting of plants.

In almost all the Gram Panchayats, the maintenance of plantation and after care, soil work and weeding post plantation was considered to be of average quality and needs to be improved further. The need for systematic planning with clear timeline for maintenance and after care of plantation was suggested during the consultations.

ii) Plantation of shrubs and grass

In 86 percent of the GPs, the GP members were reportedly satisfied with the planting of shrubs and grass in watershed treatment area. 7 percent of the GPs (6 GPs) the GP members were not satisfied with the coverage of shrubs and grass plantation and in the remaining GPs the plantation of shrubs and grass was considered average or acceptable. In all the GPs, the members were satisfied with the maintenance of shrubs and grass plantation undertaken.

iii) Species and Survival Rate

The community and MDT teams during consultations shared the survival rate of species planted, which varies across Gram Panchayats visited. The reported survival rate varies between 70 to 90 percent for timber species; 65 to 85 percent for fuel wood species; 75 to 95 percent for fodder species; and 65 to 100 percent for horticulture plant species planted under the project.

4.2.5 Impacts

Gramya II has endeavoured to link forest / tree conservation and rural development under a single umbrella to create synergies in watershed development, conservation of water and sustainable livelihoods. The project has provided ideal opportunities of providing water conservation, water harvesting and drought proofing, reforestation, and tree plantations in an integrated manner for conservation of natural resources and for strengthening local livelihoods.

Economic returns from the investments in the project are an important aspect of the evaluation but it may be premature / imprudent to assign productivity to the unirrigated tree plantations on the depleted/ stressed in the formative years (2 to 5 years).

i) Reduction in blank / bare land

The various plantation activities including afforestation, assisted natural regeneration of Oak tree, fodder and orchard plantation in approximately 0.024 lakh Ha in project area has effectively resulted in reduction of 4.7 percent of blank / barren land in project area (0.51 lakh Ha blank land in project area at the beginning of the project).

ii) Species Diversity

Vegetation survey was conducted in accordance with the vegetation sampling process and methodology as described in section 2.2.3. The diversity index for different vegetation classes were assessed using the total number of tree, shrubs and herbs and their abundance. The diversity index is an effort to integrate both affluence and abundance into a single value. Here Shannon-Weiner diversity index was used to calculate the species diversity. This index is based on the relationship between numbers of individuals of a species to the total number of plants within a sample.

$$H' = - \sum pi \ln pi$$

Here pi is number of individual of one species divided by total number of plants and ‘ln’ is the natural logarithm to base e.

In the present study estimation of Species diversity and richness was done separately for tree, shrub and herb. Details of the diversity index and species richness are provided in the following table.

Table 44: Biodiversity and Species Richness							
Division	Micro-watershed	Block	Vegetation Type	Diversity Index		Species Richness	
				2014	2019	2014	2019
Dehradun	Kalsi	Kalsi	Tree	1.458	1.510	6	07
			Shrub	1.73	1.69	10	10
			Herb	1.539	1.52	13	11
	Aragad	Kalsi	Tree	0.29	1.20	2	9
			Shrub	1.22	0.60	6	5
			Herb	1.37	1.40	7	11
	Khatwagad	Kalsi	Tree	0.92	0.76	4	3
			Shrub	0.64	0.59	2	2
			Herb	1.19	1.12	4	3
Thatyur	Paligad	Jaunpur	Tree	1.38	1.14	5	5
			Shrub	0.93	0.97	4	5
			Herb	0.41	0.53	4	5
	Kyarigad	Jaunpur	Tree	1.32	1.53	5	11
			Shrub	1.17	1.06	4	3
			Herb	2.02	1.92	9	4
			Tree	1.51	1.43	10	9

Table 44: Biodiversity and Species Richness							
Rudraprayag	Dangi	Augustmuni	Shrub	1.05	0.989	6	5
			Herb	1.70	1.52	7	4
Pauri	Chargad	Pokhra	Tree	0.91	0.987	4	5
			Shrub	1.09	0.992	5	4
			Herb	1.55	1.33	5	5
	Patisen	Ekeshwar	Tree	0.84	0.783	7	6
			Shrub	0.84	0.821	4	4
			Herb	0.64	1.21	3	5
Almora	Bhanwargad	Dhauladevi	Tree	0.83	0.89	5	6
			Shrub	1.47	1.39	10	8
			Herb	1.83	1.82	9	7
			Tree	1.48	1.42	8	7
Bageshwar	Loharkhet	Kapkot	Shrub	1.20	0.91	6	5
			Herb	1.48	1.31	5	4
			Tree	1.62	1.10	6	6
			Shrub	1.18	1.19	4	7
	Gogina	Kapkot	Herb	1.60	1.59	7	5
			Tree	1.04	0.98	4	4
			Shrub	0.18	0.39	3	6
			Herb	1.05	1.12	3	3

The project interventions have resulted in the increased biodiversity and richness of tree species. It has been observed that the overall tree species show substantial change whereas herbs and shrub species shows nominal change in biodiversity and richness values. The treated plantation sites have higher values of diversity and species richness as compared to the control sites. Overall, it has been observed that herbs have higher diversity values and species richness as compared to the tree and shrub species. It may be concluded that conservation and protection activities has created conducive environment for various other local species to grow and survive better. Increase in the species richness and diversity index were largely due increase in the moisture content through the various soil and water conservation structures.

iii) Survival percentage

Survival percentage was also calculated based on the survey of plantation sites in each of the project area. In each surveyed site, around 3 to 6 quadrats were laid depending upon the plantation 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.

It was assessed that the average survival percentage varies from 55% (Quasi, Jaunpur, Thatyur) to 79% (Loharkhet, Bageshwar) within the twelve surveyed sites. In Dilau, Dudhau, Pali, Saran Gadhera, Rayari, Dankot, Falai, Patisain and Bhanwargad sites the survival percentage was recorded as 76%, 76%, 75%, 67%, 64%, 65%, 75%, and 78 % respectively. Overall average survival percentage within the surveyed sites was around 71%.

In loharkhet site, the survival percentage was highest because the plantation was only one year old, while for the other sites (2 to 4 years old) the survival rate varied due to various site-specific reasons. The following table provides the details of micro-watershed wise survival rate.

Table 45 : Survival Rate			
Division	Micro-watershed	Block	Survival rate (%)
Dehradun	Kalsi	Kalsi	76
	Aragad	Kalsi	76
	Khatwagad	Kalsi	74
Thatyur	Paligad	Jaunpur	75
	Kyarigad	Jaunpur	55
Rudraprayag	Dangi	Agastmuni	64
Pauri	Chargad	Pokhra	65
	Patisen	Ekeshwer	75
Almora	Bhanwargad	Dhauladevi	78
Bageshwar	Loharkhet	Kapkot	79
	Saran Gadhera	Kapkot	67

iv) Fodder availability and production

The following impacts were reported by the community as a result of afforestation and plantation activities undertaken in Gramya II. A greater percentage of households have access to fodder and grass now from own land, while a substantial decrease in grazing has been reported. Fodder and fuel wood stress on natural forest has reduced with lesser households collecting them from forest and also reduced quantity of collection as the same is available in own and common land in village.

Table 46: Impact on fuel wood and fodder due to forestry activities in Gramya II		
	Prior to Project	Presently after Project
Fodder and grasses from own agricultural, barren and other land	Average: 69 percent of Household	Average: 95 percent of Household
Feed purchased from market	Average: Few Household	Average: Few Household
Fodder and fuel wood from forest	Average: 66 percent of Household	Average: 64 percent of Household
Grazing	Average: 29 percent of Household	Average: 12 percent of Household

v) Institutional, Social and Gender Impacts

The forestry interventions have several positive social and gender impacts on women beneficiaries. The time spent on fodder collection has reduced and now lesser number of family members are involved in fodder collection indicating reducing drudgery. Women have greater involvement now in local development planning with positive impact on their empowerment. Employment opportunities for women have also expanded due to forestry activities undertaken in the project.

Table 47: Impact on women due to forestry activities in Gramya II

	Prior to Project	Presently after Project
Time spent for collection of fodder	Average=2.5 hours	Average=2.0 hours
Members involved in collection of fodder	2 or 3	1 or 2
Employment opportunities created for women in plantation activities	Low	Improved due to labour opportunity
Involvement of women in planning activities of plantation	Low	Improved due to involvement in planning, planting and fire protection

Success Story 4: Afforestation in Sakholi

In Sakholi Afforestation activities were undertaken in 5 Ha area in which 5000 plants were planted. 4500 Banj Oak; 20 silver oak; 50 Jamun plants; 200 Morus plants, 200 Kachanar plants besides Napier was planted.

Banj plants are healthy and vigorously growing. 85 percent of mutilated root stock is also showing healthy shoot growth that may require thinning in the next two to three years. With beating up of casualties, the area is expected to get fully stocked within next five years.

With soil and moisture interventions, a natural spring in the lower reaches of the plantation area, is showing signs of better recharge and retaining water even during unprecedented dry summer months this year. As the grasses and vegetation cover (particularly shrubs and bushes) improves further over the years, the recharge will increase and according to local plantation watcher, elderly Smt. Bharosi Devi, there is increase of water flow in Pandera Nawala and it has become perennial. This is a great success story of improving recharge in micro-catchments that directly benefit the local villagers in almost no time. However, while expressing her happiness at increasing forest cover, she was also critical of the increase of wild animals particularly monkeys and wild boars as the depredation of agriculture crops has also increased.

Interestingly in this village, women celebrate Raksha Bandhan by tying rakshas (religious threads) to the trees recognizing them as their brethren benefactors, carrying voluntary repairs/ strengthening of the fencing and renewing their pledge to protect the plantation area from grazing, fire and unauthorized felling and other damages to the tree crops.

Success Story 5: Medicinal Plant Cultivation

The village Dhaspad falls under Bhanoli unit in Kumaon region with 40 households and a population of 220 people. Gramya II is working in the village where the intervention has been made. Installation of a solar water lifting scheme is constructed with a submersible pump having a vertical lift of 118m. Two solar panels with a capacity to produce 325 kw/day when 6 hrs of sunlight is received. One geo tank of 20,000 liter capacity is installed at a higher point in the village. Around 550 meters pipeline was used from water source to the geo tank. About 18 LDP tanks have also been constructed in the village with 10% share of the cost as beneficiary contribution. The operational mechanism is to lift water from the source to the Geo tank through solar water lifting scheme. From the Geo tank pipelines are connected to the LDP tanks and water is supplied through gravity to these tanks. This water is thereafter used for irrigation and household purposes by the

beneficiaries. The project has also constructed 4 poly houses in the village. This intervention by Gramya has provided an irrigation facility for 6 ha of land which was previously 0.75 ha only.

Echinacea purpurea a medicinal plant is cultivated in the village. The plant is planted once and grows for three years. Harvesting is done after every six months in which the plant is cut four inches above ground. It is dried and cut into pieces for selling. The buyer is from Haldwani who asked the villagers to cultivate the flowers on a buyback agreement. The production of this flower is around 50 kg per Nali and fetches a price of INR 60/kg. The beneficiaries prefer cultivating this medicinal plant as it is not damaged by wild boars and monkeys. Very little inputs in terms of irrigation, weeding and manuring are needed for the crop. Though this is not a very remunerative crop but it does not require watch and ward and provides assured returns to the farmers. Beneficiaries in this village have also been provided with seeds of off-season vegetables. Production of these OSVs (cabbage, tomatoes and chillies) was good but the market price was very low due to excessive production. Plantation of trees like *Tejpatta* has been undertaken by the beneficiaries in the open spaces.

4.3 Agriculture and Allied Sectors

4.3.1 Agriculture and Horticulture

The geographical area of Uttarakhand is 55,845 sq. km. (FSI, 1999). In terms of geographical area, the state is dominated by the hills covering 46035 sq.km (~90 percent) and 7448 sq. km (~10 percent) for the plains. However, the total cultivated area is much more evenly distributed between the hills and plains. It is estimated that the total cultivated area in the state is 741,000 ha. (Land Use Survey 2009-10), of which 54 percent (415,000) is located in the hill regions. Land use surveys in the nine hill districts of the State show that forests occupy almost two-thirds of land (63 percent) with only 9 percent being used for cultivating annual crops. The hill farms are characterized by being very small and fragmented. The average farm size being 0.6 to 0.8 ha, often subdivided into a number of plots in different size, shape and locations.

Agriculture and Horticulture in Uttarakhand

About 80 percent of the population living in the hills of Uttarakhand depends on agriculture. The project area has 66,400 farmers, currently cultivating 45,050 Ha. of which, 77 percent are rainfed, 12 percent are irrigated, and the remaining 11 percent are under fallows. Rainfed cropping patterns are dominated by cereal, millet, and pulse crops. Major crops are Ragi, Wheat, Paddy, Pulses, Rapeseed, and Mustard, which occupy 75 percent of the cropping area in the project villages. Cropping patterns are determined by agro-ecological zones which are broadly defined by altitude. The farming system for the majority of the non-irrigated hill areas consists of a 2-year rotation of barnyard millet (or upland rice), wheat or lentils- both mix-cropped

with mustard, finger millet mix-cropped with soybean, sesame, or Amaranthus. Nearly all these crops are grown for own-consumption, the exceptions being soybean and Amaranthus. Some of the millet is also used as feed for livestock. Almost all the crops are grown without chemical fertilizers and mostly the FYM and compost are used to fertilise the farms wherever available. Despite low to no use of chemicals, it was reported that the overall soil fertility is declining (Crop productivity and suitability analysis for land-use planning in Himalayan ecosystem of Uttarakhand, India, August 2018). As a result, major crops like staple cereals, have productivity as low as 1.2 to 1.4 tons/Ha almost 50 percent lower than in the plains. This is evident from the below comparison of production averages with global and national scenarios.

Crop	Global average (Qtls/Ha)*	National average (Qtls/Ha)*	Project area average (Qtls/Ha) from baseline
Wheat	32.57	30.75	12.6
Rice	30.26	21.91	11.2
Pulses	8.90	8.41	7.6

*Economic Survey of India 2015-16

In the hills, conventional irrigation practices are not feasible. Moreover, there has been an overall reduction in the discharge rate of spring and stream water sources: about 10 percent of these water sources have disappeared over the last decade. Most regions have good rainfall and the average annual rainfall is around 1308 mm (IMD, 2016) of which more than 90 percent is received during the July-September monsoon months, resulting in severe soil erosion. The average soil loss of 40 tons/Ha is estimated due to rapid water run-off from the undulating and steep slopes during monsoon months adversely influencing downstream valley and plains. These are major constraints to enhancing rainfed agronomic practices and increasing agricultural productivity. Poor households own most degraded lands, and their land holdings are small and scattered. Consequently, household incomes are low, forcing people to leave the region in search of jobs, as evidenced from the fact that the out migration in the state is reported to be over 24 percent.

4.3.1.1 Rationale for Selection

The small farms, fragmented plots and lack of capital investment leave little scope for making staple crop cultivation a major “income-generating” activity. Therefore, a range of income-generating crops have been developed for the hill regions; the most important being horticultural crops. In addition, efforts have been made to develop crops for seed production, and encouraging farmers to grow aromatic plants, spices, tree nuts, etc.

The relatively cooler temperatures compared to the plains results in the Uttarakhand hill regions being one of the few areas in India that can produce certain temperate vegetables such as potatoes, brassicas (e.g. cabbage, cauliflower) and legumes (e.g. peas, beans). It is also one of the few areas of India that can produce temperate fruits like apple, pear, plum, apricots and peaches. Fruits and vegetables being highly perishable, the lack of post-harvest, storage, logistics, and lack of access to bigger markets make it particularly challenging. Vegetable cultivation is ideal for small and marginal farmers to get better returns if they can grow vegetables in the off seasons owing to higher market price during off season. The shorter duration of

these crops also makes them more suitable and remunerative. Uttarakhand, being a hilly state with varying agro-climatic zones possesses immense potential for production of off-season vegetable and there is tremendous scope to enhance their productivity. It is estimated that more than 57 percent of the vegetable production of the state is from the hill areas. Therefore, the promotion of high yielding vegetable crops through demonstration has been a crucial intervention of this project to substantially improve their incomes and livelihood security.

4.3.1.2 Gramya II targets for Agriculture and Horticulture

Rainfed crops occupy about 77 percent of the arable lands. Average annual rainfall in the project area is ranging from 1000 mm to 2680 mm across project districts (IMD, 2016). About 74 percent of the annual rainfall occurs during June to September. Average rainfed crop yields in the project area are low, varying from 1.2 to 1.8 t/Ha for cereals and 0.6 to 0.7 t/Ha for pulses/oilseeds. Actual crop yields are only 40 to 50 percent of the potential crop yields in rainfed agriculture. Resource conservation-cum-improved production technology packages are critical to close this yield gap and stabilize the productivity across diverse rainfall situations in the project area. Gramya II is expected to promote integrated resource conservation measures in the arable lands and support adoption of moisture conservation based efficient crop production management in cereals, coarse cereals, pulses, and oilseeds in about one million farming terraces, protected with vegetative (fodder) boundaries.

To promote improved resource conservation cum production technologies, 14,300 demonstrations of High Yielding agricultural crops in rainfed area are planned during the project implementation period, covering the major crops in all 1,066 project villages. Adoption support would be provided to all rainfed farmers who would be actively linked to implementation of demonstration programs, in which soil and moisture conservation within the rainfed terraces would remain the central focus. Improved inter and intra-terrace conservation techniques are being promoted through farmer participatory demonstrations, along with the adoption of location-specific efficient crop production packages. All these interventions are projected to enhance crop productivity by 15-20 percent and crop income by 40 percent to 50 percent by end of the project.

About 5,262 Ha of area was irrigated in the state accounting for 13 percent of the arable lands. Gramya II is supporting investments in location-specific water harvesting systems shared by groups of rainfed farmers to harvest and efficiently recycle the runoff to increase the irrigation support to 19 percent of the arable land. The project supports and encourages farmers to produce high-value crops which would enhance household income. Project interventions include harvesting run-off and capture, store and use the rainwater for increasing irrigation coverage by 50 percent to reach 7,800 ha, by end of project.

To promote efficient use of harvested rainwater, improved crop production technologies with emphasis on cultivation of mainly vegetable crops is being popularized through 18,950 demonstrations and linked to adoption groups covering all irrigated farmers with adoption support. About 15,500 polyhouses and tunnels would be supported in the project villages to ensure viability of quality seedlings of short duration off-season high-value crops for the farmers in project villages. Project interventions in irrigated agriculture are expected to benefit 16,660 irrigated farmers covering 7,893 Ha.

At end of the project period, about 90 percent of the irrigated farmers are projected to adopt and sustain efficient irrigated crop production technologies across the project area.

4.3.1.3 Implementation Arrangement

“On Farm Demonstrations” (Method demonstration and Impact demonstration) is a strong means to convince farmers, leading to wider and sustainable adaptability. Agriculture demonstrations are focused on rainfed areas using suitable high yielding rainfed variety of the crop predominant in that area. Vegetable crops will however be area specific to get maximum productivity with proper input support. Complete recommended package of practices for the select crops is being demonstrated in the farmers’ field.

In order to achieve the desired outcomes, the main focus is on farm demonstrations (and farmer trainings linked with these demonstrations) to achieve wider dissemination of improved crop husbandry and natural resource management practices. The scope of demonstrations includes supplying subsidized inputs such as seed, fertilizers, bio-fertilizers, bio-pesticides, etc. to the beneficiary farmers. The demonstrations are being strategically used to increase productivity of land, water, inputs, and other resources resulting in increase in total production and farm income.

For enhancing rainfed crop productivity, the main thrust has been given for adoption of improved varieties of crops, quality seeds, low water-requiring crops like Finger millet, Wheat, Maize, other Nutri-cereals, Pulses, and Oilseeds based on bio-physical and resource suitability. This is combined with improved crop husbandry and rainwater conservation practices, including life-saving irrigation with stored rainwater at critical stages of crop growth for maximizing productivity. Specific technologies and practices developed and/or recommended for Uttarakhand by GB Pant University of Agriculture and Technology (Pantnagar), the Central Soil and Water Conservation Research and Training Institute (Dehradun), Vivekananda Parvatiya Krishi Anusandhan Sansthan (Almora) and the Centre for Research in Dryland Areas are being promoted in the project area. Some of these are:

- Use of soil test based nutrient application and proper method and stage of fertilizer application, including integrated nutrient management using organic manures, bio-fertilizers and chemical fertilizers. Polyhouse production of seedlings and vegetable crops for reduced losses due to damage and disease/pest
- Use of good quality seed of improved variety/hybrid, which is recommended for cultivation in the area, especially rainfed areas. e.g. VL832, VL829, UP2575, HD2966 in Wheat
- IPM using Bio agents developed by GB Pant University, cow urine, and other mechanical measure such as yellow sticky traps, light traps, etc.
- Certified Seed Production Programme with Foundation and Breeder seeds from VPKAS, Almora & Uttarakhand State Organic Certification Agency
- Methods of in situ moisture conservation and reduced run off during crop growth, and minimizing evaporation by use of mulches and other appropriate practices.
- Recommended seed rate and optimum time of sowing to ensure proper plant population, particularly in rain fed areas.

- Line sowing of crops and proper placement of fertilizers for higher plant population, greater plant vigour and easy weed control.

Gramya II has also undertaken interventions to educate farmers about the benefits of growing short-duration crop varieties suitable for rainfed conditions, and adoption of critical package of practices like fertilizer application to the crop immediately after a rainfall event in early stages of crop growth.

4.3.1.4 Key Results

Achievement of Project Development Objective

Project Development Objective 3: Increase in Ha of rainfed area under irrigation

The major focus of Gramya II is on increasing productivity in rainfed areas through enhanced soil moisture management and providing supplemental irrigation where feasible. The intervention is aimed at bringing more rainfed areas under irrigation. The expansion of cropped areas is being done through-

- Investing in irrigation (groundwater recharge, investment in high-tech irrigation systems, etc.).
- Increasing annual irrigation water supplied by innovative systems management,
- Developing new surface water storage facilities, and
- Increasing water productivity in irrigated areas and value per unit of water by integrating multiple uses—including livestock and domestic use—in irrigated systems

As already discussed in section 4.1 Soil and Water Conservation, the MTR data shows that a total of 3252.8 ha of previously rainfed area has been brought under irrigation now. The total irrigated area in the project region now stands at 8514.8 Ha. This also includes 1854 Ha of previously fallow land brought under irrigation (Refer Annexure Table 24 for details). The major interventions to improve irrigation sources in the region are construction of irrigation tanks, installation of pipelines, solar lift irrigation systems, ponds, and gul. The interventions have helped bring fallow lands under cultivation besides bringing rainfed areas in to irrigated agriculture. The increase in area under irrigation has helped increase the cropping intensity substantially.

PDO 4: Increase in productivity

Table 48: Increase in crop productivity PDO 4						
Project Development Objective		Unit	Baseline		Midterm	
			Project	Control	Project	Control
Indicator	Four: Increase in productivity					
	In irrigated crops	%	0	0	37.2	16.8
	In rainfed crops	%	0	0	27.2	12.8

The data collected for the Midterm shows that there is a net increase of 23.7 Qtls/Ha in the average productivity of Irrigated crops corresponding to 37.2 percent increase in productivity against the year 4 (MTR) target of 30 percent. The crops studied under this component are Garlic, Cauliflower, Cabbage and Green Pea. The detailed Crop Yields of Irrigated Crops is shown in Table 40 below.

Crops	Unit	Baseline Value				Midterm Study				DiD
		Project		Control		Project		Control		
		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	
Garlic	Qtls/Ha	-	40.2	-	39.9	-	60.8	-	47.1	13.4
Cauliflower	Qtls/Ha	-	99.5	-	98.5	-	113.2	-	107.0	5.2
Cabbage	Qtls/Ha	-	86.4	-	85.3	-	128.7	-	102.6	25
Peas	Qtls/Ha	-	51.8	-	51.0	-	70.0	-	61.3	7.9

The increase in productivity can be mainly attributed to ensuring availability of water and extensive field demonstrations of High Yielding vegetable crops. HYV demonstration effectively demonstrates the benefits over traditional varieties and methods of cultivation. Demonstration of raising seed and seedlings of high value crops, especially off-season vegetables under poly tunnel/polyhouse, Use of Vermicompost, Bio-composting etc. has encouraged the farmers to raise good quality seedlings for large scale cultivation of high value crops. The high yielding crop varieties being utilized for Irrigated crops include the following;

Crop	High Yielding Variety utilized
Cabbage	Varun, NSC Longyard
Cauliflower (I)	Snow crown, Snow white, Moti
Garlic (I)	Agri found Parvati
Pea	GS 10, Arkel, Indo-American Hybrid Seeds, NSC P 10

With respect to rainfed agriculture too, there is significant achievement in the productivity where an increase of 12.6 Qtls/Ha (Kharif) and 8.6 Qtls/Ha (Rabi) has been documented corresponding to 27.3 percent and 27.9 percent increase in productivity for Kharif and Rabi respectively over baseline data. The target for increase in productivity of rainfed crops was 5 percent for Year 4 i.e. Midterm. The detailed Crop Yields of Irrigated Crops studied for Midterm review is shown in Table 42.

Crops	Unit	Baseline Value				Midterm Study				DiD
		Project		Control		Project		Control		
		Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	
Spice Crops										
Ginger	Qtls/Ha	84.7	-	84.2	-	113.9	-	98.4	-	14.96
Turmeric	Qtls/Ha	76.1	-	75.9	-	88.3	-	81.9	-	6.23
Onion	Qtls/Ha	-	44	-	43	-	61.1	-	49.4	10.72
Garlic	Qtls/Ha	-	40.2	-	39.9	-	60.9	-	50.2	10.43
Cereal crops										
Maize	Qtls/Ha	13	-	12.3	-	15.8	-	14.1	-	1.01
Wheat	Qtls/Ha	-	12.6	-	12	-	15.7	-	14	1.05
Rice	Qtls/Ha	11.2	-	11.1	-	13.8	-	13	-	0.68
Nutri Crops										
Finger Millet (Mandua)	Qtls/Ha	12.1	-	11.5	-	13.8	-	12.6	-	0.74

Barnyard Millet (Madira, Jhangora)	Qtls/Ha	11.7	-	11.5	-	13.3	-	12.5	-	0.63
Amaranthus (Ramdana)	Qtls/Ha	6.1	-	5.8	-	7.3	-	6.3	-	0.69
Horticulture Crops/ Vegetable Crops										
Potato	Qtls/Ha	90.1	-	89.8	-	106.7	-	98.2	-	8.31
Tomato	Qtls/Ha	105.4	-	105.2	-	137.8	-	123.4	-	14.18
French Bean	Qtls/Ha	55.6	-	55.2	-	79.7	-	67.5	-	11.78
Capsicum	Qtls/Ha	58.5	-	58.1	-	81.9	-	62	-	19.5
Cauliflower	Qtls/Ha	-	99.5	-	98.8	-	112	-	105	6.3
Oilseed crops										
Mustard/ Rapeseed	Qtls/Ha	-	5.6	-	5.4	-	7.3	-	5.6	1.5
Pulse crop										
Lentils (Masoor)	Qtls/Ha	-	7.3	-	7.1	-	9.5	-	7.5	1.8
Black Soybean	Qtls/Ha	8.9	-	8.6	-	11.9	-	10.2	-	1.4
Horse gram (Gehat)	Qtls/Ha	-	6.8	-	6.7	-	6.5	-	6.7	-0.3

The increase in productivity of rainfed agriculture can be attributed to the introduction of High yielding varieties (Refer to Table 43 as in case of Maize, Rice, Mustard, Soybean, French Beans, Green Peas, Capsicum, Tomato), Introduction of varieties suited for hill areas and promotion of millets through National Mission for Sustainable Agriculture.

Highlights:

- **Maize**- 25 percent increase due to high yielding and hybrid varieties Vivak Makka, TATA DMH-849 replacing composite variety. Also, the Chardham circuit is favourable for Maize growth and combined with IPM and INM techniques the production has considerable increased
- **Rice**- 23 percent increase in productivity by shifting to VPKAS recommended long strain variety PB 1509
- **Millets**- 5 percent increase in productivity attributed to promotion of Nutri Cereal cultivation under National Mission for Sustainable Agriculture
- **Rapeseed/Mustard**- 30 percent increase in productivity attributed to short duration High Yielding Varieties that are suitable for hill regions
- **Pulses (Lentils & Soybean)**- up to 30 percent increase in productivity attributed to High Yielding Varieties, hill adaptive varieties and good mineral content of the soil in the region. PS 1225 a Soybean variety was widely used
- **Horse Gram** is having negative productivity due to heavy rainfall during sowing season

The following high yielding varieties of crops has led to the increased productivity of rainfed agriculture under Gramya II;

Table 52: HYV Crop introduced under Gramya II	
Crop	Recommended High Yielding Variety
Amaranthus	VL Chua 44
Barnyard millets	VL Madira 207
Cabbage	Varun, NSC Longyard
Capsicum	Green diamond, Hyb Raja, California Wonder, Radhika
Cauliflower	Snow crown, Snow white, Moti
Finger millet	VL 324, 347, 315, 352
French bean	Makhmali, Himgiri, Anupama, Falguni
Garlic	Agri found Parvati
Ginger	Rio de Janeiro
Maize	Kanchan, TATA Ril 009, DMH-849, African tall, Vivak Sankul Makka 31, K 65, DMN 849
Mustard	8501, PT 303, PPS-1
Onion	Nasik red, Sarik Red
Pea	GS 10, Arkel, Indo-American Hybrid Seeds, NSC P 10
Potato	Kufri Badshah, Kufri Jyoti, Chandramukhi
Rice	PB 1509, VL 85, 86, 62
Soybean	PS 1225, PS 1092
Tomato	Saksham, Himsona, Bravo, TO-71, Manisha, Naveen 2000+, Archana
Turmeric	Swarna
Wheat	VL 953, HS 507, VL 892, HS 507, HD 2967, UP 2572, UP 2526, PBW-550, VL 824, VL 832, VL 907

Along with high yielding and hill recommended crop varieties, yield increase is also attributed to appropriate crop husbandry, integrated nutrient management, and adoption of improved crop production technologies and soil moisture conservation practices as recommended under the project. The Intermediate Indicator 5 (discussed further) shows that over 70% of the farmers in the project area practice seed treatment, 50% utilise Bio-compost, almost 40% use mulching in their fields. Crop production technologies such as deep ploughing and line sowing are also adopted by almost half the farmers and have proved to be beneficial. The extensive adoption of improved crop production technologies and soil moisture conservation practices has thus helped considerably in the manifestation of the genetic potentials of HYV in enhanced productivity at the demonstration and adoption plots. Continuous support through extension services that helped create awareness, adoption support and capacity building of the farmers resulting in farmers largely following the recommended package of practices.

Additionally, productivity increase can be also attributed to the National mission for sustainable agriculture scheme that is being promoted in the area (both project and control). Along with the Project area, Control areas have also shown a good progress with productivity increasing by 8 to 20 % in Irrigated crops and 3 to 25 % in rainfed crops. The National Mission for Sustainable Agriculture scheme aims to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific Integrated/Composite Farming Systems; an objective that is also being promoted under the agriculture component of GRAMYA II. The scheme promotes sustainable agriculture through promotion of ten key dimensions namely; 'Improved crop seeds, livestock and fish cultures', 'Water Use Efficiency', 'Pest Management', 'Improved Farm Practices', 'Nutrient Management', 'Agricultural insurance', 'Credit support', 'Markets', 'Access to Information' and 'Livelihood diversification'. Gramya II interventions are also focusing on integrated farming systems, improved agronomic practices for higher productivity,

improved water and soil conservation practices, and judicious use of chemicals which are also being promoted under the NMSA scheme.

Intermediate Indicator 5- Soil moisture conservation practices

The main objective of soil moisture conservation is to minimize the amount of water loss from the soils through evaporation (water loss directly from the soil) and transpiration (water loss occurring through the plants) – or combined, the evapotranspiration. Soil moisture conservation is ensured through the initiatives such as deep/shallow ploughing, poly and organic mulching, seed treatment, IPM, INM, Intercropping, and providing irrigation facilities.

This indicator captures the number of farmers practicing at least five soil conservation method or improved crop production methods in last cropping seasons. Adoption is defined as any one technology adopted from the basket of technologies promoted and demonstrated under the project. The agricultural technologies and improved practises promoted include;

- Seed Treatment,
- Bio-compost,
- Vermi-compost,
- Mulching,
- IPM measures like Bio Pesticides, Yellow Strip, Insect Trap
- Deep Ploughing, Zero Tillage,
- Line Sowing, and
- INM measures like Organic Manure, Cow Urine, Bio Fertilizer

Table 53: Intermediate Indicator 5						
Project Objective/intermediate Indicator	Development Unit	Baseline Study		Midterm Study		
		Project	Control	Project	Control	
Intermediate Indicator 5: Targeted farmers adopting	%					
Soil Moisture Conservation Practices	%	28.4	27.0	65.1*	41.0*	
Crop Production Technologies	%	13.3	11.7			

*Farmers using at least five soil moisture conservation technologies

The MTR study shows that such practices are now widely followed and 65.1 percent of the farmers in the treatment area are using at least five of the soil moisture conservation practices and crop production technologies. Of the study group 99.9% farmers follow at least 1 of the 13 practices in project area and 99.4% in control area.

It is seen from the baseline data that farmers were already exposed to and also adopting some of the improved crop production and soil conservation technologies in both treatment and the control areas. This indicates that there was certain level of existing sensitization about these practices however, these were traditionally used methods like seed treatment, spreading of ash in the fields, organic mulch, practiced with little technical approach. The Field demonstrations along with extension services played a major role in leveraging this awareness and encouraging the farmers in adopting the improved practices with providing essential technical

know-how. With demonstrations farmers are able to see for themselves the benefit of using improved crop production technologies and soil moisture conservation practices through visual observation and participation in the demonstrations. Seed Treatment, mulching and use of bio-compost and vermicompost are most popular as the project has special focus on these activities. Qualitative assessment in field has also revealed about convergence activities by other departments in providing high yielding variety seeds, demonstrations on line sowing etc. under the NMSA scheme.

Seed Treatment (71.5%), Bio-compost (50.5%) and Mulching (38.3%) are the most popular practices adopted by the farmers from those demonstrated through GRAMYA II activities. Deep Ploughing/Zero Tillage, Line sowing are also being adopted widely as they help save cost of labour and seed cost due to reduced requirement respectively. Pest and nutrient management techniques such as using insect traps, yellow strips, bio-pesticides are still not being adopted widely as these are novel practices. The project extension must focus on promoting these practices.

Table 54: Soil Moisture Conservation Measures Adopted		
Soil Moisture Conservation Measure Adopted	Project (%)	Control (%)
Seed Treatment	71.5	32.2
Bio-compost	50.5	21.7
Line Sowing	49.8	9.6
Deep Ploughing, Zero Tillage	49.7	5.1
Poly Mulching	38.3	23.1
Mix Cropping	34.3	33.1
Insect Trap	33.5	13.8
Yellow Strip	32.7	11.4
Cow Urine	24.7	17.7
Bio Fertilizer	20.0	13.4
Organic Mulch	14.3	10.5
Vermi-compost	10.7	10.5
Bio Pesticides	9.2	1.5

Project Progress under agriculture and horticulture

Table 55: Agriculture and Horticulture Activity Progress				
Component Activity	Unit	End Project Target	Progress till Mid Term	Progress (%)
<i>Agriculture</i>				
Agriculture mini-kit (0.04 Ha.)	No.	17603	1482	8
Agriculture/Horticulture. tools	No.	2694	1455	54
Terrace repair/Vegetative field boundary	Cum	88514	19357	22
<i>Horticulture</i>				
Bio Compost	No.	974	432	44
Vermi Compost	No.	840	72	9
High value crops mini-kit (0.04 Ha.)	Ha.	321	21.15	7
Homestead plantation (250 Plant)	Ha.	1719	1312	76
Orchard Development (250 Plant/ha.)	Ha.	1777	1879	106

Poly House	No.	1601	1955	122
Poly Tunnel	No.	4222	5294	125

Agriculture mini-kits

Small and marginal farmers are pre-dominant in the project area. More often these farmers operate with minimal resources and therefore are reluctant in adoption of new technologies and practices. In order to boost the adoption of the demonstrated high yielding varieties and recommended package of practices agriculture minikits are distributed to the farmers. These minikits consist of improved seed input, bio-fertilizer application as per soil test based recommendation, inputs for IPM and training on crop husbandry and package of practices for an area of 0.04 Ha. The mini-kits help in encouraging adoption of improved practices and new seed varieties by the farmers in the early stage. With adoption support farmers are able to witness the benefits of the recommended crop varieties and practices in their own farms without increased input cost. The benefits derived from the adoption plot contribute to long term adoption by the farmers. Agriculture mini-kits have been distributed to 1482 farmers covering 8 percent of the total project targeted farmers.

i) Agriculture/Horticulture tools:

The traditional tools and implements are still used by the hill farmers. To encourage usage of gender friendly small tools and implements for tillage, sowing, intercultural operations, harvesting, and threshing, the project has distributed about 1,455 improved agriculture tools to the farmers. As part of the selective mechanisation to reduce drudgery, power tools are distributed under this intervention such as Power Generated Disc Cultivator, small tractor, Power Weeder, Hand operated & power operated sprayers, etc. The distribution of these tools and implements has increased ease of operation and reduced the effort required for implementing appropriate crop husbandry practices such as deep ploughing, line sowing, weeding, spraying of pesticides, etc.

ii) Terrace repair/Vegetative field boundary:

Repair of agriculture terraces and vegetative field boundaries is being undertaken for reducing soil loss and improving agricultural productivity. Adoption support is provided to all rainfed farmers linked to implementation of demonstration programs. The soil and moisture conservation within the rainfed terraces would remain the central focus for improving the overall crop productivity and sustainability. While undertaking terraces repair activities, inward slopes have been preferred especially steep slopes because they guide the surface runoff towards the hillside rather than down the slope. Inward sloping terraces prevent soil erosion with water run-off and also useful in impounding water for paddy cultivation. Farmers are encouraged to cover at least 2/3 of the terraces with vegetative boundaries that would also provide fodder for livestock. Terrace repair and Vegetative field boundary has been done over 18,357 cum area covering 22 percent of total project target of 88514 Cum.

iii) Bio-composting & Vermicomposting:

UDWDP envisaged to promote bio-composting technique to make farmers self-sufficient in terms of on-farm management of plant nutrients. The technique is simple enough and low-cost to make compost. It does not involve much labour and technical skill as compared to other techniques. However, the recommended practice of alternate layering of cow dung, biomass and soil in the pit is not fully practiced as it is perceived to be labour intensive work.

The construction of compost tank has been replicated in considerable numbers in the study villages, where cow dung is available and villagers see the technique efficient enough to decompose in less time and maintain hygiene around the house. Under Horticulture, 432 farmers (44 percent) have adopted Bio-compost and 72 farmers (9 percent) have adopted vermicompost production for their fields. Some farmers are also producing excess bio-compost and vermicompost for sale. As of March 2019, 14114.25 cu metric tonnes of vermicompost is annually produced in the units established through Gramya II.

iv) High Value crops mini-kit:

High Value crops mini-kit has been distributed for 21.15 Ha (7 percent of target) and farmers have adapted to the recommended crops including medicinal plants, aromatics, flowers, spices such as echinacea, kutki, kala jeera, marigold, etc. along with the recommended package of practices and bio fertilizer input provided as part of the minikits, which contains seed input, bio-fertilizer and training on the PoP as per each crop.

v) Homestead plantation (250 Plants):

Homestead plantations are mix of fruit trees, and trees for fodder and fuel. A typical homestead plantation unit consists supply of plants and other inputs and services. The survival rate of these plantations is better as farmers live close to the plantation enabling better management of pests and diseases resulting in good survival and productivity rates Homestead plantation has been undertaken in 1312 Ha covering about 76 percent of the total project target. Plantation of fruit trees like *Amla* (Indian Gooseberry), *Harad* (*Chebolic myrobalan*), *Sehtoot* (Mulberry) along with multipurpose (fodder and fuelwood) trees such as Banj Oak (*Quercus leucotrichophora*), Bheemal (*Grewia optiva*), Khaural (*Bauhinia variegasa*), Manipuri Oak, Bakain (*Melia azedarach*), Khair (*Acacia catechu*), Angu (*Fraxinus micrantha*), etc. is being done under this intervention. Farmers are provided quality seedlings or assistance in procuring them through local certified nurseries.

vi) Orchard Development (250 plant/ha.):

Fruit crops have immense potential for diversification of income sources and in reducing risk in other cash crop based farm-economy. Major fruits grown in Uttarakhand are Mango, Guava, Litchi, Apple, Pear, Peach, Plum, Walnut, Apricot, and Citrus. However, Pomegranate, Kiwi, Pecan nut, Strawberry, Raspberry are gaining popularity in recent years. The quality and productivity of these fruits are low owing to poor management practices. Since these fruits are being introduced recently, proper cultivation practices are not followed for them. The orchards are planted with seedlings procured locally and grown without proper nutrient management or management of pests and diseases. The already low productivity of local varieties is further lowered due to losses caused by pest and disease. The project thus envisaged specific interventions to improve the quality and productivity of fruit orchards for diversification and risk reduction. The interventions include assistance for procuring good quality fruit saplings (including financial), technical

guidance for planting, digging of specific pit size, plastic mulching material and insect/pest and disease management.

Under these plantations, Orchard development 1879 Ha has been covered accounting for 6 percent over and above the total project target of 1777 Ha

vii) Poly tunnel & Poly house:

UDWDP II is providing Polytunnels as one of the interventions to promote good quality seedling through protected nursery for vegetables and fruits crops. Poly tunnels are supplied at 100 percent subsidy. It includes the standard polytunnel with a wooden frame. These are used to raise plant nurseries, protect the germinating seedlings from frost, rain, and excess sun and also from pest and diseases. Poly tunnels significantly reduce the damage to the young seedlings from extreme weather events, pest and diseases and cattle trespassing. Poly tunnels were distributed widely across the project beneficiaries owing to its ease of use and opportunity to produce good quality seedlings Farmers showed a lot of interest as it was simple to use and within short period of time gives appropriate benefits. The beneficiary farmers have not only raised the disease free, quality seedlings and plantlets of horticultural crops for themselves but also sold the surplus seedlings to other interested farmers in the vicinity. Good quality seedling is the important first step to get good crop yields and thus poly tunnels have good positive impacts in increasing the productivity and reducing the loss.

Polyhouse unit consists of a poly house either with wooden, aluminium or steel frame. Farmers use polyhouses to produce high value vegetable crops under protected cultivation. The yield from polyhouses is observed to be double for many vegetable crops. The produce from protected cultivation is also of high quality and free of pest and diseases. Poly houses are also giving farmers the opportunity to produce vegetables in the off season and thus fetching higher price contributing to the overall raise in the farmer's income. Vegetables such as off-season peas, cauliflower, cabbage grown in rainy season along with tomatoes and ginger are being cultivated in the polyhouse. The polyhouse structures promoted by the project have also enabled the beneficiary farmers to cultivate high value horticulture crops like broccoli, purple cabbage, coloured capsicum and flowers such as liliun, orchids, etc. under protected cultivation.

The progress achieved in Poly house and Poly tunnels intervention is over and above the targets set for end of project and progress is 122 percent and 125 percent for poly house and poly tunnels respectively.

Table 56: Project Progress of Agriculture & Horticulture demonstrations				
Component Activity	Unit	End Project Target	Progress till Mid Term	Progress (%)
Demo. of High Yielding agric. crops (0.2 ha. For rainfed ag)	No.	14300	16367	114
Adoption support for High yielding agric. crops (0.06 ha for rainfed area)	farmer	50500	42395	84
Demonstration for high yielding vegetable crops (0.08 ha. for irrigated area)	No.	18950	25817	136
Seeds and Seedlings (High value crop demonstration)	Ha.	NA*	1062	-
Seeds and Seedlings (Orchard Cluster Development)	Ha.	NA*	565	-

Vermi compost Demonstration	No.	NA*	4545	-
Improved agriculture/horticulture implements	LS	NA*	125	-

*It is treated as lumpsum

viii) Demonstration of High Yielding agriculture crops (0.2 Ha For rainfed ag):

Demonstration of High Yielding agriculture crops (0.2 Ha For rainfed agriculture) and adoption support for High yielding agriculture crops (0.06 Ha for rainfed area) was undertaken in the target area. Demonstration of package of practices for Cereal crops (Maize, Wheat, Rice), Spice Crops (Ginger, Turmeric, Onion, Garlic), Nutri Crops (Finger Millet, Barnyard Millet (Madera, Jhangora), Amaranthus (Ramdana)), Oilseed crops (Mustard (Sarson) /Rapeseed), Pulse crop (Lentils (Masoor), Black Soybean, Horse gram (gehat) is being done under this intervention.

Table 57: Crop wise demo and adoption of different divisions			
Crop	Major growing divisions	No. of Divisions	Area (Ha.)
Rice	Almora, PMU, Bageshwar, Pauri, Pithoragarh,	5	113.28
Wheat	Almora, Rudraprayag, PMU, Bageshwar, Vikasnagar, Pauri, Pithoragarh, Tehri	8	632.02
Finger millet	Almora, Rudraprayag, PMU, Bageshwar, Vikasnagar, Pauri, Pithoragarh	7	269.18
Soybean	Pauri, Pithoragarh, Rudraprayag	3	31.86
Maize	Bageshwar, Vikasnagar, Pauri, Pithoragarh, Tehri, Almora	6	195.5
Barnyard millet	Almora, Pithoragarh, Vikasnagar, Tehri, Rudraprayag	5	128.74
Amaranthus	Almora, Pithoragarh, Tehri, Rudraprayag, Vikasnagar	5	97.28
Pigeon pea	Pauri, PMU	2	20.42
Black gram	Bageshwar, Pithoragarh, Rudraprayag, Vikasnagar, Pauri, Tehri, PMU	7	159.5
Gram	Vikasnagar, Pithoragarh, PMU	3	23
Horse gram	Almora, Vikasnagar	2	32.12
Lentil	Almora, Pithoragarh, Vikasnagar, Tehri, Pauri, PMU	6	142.88
Mustard	Almora, Pithoragarh, Rudraprayag, Tehri, Pauri	5	247.8
Rajma	PMU	1	6
Sorghum (Chari)	Almora	1	3.9
Til	Tehri	1	19.8
Wheat	Almora, Bageshwar, Pithoragarh, Vikasnagar, Pauri, Tehri, Rudraprayag, PMU	8	632.02
TOTAL			2123.28

Total of 16367 demonstrations for high yielding Agriculture crops have been conducted covering 2123.28 Ha till March, 2019. Maximum productivity under high yielding agriculture crop demonstrations reported is of Oilseeds and Pulses having 18.95 percent while Nutri Crops are having lowest productivity increase at 13.6 percent.

The impact of introducing HYV seeds of cereals, pulses and millets is much greater in all the demonstration plots in terms of productivity improvement. It was achieved through proper crop husbandry, nutrient management with integrated use of FYM, Vermicompost and Green manure. Adoption of other improved farming practices like seed treatment, line sowing etc. has also helped further in harnessing the genetic potentials of HYV in enhanced productivity in the demonstration plots. Traditionally, for growing cereals and pulses, farmers plough their field two to three times before and use broadcasting method of sowing. GRAMYA II introduced the practice of line sowing, seed treatment and mulching which has been greatly beneficial to the farmers. More than half of the farmers in the area have adopted one or multiple of these technologies and gained benefit. As discussed under Intermediate Indicator 5, seed treatment (followed by 71.5% farmers), Bio-compost (followed by 50.5% of farmers) and Mulching (followed by 38.3% of the farmers) are the most popular practices.

ix) Adoption support for High yielding agriculture crops (0.06 Ha for rainfed area):

UDWDP II promotes HYV of agricultural crops (cereal, pulses, millets etc.) and provides adoption support to increase yield through high yielding and climate resilient agricultural crop seeds with an aim to convert the subsistence level hill agriculture to sustainable and profitable one under rain-fed condition. The package under this component includes seeds, package of practices training and support for the select crops for an area of 600 square meters. Adoption support for High yielding agriculture crops has been provided to 42,395 farmers.

x) Demonstration for high yielding vegetable crops (0.08 Ha for irrigated area):

A total of 25,817 demonstrations were conducted covering in area about 2056.4 Ha till March, 2019. Overall productivity of all vegetable crops stood at 103.75 Qtls/Ha during 2018-19 against the baseline productivity of 80.85 Qtls/Ha; while increase in Spice crops productivity was 77 Qtls/Ha during 2018-19 against the baseline productivity of 57.04 Qtls/Ha. The percentage increase in productivity of vegetable crops is between 13 and 50% and that for spice crops is between 16 and 51 %.

In order to sustain the high vegetable production achieved across the project locations, beneficiary farmers are provided with the facilities for the organic manure production, liquid fertilizers, biofertilizers and other pest and disease control agents, both chemical and organic in origin for proper nutrient and pests and disease management of the crops under Integrated Nutrient and Integrated Pest Management. INM is an important intervention that aims to correct the imbalanced use of fertilizers through regular soil testing and implementing appropriate recommendations.

Excessive and continuous use of inorganic pesticides has on one hand resulted in immunity and resistance of pests to some pesticides and on the other excessive residues of pesticides in the produce, polluting ground water and streams. IPM plays a vital role in reducing the water pollution, environmental hazards and reduce the risk to human health and the environment. Apart from chemical pesticides and biological control agents, yellow sticky traps and solar powered light traps are also used by more than 30% of the farmers for the physical control of the insect pests.

Adoption of climate resilient practices like application of organic manure, seed treatment, application of fertilisers based on soil test based recommendations, line sowing and proper management of plant

populations, mulching, diversified farming, proper mechanization, life-saving irrigation etc. has significantly increased the yield and productivity of the high value vegetable and other horticultural crops across all the study villages. As discussed under Intermediate Indicator 5, more than 65% of the farmers in the project area are utilising at least 5 of the demonstrated technologies. These practices have helped in conserving the precious natural resources, especially soil and water.

xi) Seeds and Seedlings (High value crop demonstration):

For production of quality high value vegetable crops, good quality seedlings are essential. Demonstration of raising seed and seedlings of high value crops, especially off-season vegetables under protected poly tunnel on raised has encouraged the farmers to raise good quality seedlings for large scale cultivation of high value crops for better economic returns as well as gaining additional income from distributing the surplus seedlings to the fellow farmers.

Additionally, certified seed production is also being undertaken and Jagnath Beej Utpadak Sangh- an Innovative endeavour of farmers of Dhauladevi block produced 118.45 Qtls seed of Finger millet, Amaranthus, Horse gram, sorghum and Rice in rain fed condition during 2018-19. In 2018-19, 25 Farmers and 240 associate farmers of Dehradun division registered with U.K Seeds and TDC, produced 30 Qtls of Wheat (variety Hs 507) seed. Sixteen Farmers of Bageshwar division registered with UPL Advanta Seed Company and produced total of 25.6 Qtls of Knol-khol seed. A total of 174 Qtls of certified Seed has been produced by WMD.

xii) Vermi composting demonstration:

This technique has generated considerable enthusiasm and adoption in more or less similar manner in all the study villages. The project has conducted 4545 demonstrations for vermicompost until March 2019 and it is expected that this technique would be utilized even after the project completion. The reasons of adoption are as follows.

- The quality of compost is very high as compared to that of other composting techniques
- Less labour intensive
- Simple and low-cost technique of easy in-house breeding of earthworm
- Becoming a source of income by sale of surplus earthworms and vermicompost.
- Suitable for use in kitchen gardening, vegetable nursery, and commercial vegetable crops.

Success Story 6: Transforming lives through Integrated Agricultural Technique

Beneficiary: Mr. Ranjeet Singh

Location: Tok Dhaksaari, village Sindhwaal, Raipur Block in Dehradun

There are total of 8 families in this *Tok* and it is connected to the rest of the outer area through an undeveloped road which gets damaged every year in the rainy season by Bidlanaa River thereby isolating it from the rest of the world for considerable period. Mr. Ranjeet Singh and other families are largely dependent on farming for their survival. This tok had facility of only drinking water source before the initiation of the scheme. The water from hill springs and poor water management were big hindrances to dependable agricultural development of the area. Farmers were able to grow crops like Red-kidney beans, Wheat or other rainy-season crops like onion, garlic, gourds, etc. only during the monsoon.



As Gramya-II was inaugurated in July 2014, Mr. Ranjeet Singh actively contributed in the evaluation and planning of the scheme. He proposed to conserve and collect the water from a water-source located at 1 km from the village. The village assembly office bearers readily agreed to his idea and included it in the Village catchment Scheme. Along with the assistance of the villagers, the village assembly constructed a chamber at the water source and laid a pipeline of approximately 1000 meters to divert water for irrigation of the fields. Also, a 1500-litres capacity

irrigation tank was constructed to further benefit the farmers. Mr. Ranjeet Singh and other farmers are properly maintaining and up keeping this irrigation tank and availing irrigation facility through users' group and Farmers' Interested Group (FIGs).

Mr. Ranjeet Singh is an active member of the village and has participated various trainings, workshops and educational tours conducted within and outside the state from time-to-time. This widened his awareness to realize the benefits of advanced agricultural techniques. With the experience gained from these trainings he also encourages other local farmers to start growing off-season vegetables. Acting as a bridge between the villagers and the scheme officials, he made possible the construction of a poly house, vermi-compost pit and rain water collection tank.



On his request, Uttarakhand's famous brand ambassador, Mushroom lady Ms. Divya Rawat gave a 3-day training course to the villagers on the mushroom production which eventually led to the formation of mushroom unit and production of high-quality mushrooms in the village.

Gramya II with active participation of local farmers has helped in tok Dhaksaari, village Sindhwaal to increase livelihood options. Farmers in the village now have the opportunity and infrastructure to benefit from Vermi-compost for soil treatment, cultivating vegetables, Napier production for cattle, Mushroom production, new hybrid cattle, poultry, goat rearing to name a few.

4.3.1.5 Beneficiary and Community response to Interventions

i) Demonstration of High Yielding agriculture crops (0.2 Ha For rainfed ag):

As the study was conducted during Rabi season, mostly wheat crop was observed in the field. Farmers of the demonstration farms were very convinced about the benefit of the recommended techniques because of the following reasons:

- The requisite quantity of seed in line sowing method is 20-30 percent lower than that of the conventional practice.

- The germination percentage of the crop increased significantly. This made pest and disease management, nutrient management, and application of plant protection chemicals easy.
- The intensity of Phalaris minor weed in wheat was found to be below the threshold level thus saving labour and time.
- Decrease in cost of wheat production because of considerable decrease in labour requirement in various cultural operations such as weeding, watering, and intercultural operations.
- There was comparatively less infestation of pests and diseases in the demonstration plot as seed treatment was followed.
- Significant increase in yield of wheat was observed in line sowing method.

ii) Demonstration for high yielding vegetable crops (0.08 Ha for irrigated area):

Majority of the beneficiary farmers of demonstration plots have practiced nutrient management recommendations as per the Soil Test Report provided for growing vegetable crops. •Azotobacter (AZT), Azospirillum (ASP) and Phosphate solubilizing bacteria are some of the bio fertilizers used in the demonstrations, along with Use of Organic Manure (Vermi compost, Neem Cake, Dhanzyme etc.), and IPM & INM interventions (Yellow traps, Solar light traps, VL Kurmula Trap, Trichoderma, Pseudomonas, Foliar spray of NPK, Zymes. Farmers involved in INM in the study villages have improved their understanding regarding type/number of plants nutrients and their role in various stages of crop growth; role and importance of soil testing and process of sampling and labelling of soil samples and the impact of imbalanced fertilizer use on soil health, fertility, and fertilizer use efficiency.

Experiences of farmers engaged in INM of high yielding vegetables in study villages generally indicates that INM entails various constraints to be effectively managed by the groups or individual in the future.

- Farmers in the study villages reported that INM practice in vegetable production has lowered the fertilizer usage by 30-40 percent and thus has reduced the production cost of crops.
- Most of the farmers in study villages expressed their doubt about the logistics and practicalities of regular soil testing for various crops in myriad hill conditions after the project withdrawal.

The IPM practice at demonstration sites in the study villages has increased awareness level in following terms:

- Negative impact of inorganic pesticides on soil, plant, human health as well as on farmer-friendly insects.
- Relationship of farmer friendly insects with crop health and vital characteristics to identify farmer friendly and harmful insects.
- Safe usage techniques and proper insecticides to be used for different pest and insects in various crops.
- Benefits of various seed treatment techniques.
- Reduction in use of banned inorganic insecticides for pest control.
- Use of pesticides only after pest infestations has crossed the threshold level in crop.

iii) Adoption support for High yielding agriculture crops (0.06 Ha for rainfed area):

In study villages, high yielding seeds of cereal, pulses and millets have shown mixed results.

- In most of the cases farmers have given credit to good quality seed for the increase in the yield of the crops grown. The farmers recognize the benefits of HYVs in terms of increased shelf life, uniformity in size and colour of the crop and increased yield.
- It was also observed that many of the farmers were unsure of their exact land holdings and therefore the seed input provided as per recommended rates was in some cases lower than requirement.
- Only about 10 -15 % of the farmers have adopted INM and IPM techniques demonstrated as these are new techniques. More focus could be given on promoting the mechanical methods such as sticky traps, light traps along with introduction of pheromone lure traps, barrier traps, bait traps etc.

iv) Bio-composting/Vermicomposting:

Beneficiary farmers of study villages perceived that Bio-compost pits and Vermicomposting are most promising technique that is being followed and adopted gradually by the farming community. Bio-composting techniques has facilitated transition towards organic farming by providing promising alternative against chemical fertilizers. Almost all farmers interviewed in the study villages, have stopped using the chemical fertilizers, except for few who use both, chemical fertilizer as well as the compost. In these villages farmers now prefer to purchase compost rather than chemical fertilizers.

The feedback from the beneficiary farmers indicated Increased awareness about long term impact of organic manure vis-à-vis reckless use of chemical fertilizers on soil fertility; Increase in knowledge and practices to use biodegradable wastes such as agricultural wastes, uneconomic shrubs, grasses, and leaf litters etc. for bio-composting has enhanced both the quantity and quality of compost. Farmers especially involved with Vermiculture and Vermicomposting demonstration have started producing at a large scale to create income generation avenue.

v) Seeds and Seedlings (High value crop demonstration):

This activity has helped reduce the wastage of small and expensive high yielding seeds due to better care in a nursery. Farmers have adopted this practice due to the following advantages:

- The germination per cent was found much higher in nursery beds as compared to direct sown crops.
- Due to small nursery area, seedlings were managed in a better way with minimum care and cost.
- Better and uniform crop growth obtained in the main field with higher survival chances by raising vigorous and healthy seedlings in a nursery for transplanting.
- It helped reduce crop duration in the main field by at least a month, which saved both land and labour.
- Insects, diseases, and weeds were better controlled in nursery condition.
- Nursery raising has reduced the overall crop period and favours early maturity.

vi) Homestead Plantation (250 plants):

Marginal farmers have adopted Homestead Plantation due to its feasibility for small land areas. Hills have very low land ownership and homesteads give high productivity with minimum cost in a small area.

Another reason many farmers have adopted Homestead plantations is because they provide variety of produce in a small area of land thus helping in covering fuel, fodder as well as nutrition requirements of the farmer family. Alongside some farmers have also started producing excess vegetables for sale that will generate supplemental income by selling in local markets.

The data from the Farmers Federations shows that farmers have marketed above 31% of their total produce (fresh, graded, processed). Additionally, some other farmers have also sold their produce in small quantities in local markets.

Table 58: Produce marketed by FIGs		
Name of Division	Total volume of produce by all FIG	Produce marketed in (Qtls.)
Almora	522.7	403.3
Bageshwar	1363.0	458.3
Pithoragarh	680.0	507.2
Thatyur	2767.5	2687.1
Dehradun	8985.0	395.0
TOTAL	14318.2	4450.9

vii) Orchard Development (250 plant/ha.):

In the sampled villages, UDWDP II took significant efforts to motivate farmers to adopt and expand the area under fruit orchards. The plantation of improved variety/tissue cultured saplings of Mango, Litchi, Citrus, Pomegranate, Walnut, Peach, Pear, Apple, Cinnamon etc. has made efficient use of barren lands to protect it from further degradation and also provided option of livelihood for the local populace. About 1043.05 Ha of previously barren land has now been brought under orchard cultivation in 479 villages through Farmer's Interest Groups (FIGs). To get assured marketable yield, cluster approach has been adopted under Project.

Success Story 7: Pomegranate Plantation

Beneficiary: Mashrash FIG: Rishikesh Devta Ichukh Krishak Samuh

Location: Gram Panchayat Mashrash, Revenue Village, Division Dehradun

A total of 29 families are living in the village, with a total population of 370. Traditionally the village was into cultivation of maize which has a good market in Vikasnagar and Dehradun. Due to wild bores and monkey menace plus absence of labour to cultivate the fields, the agriculture fields at a distance from the village were left barren. The village is also facing a migration problem, majority of youth have moved to nearby cities for employment or education purpose. This led to much of the land being left fallow with no cultivation. These fields were covered with bushes and wild grass for the past 7 – 8 years. Under Gramya-II a consolidated area of about 5 Ha was planted with pomegranate trees after collective decision of the members of FIG. The plantation is one year old and growing well. The plant mortality rate was around 10 percent. New plants have been planted replacing the dead ones. It is assumed by the beneficiaries that a long-term source of sustainable income from fallow land has been provided. The fallow lands will be economically valuable lands in next 4 years' time along with an increase in biomass.

viii) Poly House & Poly Tunnel:

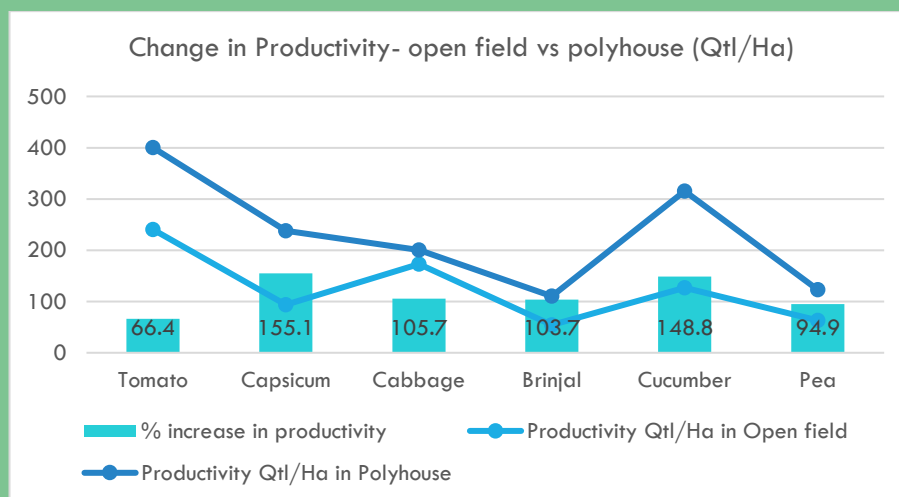
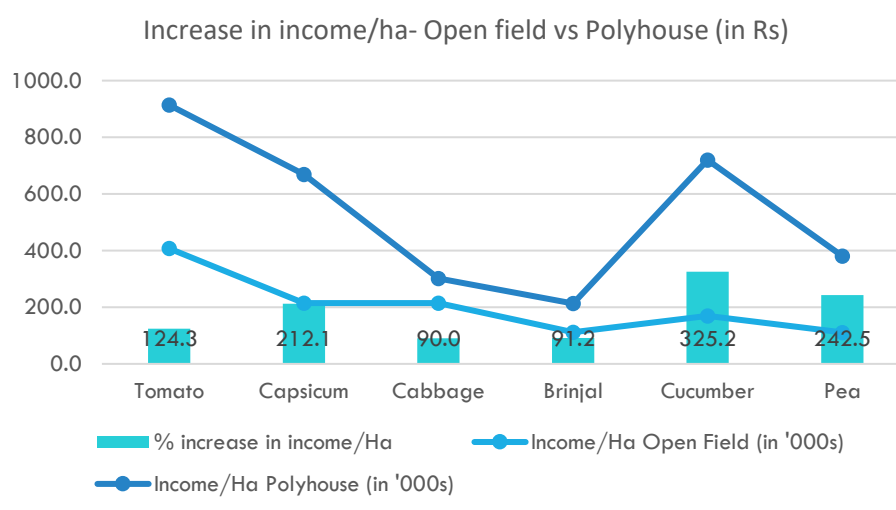
All polyhouses in the study villages found to be naturally ventilated without micro irrigation facility. Protected cultivation under Polyhouse is gaining importance in the project's targeted villages since it enables:

- Off Season cultivation of vegetables/fruits which enables the farmer to have a better price realization.
- Extended life cycle of the crops.
- Check damages or losses from Insect, diseases & adverse weather conditions and more crops
- High value vegetable and other horticultural crops like Cucumber, Tomato, cabbage, capsicum, Zucchini, and flowers (lilium) are being cultivated in polyhouse which provide high returns.

COMPARISON BETWEEN PRODUCTION ADVANTAGES IN CLOSED ENVIRONMENT (POLYHOUSE) VERSUS OPEN FIELD

The following analysis shows an overview of crop production in PolyHouse vs open field cultivation across GRAMYA II area. Polyhouse production has been analysed in comparison with open field production of the same crops to assess the benefits that farmers have received by adoption of PolyHouse for vegetable cultivation.

Table 59: Comparison of productivity Polyhouse Vs open field cultivation									
Crop	Area (Ha)	Total Production (Qtls)	Productivity (Qtls/Ha)	Sale Volume (Qtls)	Sale Value (Rs)	Income per Ha	Sale Price/ Qtls (Rs)	% increase in productivity	% increase in income of farmer/Ha
Open Field cultivation									
Tomato	34.50	6560.4	190.1	5446.4	10479364	303708	1924	-	-
Capsicum	34.49	2967.9	86.0	2512.4	6606292	191516	2629	-	-
Cabbage	27.55	4598.8	166.9	3917.8	5763945	209192	1471	-	-
Brinjal	1.20	65.0	54.2	57.5	133700	111417	2326	-	-
Cucumber	7.74	981.7	126.8	798.7	1309738	169204	1640	-	-
Pea	28.68	1807.1	63.0	1551.1	3188480	111162	2056	-	-
PolyHouse cultivation									
Tomato	3.01	1127.8	375.2	1066.6	2531423	842207	2373	97.4	177.3
Capsicum	1.45	336.9	231.8	319.1	948380	652390	2972	169.4	240.6
Cabbage	1.80	386.3	214.2	347.8	513000	284463	1475	28.4	36.0
Brinjal	0.31	33.8	110.3	28.0	65200	213072	2329	103.7	91.2
Cucumber	0.96	303.1	315.6	292.2	691125	719472	2365	148.8	325.2
Pea	0.65	80.1	122.8	77.1	248320	380742	3222	94.9	242.5
Average								107.1	185.47



- Crops like Capsicum and Cucumber have shown 150% more productivity in PolyHouse cultivation as compared to other crops.
- Tomato has also been widely cultivated in the Polyhouses and some units have achieved about more than 500 Qtls/ha productivity in tomato cultivated in PolyHouse. The price received for tomatoes in PolyHouse is also higher because of less damage and better looking fruit.
- Overall, farmers have been able to increase the productivity by an average 107% across the 6 vegetable crops analysed above as compared to their production in open fields. With respect to income, farmers have received 185% more per Ha as compared to that of open field production owing to more yield, less damage/loss and better quality of produce.

ix) Improved agriculture/horticulture implements:

Project has provided improved agriculture/horticulture machines, tools and implements to FIG/individual in some places, which are being used effectively. Beneficiaries have appreciated this input considerably. There is need to promote small sized gender friendly tools that are appropriate for use in the hilly regions.

Success Story 8: Bringing Fallow Land under Cultivation

Beneficiary Name: Jagat Singh Chauhan

Location: Gaon Khet, Village Bhediana, District Dehradun

Land lying barren (approximately 3 ha) for past 15-20 years was brought under cultivation with the support from Gramya Project. An agreement with the villagers was signed for cultivating the land for a minimum 5 years. Expenditure of 1.25 lakh was done in making the land suitable for cultivation by 5 farmers. The objective was to utilize the fallow land as cultivable land was unavailable in the village, irrigation facilities were not available and connectivity with the market was difficult due to bad road conditions. Moreover, the farmer group also showed interest in cultivation of off-season vegetables in the area.

Gramya Project provided the farmers with pipeline for irrigation, sprayers (battery operated -electricity charged), constructed an irrigation tank, provided fertilizers, pesticides (under IPM component), plastic crates, kulta crates, sprinklers, bamboo staking apart from providing seeds of off-season vegetables viz; tomato, brinjal, capsicum, zucchini/summer squash, and cucumber. Polyhouse, poly tunnels (3x1 m tunnels): for nursery plantation and fruit trees: Pomegranates (100 plants) and lemon (25) procured from Horticulture department. Napier grass slips for approximately 1 Ha of land.

Additionally, the farmers have planted bamboo at the edges of the reclaimed land for obtaining stakes for growing vegetable crops like tomatoes and also to avoid soil erosion. Vegetables cultivated were sold in the nearby markets of Kempty, Mussoorie and Dehradun markets. Earnings of approximately INR 6, 00,000/- was reported for one season. Plans for peas cultivation is there for the upcoming season.





Field Level Impact of Demonstrations and adoption by farmers

- Crop Rotation is being followed by 21.4 percent farmers in irrigated areas and 51.6 percent farmers in Un-irrigated area. High rates of adoption are seen in Tehri district (Irrigated and Un-irrigated) and Rudraprayag district (Un-irrigated).

Area of Enquiry	Project (%)		Control (%)	
	Yes	No	Yes	No
Practicing Crop rotation (Irrigated Area)	21.4	78.6	14.9	85.1
Practicing Crop rotation (Rainfed Area)	51.6	48.4	52.8	47.2

- Majority of the farmers use Field Irrigation or irrigation channels followed by HDPE pipes. Few farmers use Drip (3 percent) and Sprinkler irrigation (0.4).

Irrigation Technology Used	Project (%)	Control (%)
Drip	3.0	0.6
Sprinkler	0.4	0.4
HDPE pipes	28.3	16.7
Field Irrigation	67.9	56.1
Others	0.5	26.3

- With respect to area in which bio-compost has been used, over 70% farmers have used it in an area of over 2 Nali (ranging from 2 to 10 Nali) The application area for vermi-compost is also at par and 67.3 percent farmers are using vermicompost in the area ranging from 2 to 10 Nali.

Area of application	Bio-compost		Vermi compost	
	Project (%)	Control (%)	Project (%)	Control (%)
Less than 2 Nali	36.0	12.6	28.9	32.7
2 to 5 Nali	44.3	57.9	52.5	47.1
5 to 10 Nali	14.1	19.2	12.4	12.5
More than 10 Nali	5.6	10.3	6.2	7.7

Field level Feedback on Activities demonstrated for High Yielding agricultural crops

Field level demonstrations have been conducted every year for different crops according to the region. The adoption rates of these crops on the subsequent years is also significant corroborating the success of the demonstration.

- The feedback from respondents in the field shows that over 90 percent of the farmers thought the selection of farmers/group of farmers, plot selection, and organisation of the field days was also good.
- Soil testing and calculation for fertilizer use was a good initiative according to 95.7 percent respondents and average according to 4.3 percent.
- Of the total respondents, 87 percent favoured adoption of demonstrated technologies and 13 percent said they were only average.
- Evaluating success of demonstrations through ok cards was a good initiative according to 55.2 percent, average according to 42.9 percent and only 1.80 percent said it was poor.
- Overall 87 percent respondents were Satisfied with demonstration of the agricultural crops and respondents also suggested improvements in the intervention with respect to quality of seeds, timely distribution of seeds along with availability of seeds and also solutions to help in reducing the crop damage caused by Wild animals on the farms.

Table 63: Response of Farmers on demonstration for High Yielding agricultural crops

Area of Enquiry	Good (%)	Average (%)
Farmer and group of farmers chosen for field demonstrations	91.6	8.4
Selection of plots	91.6	8.4
Field day/Farmers organized around the demonstration plot	91.6	8.4
Soil Testing and calculation for Fertilizer	95.7	4.3
Second field day and discussion Organizing the demonstration	67.9	32.1
Last field day at the time of crop cutting	76.6	23.4
Training and field day during the demonstration	85.3	14.7
Adoption of demonstrated technologies	87.0	13.0
Evaluating success of demonstrations through ok cards	55.2	42.9
Satisfied with demonstration of the agricultural crop	87.0	13.0
Improvement suggestion		
Quality of seeds needs to be improved		20.5
Timely distribution of seeds along with availability of seeds		18.2
Wild animals are hurdle in farming; solution is needed		61.4

Field level Feedback on Benefits of diversification of vegetable cultivation

Along with Agriculture, demonstrations were also undertaken in Horticulture i.e. vegetable cultivation and demonstrations focused on the benefits of diversification into vegetable cultivation. Some of the important crops cultivated in the demonstration plots are Beans, Brinjal, Cabbage, Capsicum, Cauliflower, Cucumber, Garlic, Ginger, Lady Finger, Onion, Peas, Potato, Tomato and Turmeric. The demonstrations have helped increase the income of the farmers and the following are the field level observations for horticulture demonstrations.

- From the respondents, 63 percent respondents received additional income through high value vegetables cultivations and 37 percent said the income has only fairly increased.

- The diversification has also helped in increasing the Availability of vegetables for consumption in off season according to 71.2 percent respondents and 28.80 percent said it has only fairly increased.
- Of the total respondents, 71.20 percent respondents said they received increased price for off season vegetables and 28.80 percent received fairly increased price for the same.
- The respondents perceived that the Input support from project on technology and crop enhancement is increased according to 91.60 percent and fairly increased according to 8.4 percent respondents.

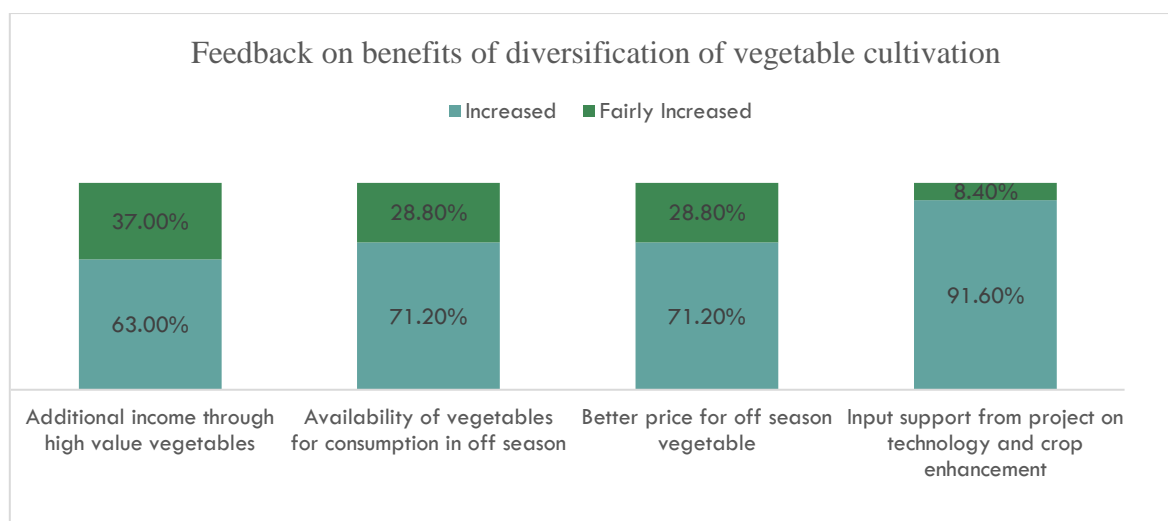


Figure 8: Benefits of diversification of vegetable cultivation

Area of Enquiry	Increased (%)	Fairly increased (%)
Additional income through high value vegetables	63.0	37.0
Availability of vegetables for consumption in off season	71.2	28.8
Better price for off season vegetable	71.2	28.8
Input support from project on technology and crop enhancement	91.6	8.4

Field level Feedback on Field demonstrations on Orchard Plantation

The field demonstrations of orchard plantation were carried out for Guava, Orange (Almora, Pauri, Tehri), Apple (Almora, Rudraprayag, Tehri), Keenu (Uttarkashi, Almora), Kiwi (Tehri, Uttarkashi), Pomegranate, Mango (Tehri, Uttarkashi, Almora).

- Of the total respondents surveyed, over 90% of the farmers said that the selection of farmers for the field demonstration, the selection of plots for demonstration, and organization of demonstrations was perceived good.
- The trainings conducted on field day were Good according to 84.50 percent respondents as well as promotion of adoption of the technologies by large number of farmers was demonstrated good according to 85.30 percent.

- Of the total respondents, 91.60 percent said the field demonstration were useful and most satisfied with the same.

Table 65: Farmers response on Orchard Plantation		
Area of Enquiry	Good (%)	Average (%)
Selection of group of farmers for field demo	96.5	3.5
Selection of plot	96.5	3.5
Organization of farmers around the demonstration plot	87.0	13.0
Organizing the demonstration	96.5	3.5
Training and field days	84.5	13.8
Promotion of adoption of the technologies by large number of farmers	85.3	14.7
Satisfied with demonstration of the fruit crops	91.6	8.4

Feedback on Demonstration of Poly houses

- Of the total respondents surveyed, 100 percent said the selection of farmers for the field demonstration of poly houses was good and 91.60 percent said that the selection of group of farmers for the field demonstrations was good and 8.4 percent said it was average.
- A total of 90.5 percent respondents said the construction of polyhouse was good and 9.5 percent said it was average.
- The Varieties selected for the polyhouse plantation were good according to 89.3 percent respondents and average according to 10.70 percent respondents.
- The demonstration organized was good according to 91.6 percent of the respondents and remaining 8.4 percent said it was average.
- The training day was good according to 89.30 percent respondents and 10.7 percent said it was average.
- Of the respondents, 91.6 percent said the Use of poly house for the purpose demonstrated was good and 8.4 percent found it to be only average.
- With respect to the adoption of the demonstrated technologies, 91.6 percent respondents said the polyhouse was a good intervention and 8.4 percent it was average.

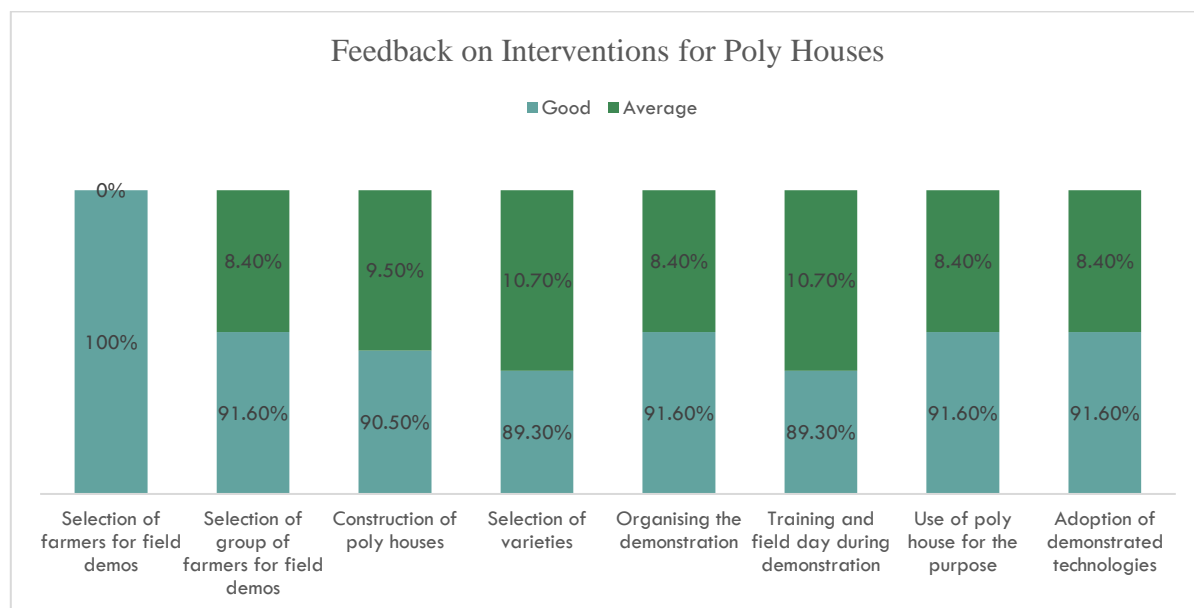


Figure 9: Intervention for poly houses

Table 66: Farmers response on Demonstration of Poly houses		
Area of Enquiry	Good (%)	Average (%)
Selection of farmers for field demos	100	0
Selection of group of farmers for field demos	91.6	8.4
Construction of poly houses	90.5	9.5
Selection of varieties	89.3	10.7
Organizing the demonstration	91.6	8.4
Training and field day during demonstration	89.3	10.7
Use of poly house for the purpose	91.6	8.4
Adoption of demonstrated technologies	91.6	8.4

Field level feedback on Homestead Plantation

The demonstration of Homestead plantation has been very successful and farmers have planted vegetable as well as spice crops. Most preference is given to crops such as Tomato, Garlic, Ginger, Peas and Potato due to their demand.

- The field level feedback for the Homestead Plantation activity shows that 100 percent of the respondents are satisfied with the demonstration of the Homestead plantation.
- The homestead plantation helped in making the vegetables available 6 months in the year in all the regions.
- According to the survey, the respondents earned average Rs 10,000 income through Interim sale of vegetables (per month).
- Almost 95 percent of the farmers who were chosen for the demonstrations in year 1 continued homestead plantation in the next year and 93 percent continued it until Year 4.

Table 67: Farmers response on Homestead Plantation	
Area of Enquiry	Response

Satisfied with demonstration of the Homestead plantation	Yes (100%)
Number of months vegetables are available	6
Income earned through Interim sale of vegetables (per month)	Rs 10000

4.3.2 Livestock and Animal Husbandry

Uttarakhand is well endowed with a variety of livestock: Cattle, Buffalo, Goat and Poultry. Cattle are the most popular and so the preponderant species. Cattle are mostly nondescript and have very low production efficiency, yielding about 1-1.5 litres of milk on an average. Large population and low productivity are the hallmark of livestock across all species in the hilly state.

UDWDP II has taken an integrated approach of livestock development, which includes controlled breeding, adequate feeding, and proper health care management in order to enhance the lifetime productivity of the livestock. Controlled breeding for the genetic improvement of non-descript, low producing cattle and buffaloes in the state and maximizing their lifetime production through scientific rearing is one of the most important interventions of the project. Under its livestock breeding program, the project supports the activities like:

- (i) Natural Breeding through establishing Natural Breeding Centre (NBC),
- (ii) Artificial Insemination through Para vet Centre, and
- (iii) Mass Artificial Insemination through convergence with Animal Husbandry Department.

4.3.2.1 Key Results

i) Project Progress under Livestock Breeding Program:

Table 68: Progress under Livestock Breeding Program				
Livestock Improvement	Unit	End Project Target	Progress till MTR	% Achievement
Natural Breeding Centres	No.	-	220	-
Natural Breeding Centres-Goat	No.	-	42	-
AI services (ordinary)	-	-	265	-
Para vet centres	No.	-	34	-
Mass AI services (sex sorted)	No.	-	1000	-
Veterinary camps	No.	-	662	-

ii) Project Progress under of Natural Breeding Centres (Milch animals & Goat):

Table 69: Progress under NBC			
Livestock Details	Total No. of coverings	Total no. of progenies	% Success Rate
Buffalo Bulls (Murrah)	5059	2885	57.0
Cow Bull (Red Sindhi)	240	136	56.7
Buck (Barbari, Sirohi, Beetal)	2262	1645	72.7

(The progeny is out of approx. 80 percent coverings in cows and buffaloes and approx. 90 percent in bucks)

Natural breeding is one of the preferred options for breed improvement by pairing of local non-descript milch (cattle and buffalo) animals with bulls of high genetic merit. The project has established Natural Breeding Centres (NBC) at strategic locations covering a cluster of 4-5 villages keeping in view the

breedable population in the area. For cattle breeding, cross bred bulls of Jersey, Holstein Friesian and Red Sindhi have been procured and distributed among the beneficiaries (Sandh Sevak) selected for running the NBC, while Murrah graded bulls have been provided for buffalo breeding. The bucks of Barbari and Sirohi breeds were distributed for breed improvement of local goats. All these NBCs are provided with a starter input including the bull shelter along with bearing the cost of transportation, insurance of the bull, and 5 bags of compounded feed along with 5 kg mineral mixture. Cow and buffalo bulls were procured under the guidance and in coordination with ULDB, while bucks were purchased directly from ICAR farm, Makdoom, Mathura.

The data from the GRAMYA II NBCs shows a success rate of 50-55 percent in cows and buffaloes and a success rate of 72 percent in natural breeding of goats. Natural breeding has advantage over AI in that it can reduce the need for heat detection, which is one of the biggest challenges in hill cattle and it has been perceived that it has increased the rate of conception considerably, (up to 60 percent as compared against 28-30 percent). It is expected that the improved female progenies born out of this arrangement would yield better and fetch more money to the farmers. This will be assessed in the upcoming reports.

The caretaker of NBCs, who have been selected by the villagers, levy a charge from the livestock owners for the covering which covers the cost of maintenance. This initiative has become a good income generation activity for the beneficiary farmers who are taking care of the bulls (Sandh Sevak), as it is evident from the records of one such NBC visited run by Shri Deevan Singh of village Ballayu, under Thall unit of Pithoragarh division. He charges Rs. 1500 for every calf born, Rs 200 at the time of coverage and rest Rs 1300 when calf is born. At the time of visit in March 2019, this NBC had so far, inseminated 85 buffalo and had a net saving of Rs. 54000 in 3 years.

Case study: Progeny Improvement in Goatry

Goat termed as “Poor Man’s Cow” is an integral part of livelihood for the marginal hill farmers. With open grazing in practice and with nearly negligible investment, it is chiefly reared for meat purpose. Farmers rear local breed which have low fecundity and high FCR in terms of weight gain. For increasing the productivity of existing population, introduction of improved breeds has been tried. In the year 2017-18, 13 Sirohi bucks were given to farmers and 121 progenies were obtained. In 2018-19 through Uttarakhand Sheep and Wool Development Board (USWDB) Dehradun, 13 Sirohi bucks have been purchased from Central Sheep and Wool Research Institute, Avikanagar (Rajasthan).

Apart from this, 84 Sirohi bucks and 170 female Sirohi goats have been purchased through USWDB, Dehradun so as to maintain the breed population. Under technical guidance of USWDB, these will be used

for breeding purpose within and outside project area of district and other districts of the state.



iii) Artificial Insemination (AI) Services:

The project undertakes rural extension services like AI and minor veterinary service for livestock development in comparatively inaccessible area and where the Animal Husbandry department is unable to provide the services regularly. These services are being provided by the help of Para vets, local educated (minimum 10th pass) and unemployed youth, who have been selected at GP level.

These Para vets were trained for four months in A.I. and minor veterinary services at U.L.D.B. training centre and were provided with AI & FA Kits through project fund after the successful completion of the training. These Para vets extend their services in a cluster of 15 to 20 villages, within a radius of 10-12 Km and charge Rs. 200 and Rs. 500, for covering of cattle and buffalo respectively. This intervention has given few local youths an opportunity to earn through providing AI and minor veterinary service in the community. Through Providing AI and minor veterinary Services these Para vets earn an average monthly income of Rs. 4500-5000.

x) Project Progress of Para vet Centre

Table 70: Progress of Para vet Centre

Livestock Details	Total No. of coverings	Total no. of progenies	% Success Rate
Buffaloes	1366	801	58.6
Cows	2784	1260	45.3

(The progeny is out of approx. 80 percent covering)

The progress of Artificial Insemination in 34 Para vet centres shows that out of 1366 coverings in Buffaloes, 801 progenies were born and out of 2784 coverings in cows, 1260 progenies were born showing a success rate of 45 -58 percent This intervention has started yielding improved breed of calves in the target area. Once these improved female calves are recruited in production group the animal owner would have additional income of about Rs. 1200 to Rs. 1500 per month per cow in terms of 6-8 times more milk, reduction in the age at first calving from 10-15 months, 4-6 months less dry period etc. in addition to the use of infrastructure facilities developed during the project period.

The rural extension services like heat detection, pregnancy diagnosis, vaccination, and other minor veterinary Services along with AI are expected to bring significant economic gains to the farmers. Timely

detection of heat and insemination at right time has resulted in decrease in service period and consequently shorter inter calving period. Timely diagnosis of pregnancy has reduced the maintenance cost by avoiding keeping non-pregnant animals over long periods of time. The money, feed, concentrate etc. is being judiciously used for animals with high productive returns.

However, the main constraints in improving the productivity of low yielding milch animals through breed improvement is the present low rate of conception at grassroots, which is only about 30 percent in some places and requires further improvement through improving the skill level of the para vets further.

xi) Mass Artificial Insemination in collaboration with Animal Husbandry Department:

Artificial insemination is an important tool to infuse new and improved genetics into the herd. Recent advances in oestrus synchronization protocols and fixed-time AI techniques increased the number of cows that can be bred during a shorter period of time, but if proper levels of nutrition, body condition and health are not maintained, the program is likely to fail. Improvement in facilities and management is essential before implementing an oestrus synchronization program.

The application of timed-AI can improve reproductive efficiency in dairy cattle. Production efficiency of livestock depends upon better reproductive efficiency- a prerequisite to better lifetime productivity. Poor reproductive efficiency among these local animals is the largest single cause of losses to the farmers and hence, dairy activity is still taken as an auxiliary chore rather than a profit-making enterprise.

Delayed puberty, late maturity, poor growth rate, lower body weight gain, pubertal anestrus, silent estrus, repeat breeding and postpartum anestrus are some of the physio-pathological states among these indigenous animals making them sub-fertile and lowering their reproductive status. Keeping the constraints in view the mass artificial insemination programs were started in the year 2017-18 in collaboration with the Department of Animal Husbandry in selected villages of Pauri division and model micro watershed Raipur. Following are the advantages of heat synchronization and mass insemination techniques-

- This technology ensures timely AI service in a group of animals in one single visit of expert inseminator.
- No need of proper heat detection by the cattle owner, which ultimately saves the expected losses which occurs due to error in heat detection.
- It reduces the losses due to anestrus & repeat breeding.
- Timely insemination decreases dry period.
- Improvement of the breeds by insemination with quality semen.
- Saving of time, fuel & skilled manpower.

Under the mass A.I. program of the project in convergence with Animal Husbandry department, a number of breedable animals in cluster are induced to heat by the process of heat synchronization and ovulation through hormonal therapy.

Table 71: Mass Artificial Insemination with ordinary semen			
Livestock Details	Total No. of coverings	Total no. of progenies	% Success Rate
Cattle	265	60 (M) 58 (F)	44.53

(The progeny is out of approx. 70 percent covering)

Mass AI with sex sorted semen has been done in 1000 cows across the project area. Of these, 7 progenies have been born until May 2019 and the remaining progress is yet to be assessed.

xii) Veterinary/Animal Health Camps:

Managing good health of livestock has direct bearing on the economic return from this sector. Therefore, animal health care activity is one of the components envisaged by the project for the enhancement of milk production that takes care by ensuring that farmers do not incur economic loss by want of health care service to their cattle holdings. The project has organized several health camps in the target areas with help of Animal Husbandry department with a view to enhance the milk production by providing better health management and veterinary services. Attempts have also been made for the reduction in infertility of the livestock and spreading of awareness among cattle owners about the best practices of cattle rearing like proper nutrition and vaccination against contagious diseases.

During the camp, vaccination of different diseases like foot and mouth disease, Black Quarter, Haemorrhagic septicaemia were done and sick animals were treated. Medicines, especially deworming drugs, and mineral mixture were also provided to the livestock owners for managing the health of their animals. The effect of health camps can be assessed from the increased milk production in the cattle as well as goats as shown in Table 52 below.

Table 72: Milk Productivity			
Milk Productivity	Before Intervention	After Intervention	Incremental difference
Average milk production all cows& Buffalo, Indigenous (in litres)	1.6	2.3	0.7
Average milk production all cows& Buffalo, high yielding variety (in litres)	NA*	6.49	6.49
Average milk production goats Indigenous (in litres)	0.5	1.0	0.5
Average milk production all goats high yielding variety (in litres)	NA*	1.5	1.5

*High yielding species of cattle and goats were not existing in the project area prior to intervention

xiii) Infrastructure Development

Table 73: Infrastructure Development				
Animal Management Program	Unit	End Project Target	Progress till MTR	% Achievement
Animal shelter /sheds	No.	6860	6863	100.0
Manger	No.	5685	4604	80.9
Animal Chari	No.	2757	2383	86.4

xiv) Stall Feeding (Manger) Program

Small-scale dairy farming under the stall-feeding management system has been promoted by the project as means of increasing farming system productivity in the area while at the same time ensuring environmental protection, especially protection of soil erosion from cattle grazing.

In order to encourage stall feeding, the project provides financial support to the beneficiary farmers to construct the mangers at their doorsteps. It was observed that Pithoragarh division has innovatively constructed the Mangers with the use of Fibre sheet and steel. This can be optimally used and can be placed anywhere as per the convenience because of its light weight. However, in Garhwal region the Mangers have been constructed mostly with concrete as per the prevailing norms of construction under Gramya II. So far, the project has constructed 4604 mangers against the total target of 5685 and already has achieved about 81 progress percentage.

Stall feeding has also helped control the unplanned breeding of their animals as farmers can observe their animals in heat properly and can inseminate them in time with better conception rate. This has also helped in proper health care management of the animals with greater economic returns. It has also helped the animal owner to save the precious lives their animals, which are always vulnerable to predator animals in the forest and falling from steep slope of the hills while grazing.

xv) Animal Shelter/Shed

Animal housing is required to protect the animals from inclement weather and predator animals in addition to providing clean, comfortable stay for good health of animals and for efficient management. The project has financially supported the beneficiary dairy farmers to construct the animal shelter of a size of 3.6 m (L) x 3.0 m (W) x 1.8 m (H) with proper ventilation window of 3 feet x 2 feet and ventilator of 1.5 feet x 1 feet have been provided in the sheds. The shed has also a soak pit of 2 feet x 2 feet outside the shed for proper disposal of urine and other wastes. Baring minor exceptions, the team observed that the construction of shed is as per the prescribed standards and quality. So far, the project has constructed 6863 sheds against the project target of 6860 with 100 % progress. Better care and management of animals under shelter has resulted in production of high-quality milk with remunerative price and better profit to the dairy farmer.

xvi) Animal Chari

The purpose of constructing Animal Chari is to provide clean and hygienic drinking water to the animals, mostly grazing outside. The project has constructed many such Chari of the dimension 2.50 m (L) x 0.70 m (W) x 0.60 m (H). These all Animal Chari are well connected to running water source, which appeared quite

clear and pure during the field visit. Project constructed 2383 Chari against the total project target of 2757 with 86 progress percentage at the strategic water scarce locations in order to save the precious animal life.

xvii) Fodder Production Program:

The program of livestock improvement can only be successful if green fodder is available in abundance. Shortage of feed and fodder supply is the greatest single factor in the low productive capacity of livestock production in the state. It has been demonstrated that production potential of crossbred animals can be exploited only if the availability of quality green fodder is maintained round the year. In order to increase the production of green fodder and to maintain its supply round the year the project has adopted the following two-pronged approach-

- **Fodder Mini-kit distribution** – The project has distributed fodder mini-kit for 2 Nali (0.04 ha) area in both Kharif and Rabi season. During Kharif Season, fodder mini kit contained the seeds of Maize varieties Jawahar, Vijay composite, Ganga, Lobiya varieties C.S- 88, C-14, Chari varieties Sirsa, T.L-1. During Rabi season, fodder mini-kit contained the seeds of Javi (Oats) varieties Kent, OS-6, 7, Berseem varieties Maskavi and Vardan.
- **Napier Crop Border plantation** – Under this activity the project has promoted the improved variety of Napier (hybrid Napier, IGFRI-7, 10 etc.) and the tufts were planted in the agriculture fields along the bunding and in common property barren and abandoned land, in the villages. The Grass planting materials were procured from the Forest Department. Nurseries, U.L.D.B. centre, KVK centres and Kisan Nurseries. The project has already planted Napier border in 299.2 Ha. Against the project target of 274.0 ha. and has achieved 109 percent progress in this component.

Table 74: Fodder production				
Fodder Production Programme	Unit	End Project Target	Progress till MTR	% Achievement
Fodder Mini-kit	No.	-	15527	-
Napier crop border plantation	Ha	274.0	299.2	109

By adopting the recommended plan of growing green fodder with the help of Fodder Mini-kit, the availability of nutritious green fodder has increased by 25-30 percent of the requirement. This has enabled the Improvement in quality fodder using fodder mini kits for last two seasons. Napier cultivation along the bunds as nonconventional forage production has been very effective intervention, especially in Pithoragarh division, which has helped the animal owners in compensating the fodder deficiency by 65-70 percent additionally. This reflects in the higher adoption of Napier grass plantation.

4.3.2.2 Community and Beneficiary Feedback

As is evident from the table given below that the beneficiary farmers under this program have reported about its effectiveness, wherein it has started delivering the extension services of AI and minor veterinary services including Pregnancy diagnosis at the doorstep of the farmers in proper time and at affordable costs.

Table 75: Community and Beneficiary Response on Paravet services	
Satisfied with the Para vet services	Response (%)
Satisfied	29.0
Somewhat Satisfied	71.0
Reasons	
Timely service	29.8
Affordable pricing	66.1
Can take care of most of animal health care issues	4.1
Satisfied with the animal health camps held	
Satisfied	38.9
Somewhat Satisfied	60.0
Not satisfied	1.1
Reasons	
Can take care of most of animal health care issues	76.6
Can provide referral support in case of non-treatment	23.4

i) Animal health camp

As reported, these camps have helped the livestock owner in keeping their animals free from internal and external parasites through the deworming program, which in turns have not only reduced the losses inflicted by these parasites but also helped in increasing the productivity of the animals.

Control and prophylaxis against contagious diseases has not only protected animal wealth but also helped in saving energy, time, and money in treating the affected animals. Treatment of Sub-fertile animals during the camps has helped enhance their reproductive efficiency, which is one of the important factors for determining the economics of livestock production. Poor reproductive efficiency is the largest single cause of losses in dairy sector.

Considering the importance of health camp, it is therefore, suggested that instead of organising it on periodic basis, animal health care should be a part of regular extension activities. The extension activities should cover regular health check-up, infertility diagnosis and treatment, aspects of animal nutrition and proper and timely vaccination against the diseases.

ii) Stall feeding

Table 76: Community Response on Stall-feeding Program	
Area of Enquiry	Yes (%)
Satisfied from the services	86.4
Women find it convenient now to provide fodder and take care of animals	87.3
Beneficiary find the chaff cutter & manger useful	
Very satisfied	54.2
Somewhat satisfied	34.7
Not satisfied	11.1

Majority of the beneficiary farmers have reported that with the use of mangers, fodder intake has increased considerably and has reduced the wastage of the precious fodder that they fetch from very difficult hilly terrain and thus save the labour. With stall feeding, farmers are now able to feed their animals as per the diet plan of the animals with the use of compounded cattle feed, which has increased the milk production due to proper nutrition.

The farmers realize that there is much reduced livestock pressure on the fragile land because of lesser extent of open grazing and the common property land which were denude, has started regenerating now. The impact of stall feeding as evident from the response of the respondents is elucidated in the table below which reflects that majority of the respondents articulated that there has been high impact of stall feeding.

Table 77: Impact of Stall Feeding Intervention	
Impact of Stall Feeding	Response (%)
No impact	25.5
Moderate	29.0
High	45.5

iii) Animal Shelter and Chari

The respondent beneficiary farmers have admitted that the proper animal housing has helped them safeguard their animals from environmental extremities and has also proved very useful in protecting the precious life of the animals from their predators, especially during night time in the villages around the forest area.

The provision of proper animal shelter would have contributed in the enhanced milk production because of improved health care management of the animals and less exposure of the animal to stressful conditions.

While interacting with the villagers, it was reported that the Animal Chari have been of great help in saving the precious lives of the animals from heat stress and dehydration, especially during summer months when water is scarce and rare. The activity needs further extension.

iv) Fodder Production

It was observed and as reported by the respondent farmers in the field that production potential of milch animals was exploited where there was Napier production maintained round the year in plenty. It has not only checked the drop in milk production during the lean season but has also increased overall productivity of the animals. However, project is not working on any alternative measures of fodder augmentation, especially in the area where Napier is not surviving well.

Before the project's intervention of fodder production, women in villages used to spend at least 4-5 hours daily in forest to collect about 35-40 kg of fodder, especially the Oak leaves and wild grasses for feeding their livestock. With large scale crop border plantation and plantation of Napier in waste land, the availability of fodder has increased considerably, which has significantly reduced the time of fodder collection to 2-3 hours. Because of less rounds to forest, the drudgery of women has reduced significantly.

Table 78: Community feedback on Fodder Programme	
Fodder	Response (%)
Availability of fodder at door step	
No impact	22.1
Moderate	33.6
High	44.3
Quality of fodder	
No impact	26.2
Moderate	30.2
High	43.6
Time consumed for fodder collection	
No impact	25.0
Moderate	30.6
High	44.4
Stall feeding	
No impact	25.5
Moderate	29.0
High	45.5

4.3.3 Energy Conservation

In the hill State of Uttarakhand water, agriculture, forestry, and energy are some of the issues, which form the core strategy for the state's future growth. The project area for UDWDP II is characterized by high population density, remote locations and consequently high dependence on natural resource use for meeting the household energy requirement as well as livelihood needs.

The Project is based on various environmentally sustainable and energy efficient approaches like organic farming, use of various alternate fuel-based devices, initiatives towards fuel switch, various soil, and moisture conservation activities to improve the moisture regime for agriculture. The project encourages and partly finances the adoption of environment-friendly energy sources such as biogas plants, solar power, and pine briquetting. Such alternate energy sources mean less exploitation of the forest resources and reduced drudgery for women.

One of the highlights of Component 2: Watershed Treatment and Rainfed Area Development of the project include promotion of alternate energy sources such as biogas plants, solar cookers/pressure cookers, water mills and pine briquette production to reduce dependence on forest fuel wood and promote energy conservation.

4.3.3.1 Key Results

The component wise activity and progress is listed in the table below:

Component Activity	Unit	End Project Target	Progress till MTR	Progress %
Energy conservation				
Bio Gas Plant	No.	60	46	77
Solar lantern	No.	2,290	6,949	303
Community Solar street panel	No.	6,124	5,349	87
Pine Briquette machine	No.	65	20	31
Solar Cooker/pressure cooker	No.	153	1,634	1068
Gharat renovation for power generation	No.	13	10	77

There is a decent progress in terms of bio gas plant usage in comparison with the total project target as slightly above three fourth of the project target has been achieved since inception. In case of solar lanterns, the progress has been stellar as more than 3 times of the project target has been achieved. Community solar street panel usage also witnessed a good progress as about 87% of the project target has been achieved. However, in case of Pine briquette machine the progress has been mild with slightly below one third of the target been achieved, whereas in case of Pine briquette stove there has been no progress as the project area has minimal Chir Pine area.

For solar and pressure cooker usage, there has been an impressive progress with an increase of more than 10 times from that of the project target. There is a decent progress in case of Gharat renovation for power generation as slightly more than three fourth of the target been achieved since inception.

4.3.3.2 Impacts of Interventions in Agriculture and Allied Sectors

i) Increased self-sufficiency due to increased production

Agriculture production as well as ensuring food security for all is an important challenge for the world community. The various interventions in the project including availability of irrigation, adoption support for HYV of agricultural and vegetable crops, training, and demonstration of recommended package of practices has helped increase productivity in cereal as well as vegetable crops and majority of the farmers are now self-sufficient.

The animal husbandry interventions like natural breeding centres, artificial insemination and animal health camps have contributed to increased milk production for household utilization.

ii) Diversification of crops to include more vegetables and climate resilient agri-crops

Crop demonstrations and adoption support has helped diversification in rainfed as well as irrigated crops. Farmers are practicing double as well as mixed and intercropping and cultivating vegetables during off-season. The diversification into off-season vegetables and their short duration has increased income and also made vegetables available for over 6 months as observed from community feedback.

The coverage of rainfed crops has increased more than 15-fold from that in 2014-15. The increase in coverage is significant especially with nutri-crops (millets) which were earlier cultivated only for self-consumption but are now cultivated in surplus for marketing as well. Table 66 shows the year wise incremental change in area of important rainfed crops in the project area. Wheat is having largest area from 2014-15 to 2018-19. Pulse crop are having 2nd largest area from 2014-15 to 2018-19. Mustard is having the 3rd largest area in 2018-19 and Finger Millet was having 3rd largest area during 2017-18 while Maize is 3rd largest area during 2014-15 & 2016-17. But 2015-16 Paddy was the 3rd largest area.

Table 80: Cumulative increase in area of Rainfed high yielding varieties									
Year	Compound growth rate (CGR) of demo and adoption area (Ha)								
	Wheat	Ramdana	Paddy	Finger millet	Maize	Pulse crop	Barnyard millets	Rapeseed & Mustard	Year wise total
2014-15	89.8	-----	-----	-----	15	22	-----	8.4	135.2
2015-16	237.94	-----	22.8	9.8	4.5	125.34	2	6.08	408.46
2016-17	437.2	-----	105	35.82	169.82	291.76	7.8	33.3	1080.7
2017-18	660.04	21.2	87.22	345.52	129.14	384.92	15.4	130.4	1773.84
2018-19*	633.32	97.28	113.28	269.18	141.9	411.38	128.74	247.8	2042.88

*Area coverage until June 2019

The year wise incremental change in adoption area of cereal crops under the project from inception until midterm can be seen in the graph below.

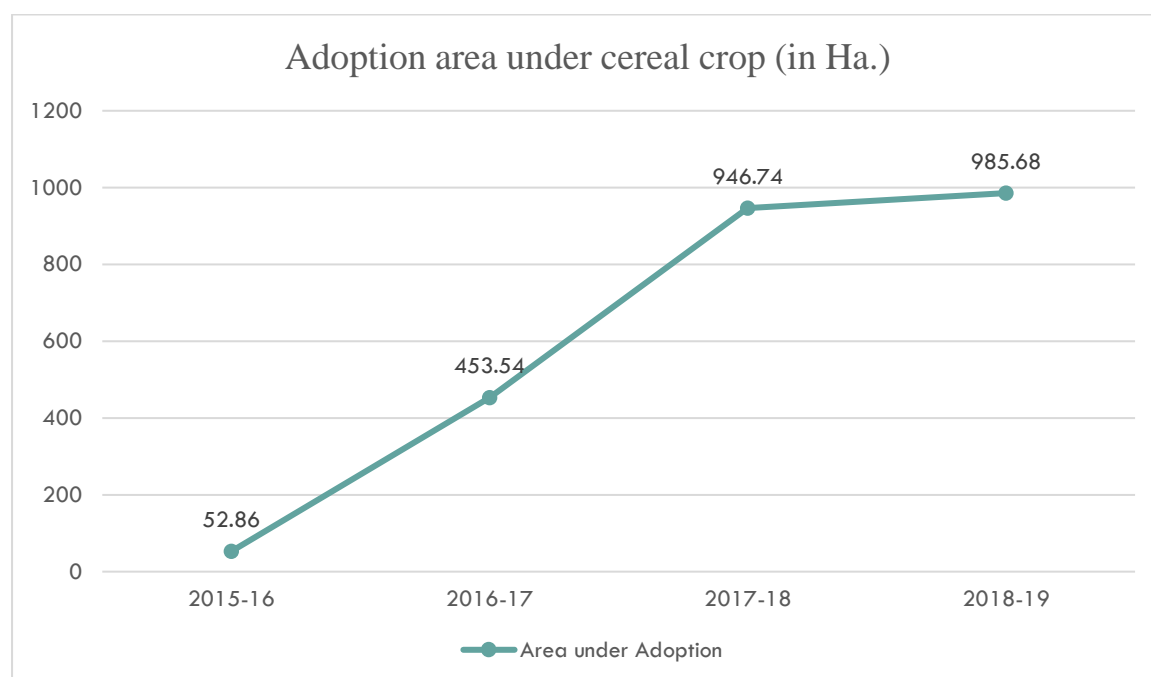


Figure 10: Adoption area under cereal crops (2015-19)

The increase in area (adoption and demonstration) has been significant for vegetable crops as well and demonstrations as well as input support is a reason for the same. The increase in area from 2014-15 to 2018-19 is more than eight times. The demonstration of polyhouse, poly tunnel, promotion of off-season vegetable cultivation and high yielding varieties are giving better prices which is attributed for the increase in area. Table 67 below shows crops wise increase in area from 2014-15 to 2018-19.

Table 81: Cumulative increase in areas under high yielding vegetable crops					
Cumulative areas under different high yielding vegetable crops in ha					
Vegetable crops	2014-15	2015-16	2016-17	2017-18	2018-19*
Cabbage	12.8	74.9	71.38	176.62	152.12
Radish	7.2	17.4	25.86	44.2	52.32
Cauliflower	6.6	33.08	36.64	32.4	86.98
Capsicum	8.04	43.2	66.8	109.66	117.27
French bean	23.2	73.2	45.74	224.85	154.54
Turmeric	32.4	29.7	55.14	68.52	105.11
Ginger	41.2	55.3	115.71	103.37	102.45
Garlic	10	127.7	180.38	42.83	79.74
Potato	1	17.5	76.34	134.48	115.88
Bottle Gourd	3.2	8.9	3.06	9.92	18.68
Leafy (Rai, Spinach, Fenugreek, coriander)	14.4	7.6	75.94	82.86	56.7

Table 81: Cumulative increase in areas under high yielding vegetable crops					
Cumulative areas under different high yielding vegetable crops in ha					
Tomato	23.3	70.9	96.9	223.95	213.47
Lady's finger	3.2	9.7	39.8	27.42	36.54
Onion	10.9	33.9	108.88	79.2	50
Pea	1.8	50.5	174.66	253.83	235.56
Chili	3.4	7.4	1.36	39.054	53.99
Cucumber and other cucurbits	2.5	1.02	2.61	40.842	99.66
TOTAL	205.2	662.1	1177.2	1694.006	1731.01

*Area coverage until June 2019

iii) Increase in gross production area

The overall cropping intensity was at 154 percent during the baseline study. During Midterm cropping intensity for land under irrigation has increased to 225 from 171 percent in baseline. The cropping intensity for rainfed crops too has increased to 160 in midterm from 152 percent in baseline. Thus, the overall cropping intensity for the rainfed and irrigated agriculture combined in the project area during MTR is 173.4 percent.

The ongoing watershed development and facilitation of irrigation has resulted in increased water availability for the crops over a longer period of time. This has played a crucial role and has enabled farmers to undertake multiple crops in different seasons during the year. With the projected progress, it is estimated that overall cropping intensity will rise up to 200 percent by the end of the project period.

Table 82: Cropping Intensity						
	Rainfed		Irrigated		Overall	
	Baseline	MTR	Baseline	MTR	Baseline	MTR
Net Area	34833	33318	5262	8631	40095	41949
Gross Sown Area	52946	53309	8998	19420	61944	72729
Cropping Intensity	152%	160%	171%	225%	154	173.4

iv) Improved Cropping Practices and better soil quality

Cropping practices play an important role in retaining the soil quality for better productivity. Majority of the farmers follow mono cropping and due to continuous cropping, nitrogen becomes a deficient nutrient. The project demonstrations recommended inclusion of legume crops in the rotation which would help in nitrogen fixation and maintain high crop yields. The percentage of farmers practicing mixed and inter cropping has seen an increase which is helping increase the land productivity and farmer's income and also help in reclaiming the soil through nitrogen fixation and turning of soil.

Adoption of climate resilient agricultural practices under UDWDP II have helped achieve the natural resource conservation, especially soil and water. Almost all farmers engaged in IPM and INM demonstrations in the study villages are convinced to follow the use of organic insecticides, bioagents and the sticky and/or light traps to control pests/insects. This has reduced the usage of chemical measures of disease and pest management, curbing the degradation of soil. Inorganic measures are also less expensive,

thus increasing the net profit of the farmers. Additionally, the Uncultivable wasteland brought under fruit orchards has helped reclaim the barren lands and improve soil quality.

v) Increase in Farmer's income & asset ownership

Increase in yield of major crops, cropping intensity and inclination towards diversification has strengthened the agriculture-based economy. Farmers in study villages are now are conscious of profitability of various crops and there is a distinct attempt to shift to crops that are more profitable. Increased productivity and better crop management has directly increased income for the farmers and provided better livelihood security. Increase in income from Agriculture/Horticulture crops has also provided surplus income which was absent previously and enabled the farmers to take risks for new crops of high commercial value thereby boosting the overall household income of FIG members.

Returns analysis and area coverage of different crops

The different interventions of the project have collectively contributed to increasing per Ha productivity of crops increasing the volume of produce per Ha as well as improving the quality of the produce to fetch better market prices. This has helped in increasing the returns per Ha of the crops. The following table gives the details analysis of income/Ha for different crops season wise.

Table 83: Income/Ha for different crops season wise								
Crop	Area[^] (Ha)	Productivity (Qtls/Ha)	Price* (Rs/Qtls)	Total Production[#] (Qtls)	Total Sale Value (Rs in Lakh)	Total Income/H a (Rs in Lakh)	Cost of Cultivatio n/Ha* (Rs)	Farmers Income /Ha (Rs in Lakh)
Kharif Crops								
Ginger	8	113.9	4050	911.2	36.90	4.61	64750	3.97
Tomato	120.08	137.8	2485	16547.1	411.19	3.42	64750	2.78
Turmeric	7.6	88.3	3850	671.1	25.84	3.40	96000	2.44
Capsicum	60.56	81.9	2535	4959.9	125.73	2.08	78500	1.29
French Bean	58.16	79.7	2245	4635.4	104.06	1.79	53500	1.25
Potato	57.36	106.7	1200	6120.3	73.44	1.28	96000	0.32
Finger millet	269.18	13.8	633	3714.7	23.53	0.09	5000	0.04
Barnyard millet	128.74	13.3	600	1712.2	10.27	0.08	5000	0.03
Rabi Crops								
Garlic	8	60.9	3400	487.2	16.56	2.07	91000	1.66
Cabbage	68.48	128.7	1460	8813.4	128.68	1.88	42000	1.46
Cauliflowe r	48.72	113.2	1600	5515.1	88.24	1.81	42000	1.39
Pea	68.64	70	2390	4804.8	114.83	1.67	49750	1.18
Onion	8.4	61.1	1130	513.2	5.80	0.69	48500	0.21
Wheat	632.02	15.7	1191	9922.7	118.18	0.19	6500	0.12

[^] Adoption + demonstration area as per 2018-19

*Average of 2018-19 prices across all divisions excluding Uttarkashi

#Total production based on average productivity of respective crops and area coverage

Among Kharif crops, Ginger is giving highest return per Ha per cropping season at Rs 3.97 Lakh followed by Tomato at Rs 2.78 Lakh/Ha and Turmeric at Rs 2.44 Lakhs/Ha. The lowest returns are from millets giving only a few thousand per Ha. Looking at the 2018-19 adoption areas, Tomato is the most popular with the highest area coverage of over 120 Ha amongst vegetable crops.

Among Rabi crops, Garlic is the most profitable with 1.16 Lakh per Ha returns followed by Cabbage and Cauliflower at Rs 1.46 and Rs 1.39 Lakhs per Ha returns respectively. Wheat has the lowest return at just Rs 12000 per Ha. Based on 2018-19 adoption areas, Cabbage and Peas are the most popular Rabi vegetable crops adopted by farmers.

When compared to the area coverage of different vegetable crops in 2014-15 i.e. at the start of the project, there has been a steady increase in coverage of vegetable crops. This shows that vegetables are being adopted at a higher pace owing to the higher returns in shorter duration when compared to majority of agriculture crops. Promoting hybrid varieties that are short duration and give higher yields area contributing factor to the high adoption rates.

Irrigation systems and improved crop production technologies has enabled farmers in bringing the fallow land under cultivation. The MTR study shows that 1854.4 Ha of previously fallow land has been brought under irrigation. This cultivable land is now an asset to the farmers and is contributing to increase their household income.

Introduction of improved livestock breeds has improved livestock ownership in the target farmers. It is evident from the success of breeding program that livestock numbers have increased (Table 69). Increase in number of cattle is directly linked to increased yield, therefore increased income for the target beneficiary farmers and has encouraged them to invest in the improved breed of cattle for better lifetime productivity.

Table 84: Asset ownership- cattle				
Average number of cattle owned				
Overall	Baseline		Mid Term	
	Project	Control	Project	Control
Improved Variety	2	1	4	1
Indigenous Variety	4	4	5	4

vi) Dietary improvements

The project has made the FIG members more health conscious, as they perceive that bio-composting techniques, organic farming practices, vegetable cultivation and hygienic milk production would help in improvement of family health. Majority of the farmers in the project region are following organic farming practices to mostly produce the crops that are being used for self-consumption. These farmers plan to increase the area under organic farming after realizing the cost-benefit of organic farm produce based on conventional market price. Additionally, homestead plantations have allowed farmer families to include diverse nutrients in their diet with availability of various vegetables and cereals around the year. The data

from MTR study has shown that carbohydrate intake of farmer families in project area is 14.1% (for once a day) and 8.3% (for thrice a day) more than control areas. Similarly, protein intake of farmer families in project area is 7.1% (for once a day) and almost equal (for thrice a day) more than control areas.

Table 85: Dietary improvements			
Nutrient	Project (%)	Control (%)	Difference
Carbohydrate			
Once a Day	32.2	18.1	14.1
Thrice a Day	16.1	7.8	8.3
Protein			
Once a Day	32.6	25.5	7.1
Thrice a Day	31	31.7	-0.7

Similarly, the increased milk production has also provided milk for home consumption which has helped provide necessary nutrients to the children as well adults of the farmer families.

vii) Reduction in drudgery of women and women empowerment

UDWDP has reached out to women in villages through FIGs and Women Aam Sabhas and there is a substantial increase in role of women in decision making regarding crop and animal husbandry. Crop demonstrations are attended by women farmers and they have also shown considerable interest in adopting new technologies. The training received in the farmer demonstrations, has resulted in them playing a more prominent role in farm related decisions and their participation is not limited to only labour work.

Farm mechanization and distribution of farm tools and animal husbandry inputs has helped in reducing the drudgery in farm labour and allowed ease of work especially for women who are the primary carer of livestock in rural homes. Fodder cultivation has ensured availability of feed for livestock around the year. The problems associated with fodder collection such as availability, carrying distance and time and effort are no more an issue and made life easier for women.

Energy conservation interventions like providing solar cookers and bio gas has provided the rural women with smokeless cooking tool that utilizes renewable energy. The time and effort spent in gathering fuelwood for cooking, and smoke less cooking has also been elemental in significantly reducing the deterrent health impacts associated with open fire wood chulhas.

viii) Reduced pressure on pastures and forests

The cultivation of fodder and Napier grasses in the fields has provided the farmers feed for livestock without having to collect it from forests or having graze the animals in common pasture lands. The forests and pastures are protected from over exploitation and have the chance to revitalize themselves. Similarly, need for fuelwood that was earlier sourced from the community forests has also considerable reduced due to solar cookers and pine briquettes.

ix) Reduced need of conventional fossil fuels and availability of light in public areas

Promotion of renewable energy sources such as solar, pine briquettes, solar powered water lifting, biogas, etc. And traditional tools such has the *Gharat* which are the traditional water powered mills has contributed

to a reduced requirement of electric power. Local communities can now access faster and more efficient crop processing as against either manual crop processing or of hours or days of walking to electric or diesel machines for availing the same services. Biogas has not only helped in utilising the cow dung and other organic material for energy generation but is also providing nutrients for farming through the output slurry. With increased acceptance of renewable sources of energy local communities stand to benefit from faster and more efficient agro-processing services and a wider range of mechanized crop-processing machinery, plus electrical services via an add-on generator, such as evening lighting, or water-heating, battery-charging, crop-drying, or irrigation pumping at night in the future.

Electric power is not available in some remote regions and where available, it is not consistent. Energy saving lighting provided through solar lanterns and solar powered street light have helped ease of movement in villages. Especially in high leopard movement regions, the street lighting has provided ease in moving about during the dark hours. The solar powered street lights also require less operational cost as compared to electricity powered lighting and minimum maintenance which is an added advantage for gram panchayats where funds are limited.

x) Provision of alternate agriculture services supplementing agricultural development

The farmers in FIGs are encouraged to register under the Gramin Krishi Mausam Sewa (GKMS) services provided by Indian Meteorological Dept. This way the farmers have wider access to weather forecasting to adjust their crops for efficient agribusiness. In 1052 Revenue villages 8801 farmers have registered for GKMS services. The service gives farmers access to information regarding weather and forecasting allowing them to adjust their crops & package of practices for better production. Regular SMS are sent to farmers for advice on critical cropping practices based on the crops grown, farm area and location.

Another first, a Buyer-Seller meet at Division level was initiated by Project Director, Gramya. The main idea behind organizing the buyer –seller meet was to provide a common platform to Buyer and Seller for viable market linkages and efficient supply chain management. The Agribusiness team facilitated the buyer-seller meet and the FIG members had a detailed discussion with the buyers on availability of surplus produce. This meet was successful in providing a common platform to buyer and sellers and for the sellers i.e. farmers to adjust their harvest as per the need of the market.

These initiatives have helped increase the knowledge of farmers and indirectly supported better agriculture practices and generate more income.

4.4 Agribusiness and Value Chain

Agribusiness sector has gained momentum over the last two decades in the country as more private players are being encouraged to invest in marketing infrastructure and food processing. Livelihood projects funded by donor agencies have traditionally supported efforts to increase production levels either by direct input or through convergence. However, a strategic shift has been witnessed over the last decade where externally funded projects have tried to increase integration of producers with the agribusiness ecosystem i.e. market yards, sub yards, food processing centres etc. while at the same time adopting climate resilient technologies in their farming practices to increase production and lower the risk.

Uttarakhand has its own share of strengths and weakness in the agribusiness sector. For instance, it is relatively a major supplier of off-season vegetables (OSV) to the north Indian market and farmers have adapted their cropping calendars to market demand. Tomato, Potato and Peas are in good demand, while other OSVs grown on a large scale are Cauliflower, Capsicum, Cabbage and Beans which are also fetching good market. This can be attributed to the fact that the temperate climate is suitable for growing many of these vegetables. Most of these crops are grown traditionally and are familiar to the local community, so have a demand in the local markets as well. Proximity to large markets like Delhi NCR, Agra and Lucknow further boosts supply of OSV from Uttarakhand to other north Indian markets. This development has been supported by several programmes and agencies forming farmer producers' groups. These producer groups now supplying significant volumes of vegetables and other produce to Delhi and other out of state mandis, supermarkets and produce stores etc.

In terms of weaknesses, the topography of the state has presented some persistent challenges in form of poor road connectivity and limited telecommunication services. Added to that, the land holdings are small and fragmented and lack irrigation facilities. Farmers are mostly employing traditional farming methods resulting in low productivity. Inadequate Agri-marketing infrastructure including collection centres, preliminary processing and packaging, transport logistics, cold storage, market access, and food-processing units makes the agri-business development a challenge, thus emphasising the need of complete value chain development and brand building.

Those already engaged in agriculture lack knowledge and skills for high value crop production, including post-harvest handling, value addition and access to expert services. Locals thus are left with no other option but to follow the traditional methods, as a result, the production from traditional crops following traditional practices is stagnant at certain level and often runs the risk of not getting the right price in the market. This situation leads to many giving up agriculture and agri-business and a resultant increase in migration of male folk to the cities in search of jobs.

4.4.1 Project Interventions

At a macro level, agribusiness activities under UDWDP-II are focused on Production increase, processing (value addition), marketing infrastructure and trade support. These activities have been supplemented by some external factors such as infrastructure development in form of all-weather roads and agricultural credit support to sustain the supply to match demand of OSV in North Indian markets. The crop varieties focused in the project are discussed below.

i) Vegetables

Hilly states are bestowed with congenial and varied agro-climatic conditions and hold enormous potential for production of vegetables in off-season like French beans, Tomato, Capsicum, Green peas, Beans, Cabbage, Garlic, Cauliflower, Coloured capsicum, and Cucumber. All these crops are cultivated successfully in seasons when it is no longer possible to cultivate them in the plains. The return on investment for off-season vegetable cultivation is very high as compared to traditional cereal crops. The hill areas have comparative advantage in supplying to the major markets of Delhi and beyond with fresh off-season vegetables.

ii) Agriculture crops

Uttarakhand has an additional advantage of longer day length during summer months due to its location in northerly latitudes. Agriculture crops that can be cultivated during these months include Wheat, Finger millet, Maize, Black gram, Mandua, Madira, Ramdana, Gehat, Paddy, Sorghum, Lentil and Mustard.

iii) Aromatic Plants

Aromatic plants have the potential to integrate the ecological, commercial, and social values of a region. Uttarakhand being a Himalayan state enjoys a proven advantage and monopoly over the availability of some valuable Aromatic plants. The Government of Uttarakhand (GOU) has recognised that aromatic plants have comparative advantage over many other crops in the hill regions as they are often more resilient to variability in rainfall and are not as susceptible to damage by wild animals or cattle.

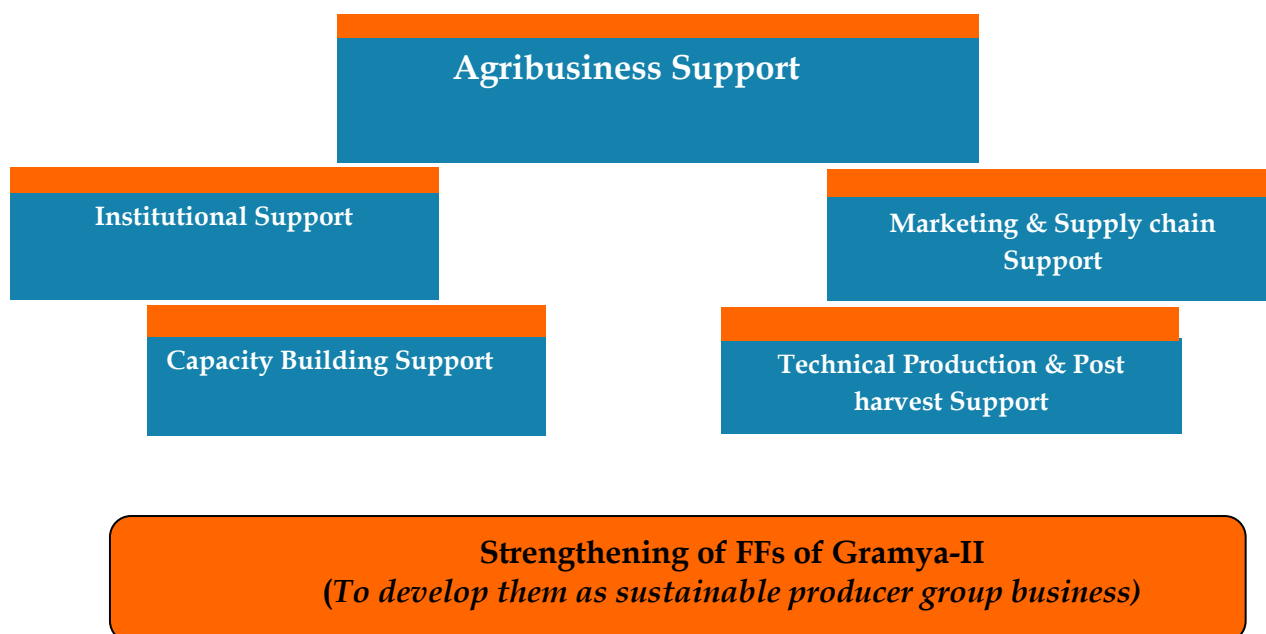
iv) Spices

The State has a range of spices grown in the hilly regions like Turmeric, Chillies, Garlic and Ginger. But the productivity of the spice crops is low due to lack of supplemental irrigation facilities and irrigation facilities are being provided through the different intervention to promote spice crop cultivation. The project has realised the potential of the local market and organised farmer groups to add value to their produce by drying and pre-packing for the local market. The surplus after meeting the needs of the local market producers could look for markets outside of the State.

Agribusiness

Agribusiness is an important intervention under the project that has reasonable chances of changing the life of community for betterment through direct increase in income. It promotes agribusiness development and support through formation and capacity building of FIGs and their consolidation into Farmer Federations, development of agribusiness plans and supply chains (including marketing support, collection, grading, packaging and processing centres) with technical backstopping by agribusiness support organizations; and capacity building of community-based institutions (FIGs and water harvesting structure user groups). Additionally, the project also aims to encourage socio-economic inclusion by enhancing livelihoods opportunities for vulnerable groups. It is also engaged in supporting the Farmer Federations formed under the Gramya I to ensure their sustainability, scale up their agribusiness development and support the beneficiary groups.

The Agribusiness support under UDWDP-II broadly covers:



- a) **Institutional strengthening** - Institutional building at the community level is the prime focus of the project. For Institution Building, ABSO Support & Capacity building were extended to the beneficiaries. The institution building was done by identification of farmers at RV/GP level and imparting them with training regarding group formation, management, and leadership development. This was followed by organizing the farmers into FIGs and later federating the FIGs into Farmers Federations at cluster level. Capacity building and skill improvement of FIGs was done as a part of Institutional strengthening.
- b) **Market linkages** – Identification of possible market linkages for potential surplus was completed. Identification of possibilities of value addition of surplus products was mapped along with market

linkage of value-added product and value chain established.

- c) **Training and Strengthening of FIGs** - Training programme for formation and management of FIGs & federations, leadership development, off- season vegetable production technology and development of crop calendar has been organized. Technical know-how about crop planning, land preparation, seed treatment and sowing, nursery raising, spacing, insect and integrated pest management, disease management, inter culture operations, harvesting & packaging techniques, post-harvest management, marketing and livestock related management were provided to farmers as per requirements during field days.
- d) **Technical Production & Post harvest Support-** The project with the help of Multidisciplinary Teams (MDT) and Agribusiness Support Organization (ABS0) has supported farmers to organize them into FIGs. MDTs and ABSOs have facilitated in providing technical and marketing support to the FIGs. The ABSO formulates the strategy to produce HYV of vegetable crops under cluster approach based on bio-physical, agro-climatic and market suitability. This helps to achieve larger marketable surplus to attract bulk buyers and gives opportunity for the FFs to negotiate a better deal.

Agribusiness input has supported FIGs in form of providing quality seeds, bio-pesticides, bio-fertilizers, bio-compost pits, poly- houses, poly tunnels, water lifting pumps, plant protection equipment, Packaging materials, plastic crates for easy transportation and weighing machines. However, production related inputs were provided only under special circumstances after due recommendation of ABSO.

4.4.2 Implementation Arrangement

Agri business Support Organization (ABS0) are appointed by WMD and are responsible for facilitating formation of FIGs, FFs and provide technical support for agribusiness activities. Specifically, ABSO provides marketing support for agribusiness activities, ensure compliance of ESCP in all agribusiness interventions, ensure monitoring of agribusiness interventions and timely reporting to WMD. The ABSO is responsible for Institutional Strengthening, Crop Planning, Input Support Plan, Brand promotion, Market linkages, Infra structure for Market support, identification of satellite collection point and Sustainability of the agribusiness activities.

There are six ABSOs appointed across different divisions, namely:

- 1) Central Himalayan Environment Association (CHEA), Almora Division
- 2) Himalayan Environment Livelihood Promotion Society (HELP), Pauri Division
- 3) Society of People for Development (SPD), Vikasnagar Division
- 4) Society for Uttaranchal Development and Himalayan Action (SUDHA), Pithoragarh Division and Bageshwar division
- 5) Appropriate Technology India (AT India), Thatyur Division
- 6) Action for Social Empowerment and Economic Development ASEED, Rudraprayag Division

The ABSOs are entrusted with the following responsibilities and tasks:

- 1) Development of Division level action plan
- 2) Farmers' Interest Group formation and promotion of Farmers' Associations
- 3) Dissemination of Improved Agricultural Practices and Extension services
- 4) Improving post-harvest handling, providing supply chain management, logistical support and establishing market linkages
- 5) Technical support, training and capacity building
- 6) Consolidation of farmer federations and their activities constituted in GRAMYA-I
- 7) Enabling adoption of modern, climate-smart, and financially viable technologies prevalent in horticulture, agriculture, and livestock sectors and compatible to hills of Uttarakhand along with cultivation of high value and high yielding crops by farmers.
- 8) Implementation of modern and commercial practices for grading, storage, packaging, processing, and market linkages by farmers to enhance the value of their produce in order to realize increased income levels for their household.
- 9) Development of value-chains in the identified sub-sectors of farming system to sustainably increase the income levels of farmers of the project areas.
- 10) Facilitation of cluster approach for bulk production of one or two crops in a cluster of two to three villages in order to develop an effective model for dissemination of technology & collective marketing of produce.
- 11) Up skilling the vulnerable households and introduction of innovative and area specific practices to them for the adoption of sustainable livelihood activities.

4.4.3 Key Achievements

i) **Intermediate Indicator 7: Self-sustained FFs**

Federation is the apex body for amalgamating the FIGs in to a formal institution and it plays an important role for strengthening Farmers' Interest Groups. Farmers' Federations have an important role in development as they provide forum for participation, understand the issues, and come up with their own solutions. FFs serve as platform for building a sense of community, a social support system, increasing self-confidence, learning together, and providing a sense of equality

A self-sustained FF under GRAMYA II has been defined as one which,

1. is functioning, i.e.
 - a. maintaining proper records and documentation
 - b. members and Managing Committee are conducting regular meetings (minimum two/year-one for each crop season)
 - c. Business operations- buying and selling of produce- is on going
2. has made profit in at least last two business cycles
 - a. Where profit is equivalent to the savings made by the federation from business operations and deposited in their bank accounts

Federations that are conforming to all of the above 4 criteria are deemed as self-sustainable under this objective. With this parameter in mind, the assessment of the Federations created under GRAMYA II shows that 6 federations out of 12 have currently achieved self-sustainability.

Table 86: Achievement of Project Development Objective 5								
Intermediate Results Indicator	Unit of Measure	Mid Term Target	Baseline Study		Mid Term		MTR revision (Indicative)	Revised End Target
			P	C	P	C		
Intermediate Indicator 7: Self-sustained FFs	%	15%	-	NA	50	-	NA	Measured by criteria identified

The federation wise compliance with each of the criterion identified above is given in the table below.

Table 87: Self-sustainability of Farmer Federations							
S. No.	Name of Division	Name of FF constituted	Maintaining records and documentation	Regular Meetings	Business Operations are ongoing	Profit made	Score on self-sustainability (Out of 4)
1	Almora	Jagnath Krishi Beej Utpadak Sangh (Certified Seed Production)	Yes	Yes	Yes	Yes	4
2		Dhauladevi Gramyashree Self Reliant Cooperative	Yes	Yes	Yes	Yes	4
3	Bageshwar	Danpur Kisan Ekta Swayat Sahakarita	Yes	Yes	Yes	Yes	4
4	Pithoragarh	Triveni Sangam Swayat Sahakarita Kisan Sangh, Nachani	Yes	Yes	Yes	Yes	4
5		Unnati Swayat Sahakarita Sangh Thal	Yes	Yes	Yes	Yes	4
6	Thatyur	Gramya Krishak Swayat Sahakarita	Yes	Yes	Yes	Yes	4
7	Dehradun	Jaunsar Phal Sabji Evam Dugdh Utpadak Swayat Sahakarita	Yes	Yes	No	No	2
8		Athgaon Phal Evam Sabji Utpadak Swayat Sahakarita	Yes	Yes	No	No	2

The progress with respect to self-sustainability of the federations is slow as the federations are operating on capital raised solely through membership and business operations. The project design does not have provision for extending financial support to the federations in terms of loans; support is provided in terms of

technical guidance and capacity building, exposure visits for members, input support for adoption and developing of value chains and marketing facilities.

*Details of the revenue and expense of the farmer federations is provided in Annexure Table 44

ii) **Project Progress**

1. **Appointment of Agribusiness Support Organisations (ABSOs) and their functioning**

Agribusiness Support Agencies (NGOs) have been hired at divisional level, following World Bank Procurement guideline, to assist divisions in agribusiness programme. Agri-business Support Agencies have accomplished;

A. Institutional Strengthening

- Identification of farmers for demonstration.
- Follow up for adaptation of demonstrated interventions
- Identification of potential farmers for replication and adaptation of demonstrated interventions for providing input support.
- Formation of FIG at G.P. level from above identified farmers.
- Formation of Farmers Federation at cluster level and their legalization.
- Capacity building and skill upgradation of FIG and FF's with respect to production and market intelligence.
- Linkage of FIG/ FF with Financial institutions to address to sustainability issues.

B. Crop Planning

- Baseline survey of each FIG/ G.P. for existing land use.
- Development of crop plan for each FIG/ G.P. for both irrigated and unirrigated area.
- Assessment of potential surplus as per the proposed crop plan.

C. Input Support Plan

- Input support plan based on the proposed crop plan. The assessment of input support to be provided by the project to individual farmer/ FIG for demonstration and adaptation of productive techniques before devising the input support plan.

D. Infra-structure for Market support & Brand Promotion

- Needs assessment and identification of satellite collection point at cluster level.
- Need assessments and identification of nodal collection point/aggregation point at federation level.
- Assessment of input support for post-harvest handling, strengthening of collection points and value addition centres.
- Brand Promotion will be done to promote Agribusiness

E. Sustainability Issues

- Addressing sustainability issues about institutions formed (FIG, FF, Cooperative, Producer Company etc.)
- Addressing sustainability issues regarding infra structure/ Assets created (collection centres, Value addition units etc.)

The following matrix reflects some of the key achievements and completeness in the documentation process of the ABSOs. While it is clearly observed that almost all the ABSOs are doing pretty well, ASEED needs to make some extra efforts in this direction

Table 88: ABSO Accomplishments								
SL. NO	PARTICULAR	SUDHA Bag.	SUDHA Pith.	CHEA	HELP	SPD	ATI	ASEED
1	Contract document	✓	✓	✓	✓	✓	✓	✓
2	Name of persons, Staffing Details, Designation Details	✓	✓	✓	✓	✓	✓	✓
3	List of Farmers for Demonstration (Baseline)	✓	✓	✓	✓	✓	✓	✓
4	List of Farmers who have adopted the demo practices	✓	✓	✓	✓	✓	✓	✓
5	List of Farmers who have been given the input support (Segregated as per inputs)	✓	✓	✓	✓	✓	✓	✓
6	Details of FIG	✓	✓	✓	✓	✓	✓	✓
7	Details of Federation with Registration	✓	✓	✓	✓	✓	✓	✓
8	CB details of FIGs	✓	✓	✓	✓	✓	✓	✓
9	Details of linkage of FIG/FF with Financial Institution	✓	✓	✓	✓	✓	✓	NA
10	Baseline Data of each FIG for land use	✓	✓	✓	✓	✓	✓	✓
11	Crop planning for FIG - Irrigated	✓	✓	✓	✓	✓	✓	✓
12	-Unirrigated	✓	✓	✓	✓	✓	✓	✓
13	Baseline Data for existing market linkages	✓	✓	✓	✓	✓	✓	✓

Table 88: ABSO Accomplishments								
SL. NO	PARTICULAR	SUDHA Bag.	SUDHA Pith.	CHEA	HELP	SPD	ATI	ASEED
14	Identification of surplus crop and their market linkages	✓	✓	✓	✓	✓	✓	NA
15	Details of value addition as per crops	✓	✓	✓	✓	✓	✓	NA
16	Need assessment details and Identification of collection point at cluster level	✓	✓	✓	✓	✓	✓	NA
17	Identification and details of collection point at Federation level	✓	✓	✓	✓	✓	✓	NA
18	Assessment of input support for post-harvest handling	✓	✓	✓	✓	✓	✓	NA
19	Value addition of collection and processing centre assets created	✓	✓	✓	✓	✓	✓	NA
20	Tracking details of crops (If any) -Input	✓	✓	✓	✓	✓	✓	NA
21	-Output	✓	✓	✓	✓	✓	✓	NA
22	Business plan for Division	✓	✓	✓	✓	✓	✓	✓
23	Farming System livelihood Assessment	✓	✓	✓	✓	✓	✓	NA
24	Marketing details of FIG Product	✓	✓	✓	✓	✓	✓	✓
25	Capacity building plans of FIG/FF	✓	✓	✓	✓	✓	✓	NA
26	Details of linkages with KVK /Other research Institutions	✓	✓	✓	✓	✓	✓	✓

Table 88: ABSO Accomplishments								
SL. NO	PARTICULAR	SUDHA Bag.	SUDHA Pith.	CHEA	HELP	SPD	ATI	ASEED
27	New technology adoption details of farmers	✓	✓	✓	✓	✓	✓	✓
28	Details of offseason Vegetables and High Value Crop	✓	✓	✓	✓	✓	✓	NA
29	Details of Capacity building in New technology	✓	✓	✓	✓	✓	✓	NA
30	Development Sub sector Value chain	✓	✓	✓	✓	NA	✓	NA
31	Details of Post-harvest technology Support	✓	✓	✓	✓	✓	✓	NA
32	Details of linkage with Supplier Market Operator and Agro process Companies	✓	✓	✓	✓	✓	✓	✓
33	Identification of market Opportunity for product	✓	✓	✓	✓	✓	✓	NA
34	Technical Support to Federation	✓	✓	✓	✓	✓	✓	NA

2. Project Progress of Agribusiness interventions

Table 89: Project Progress of Agribusiness interventions				
Agribusiness interventions	Unit	End Project Target	Progress till Mid Term	Progress (%)
Demonstration & Adoption	No.	-	56758	-
Formation of FIGs	No.	-	1358	-
Number of Farmers federations in Gramya 1	No.	-	16	-
Number of Farmers federations in Gramya 2	No.	-	12	-
Number of women in FIGs	No.	-	9137	-

2.1 Demonstration & Adoption

Demonstration of package of practices is an effective way to show as well as encourage farmers into adopting new practices. Demonstrations are undertaken in pilot plots owned and managed by the farmer with inputs and technical guidance provided by the ABSOs. The demonstrations have been undertaken for field as well as vegetable crops and are beneficial to teach various agricultural techniques and technologies, showcase new or improved crops and crop production technologies.

Till MTR, 56,758 demonstrations have been organized. It includes 16,367 demonstrations in Agriculture covering an area of 3273.4 ha and 40984 demonstration in Vegetable cultivation in an area of 3278.7 ha.

Table 90: Demonstration of Agriculture in area		
Crops	Demonstration (Number)	
	Number	Area(ha)
Agriculture	16367	3273.4
Vegetable	40984	3278.7
Total	56758	6552.1

Highlights of the innovative demonstrations and adoption are shared below.

Division: Almora

- Demonstration of Marigold Cultivation in farms of 60 members of a FIG during 2018-19
- Demonstration on Mechanization: small power tiller/ power weeders appropriate for hilly areas have been introduced in 10 GPs.
- Demonstration of Protected cultivation: Coloured Capsicum and Broccoli production has been undertaken in polyhouses
- Demonstration of Medicinal and Aromatic plants: Sweet Basil cultivation in 2 villages
- Biodiversity Management Committee (BMC) has been formed in Dhaspad and Dodam GPs under Gramya II Almora division and scaling up of Value Chain of Echinacea, an herb used to prevent and treat the common cold is also proposed along with expansion of Tulsi cultivation. The biodiversity Committee has also proposed a peoples' biodiversity register as part of the biodiversity assessment.

Division: Bageshwar

- Kiwi fruit cultivation: A batch of 25 farmers visited Solan and Shimla district of Himachal Pradesh for understanding of Kiwi fruit cultivation and have subsequently adopted the same in their fields with support of WMD. The crop is in second year now and will begin fruiting in year four.
- Water saving techniques: A batch of 25 farmers visited Karnal, Haryana to the Israel Technology Centre for exposure on water saving techniques like polythene mulching, protected farming, and micro irrigation techniques. These techniques are being adopted on a trial basis. Some techniques like micro irrigation are perceived as high investment and farmers are sceptical to readily adopting the same. These are thus being demonstrated and adopted in small farm areas.

- Cluster cultivation of Tomato: With guidance of the ABSO and support of the federation, cultivation of tomato in undertaken in 4 ha of combined area.
- Adoption in 2.0 Ha area in five GPs (Gasi, Supi, Naukuri, Sama, Baripanyali) for Knol Khol seed production with buy-back support of Advanta UPL Company. A total of 25.6 Qtls of Knol-khol seed was produced.
- Adoption of 0.8 ha area for Medicinal crop plantation (Kutki, Kalajeera) with buy-back process with support of CAP (Centre for Aromatic Plant) Dehradun

Division: Pithoragarh

- Introduction of PB 1509 high yielding variety of paddy through demonstration plots.
- San Andrews, a variety of Strawberry is adopted by farmers in 4 GPs Nachani, Napadh, Atkhet and Baltir in about 0.2 ha.

Division: Pauri

- A total of 92 RVs in 46 GPs covering a total area of 68 ha. have adopted bulk production of Garlic, Pea, Potato, Tomato, Capsicum, French bean, Okra, Cauliflower, Onion, Broccoli, Chilli, Cabbage, Ginger, Coriander and Turmeric, etc.
- Farmers have also adopted value addition to the produce and prepared Mango Pickle, Amla Pickle, Turmeric Powder, Green Chilli Pickle, Mushroom Pickle, Mandua Flour, Pumpkin Jam and Chilli Powder, etc. which is fetching them additional income.

Division: Thatyur

- Poly houses demonstrations: Vegetable seedlings are being produced from 82 Polyhouse vegetable nurseries in 27 FIGs.
- Line Sowing Demonstration: In 43 GPs a total of 93 FIGs have started adopting line sowing techniques.
- Power Tiller Demonstration: Hill-suitable small power tiller/ power weeder has been introduced in 10 GPs.
- Demonstration of Farming with Mulching Technique: mulching technique has been demonstrated in 10 GPs covering a total of 15 FIGs under the mulching technology demonstrations.
- Demonstration of nursery: This technique is demonstrated in 35 revenue villages benefiting more than 35 FIGs.
- Demonstration of Bamboo Staking in Tomato Cultivation: Bamboo staking technique has been demonstrated in 11 revenue villages benefitting 11 FIGs.
- Demonstration of Organic farming: A total of 10 GPs covered under adoption of IPNM covering 12 FIGs

Division: Rudraprayag

- Demonstration of Improved varieties: Improved Certified Varieties i.e. GS-10 in Pea & Kufri Jyoti in

Potato have been demonstrated

- Demonstration of Organic Inputs -Vermi Compost, Seed Treatment with Bio- Fungicides & Humic, Zyme based Organic Inputs
- Value addition in products: Malta Squash., Pickles, Ginger Powder, Garlic powder, Millets Flour is being prepared, packaged and marketed under the brand name of Gramyashree

Division: Dehradun

- In Vikasnagar, 25 Farmers and 240 associate farmers of Dehradun division registered with U.K Seeds and TDC, Dehradun for the production of its certified Wheat (variety HS-507) Seed Production Program and produced 30 Qtls of Wheat seed.

2.2 Formation of Farmer's Interest Group (FIGs)

Formation of FIGs is a significant part of Institution building. So far, a total of 1358 FIGs have been formed in the project and 15006 members have been organized through FIGs. The table below illustrates the Division wise FIG details.

S. no	Division	No of FIGs	Total members	Male FIGs	Female FIGs	Male & Female FIGs	Savings (Lakhs)
1	Pithoragarh	125	1187	29	12	84	11.4
2	Almora	121	1639	8	27	86	3.2
3	Rudraprayag	218	1927	0	201	17	13.6
4	Uttarkashi	210	2325	43	37	130	5.4
5	Bageshwar	186	2170	32	52	102	13.8
6	Vikasnagar	116	1708	6	108	2	39.8
7	PMU	28	219	15	4	9	2.7
8	Thatyur	161	2136	46	22	93	13.5
9	Pauri	193	1695	2	172	19	46.2
TOTAL		1358	15006	181	635	542	149.6

As a structured group, the members conduct election to choose a leader. After the leader is elected, norms are in place for how long a leader can hold the position. In terms of leadership, it has been observed that there is a well-defined mandate of leadership tenure and almost all members are aware of it. As far as the role of members is concerned, almost every member is involved in decision-making process. Also, all the members (male and female) are involved during meetings and their respective points are taken into consideration. Regulations of the Group are well documented and known to all the members. Members of FIGs are aware of their responsibilities. All information is open and freely available when demanded. More than two third of the Group members evaluate the results that have been achieved monthly.

Social Category wise distribution of Village members in FIGs

Of the total 15006 FIG members, close to half of the members are from general category. Close to one fourth of the members are from OBC, while slightly less than 20 percent of the members are from SC community. The representation of ST community is about 8 percent of total members.

Table 92: Social Category wise distribution of Village members in FIGs					
Division	Members	Social category wise distribution			
		General	SC	ST	OBC (others)
Pithoragarh	1187	624	192	55	316
Almora	1639	1221	384	2	32
Rudraprayag	1927	1631	208	0	88
Uttarkashi	2325	1	879	0	1445
Bageshwar	2170	2006	148	16	0
Vikasnagar	1708	6	574	1128	0
PMU	219	204	8	0	7
Thatyur	2136	0	273	0	1863
Pauri	1695	1399	296	0	0
TOTAL	15006	7092	2962	1201	3751

2.3 Capacity Building

Capacity building is an important tool to enhance the capacity of FIGs. Under Agribusiness subcomponent 3, the capacity building is done through Trainings and Exposure visits focused mainly on learning new technologies for increased production as well as innovation in production and post-production processes.

Table 93: Capacity Building of FIGs					
S.NO	Component Activity	Unit	Total Project Target	MTR Progress	Progress %
1	Training at Unit level & division level	No.	1440	242	17
2	Exposure visit - within state	No.	192	63	33
3	Exposure visit - outside state	No.	96	27	28

Trainings of FIGs -The training of FIGs was done at a) at unit Level & b) at division level. Till the end of March 2019, 242 numbers of trainings are organized in Agribusiness subcomponent. The training was given for Formation & Strengthening of FIGs and technical knowhow on Agribusiness.

Exposure - Till date 90 exposure visits have been organized in Agribusiness. The exposure was done for strengthening and imparting technical know-how to the FIGs. The exposure visits were undertaken within the State as well as to other States. Within state the exposure of FIGs was done to places like Bharsar (Pauri), VPKAS (Almora) and G.B Pant University, Pantnagar. Exposure outside state was done to places like Solan, (Himachal Pradesh); Fazilka (Punjab), Karnal (Haryana) for exposure to various techniques and technologies with respect to cultivation of different crops.

2.4 Savings by FIGs

Saving is a significant step in strengthening the FIGs. It helps in providing sustainability to the FIGs. The savings comes through monthly deposit by the FIG members. It ranges from Rs 50 to 100 per member on monthly basis. Till date a saving of Rs 149.53 lakhs has been done by 1358 FIGs.

Table 94: Savings by FIGs (in Lakhs)				
Division	Savings (in Lakhs)	Inter loaning		
		Total (Rs in Lakhs)	Agriculture Input use	Emergency use
Pithoragarh	11.43	1.9	1.9	Nil
Almora	3.16	0.56	Nil	0.56
Rudraprayag	13.61	Nil	Nil	Nil
Uttarkashi	5.36	Nil	Nil	Nil
Bageshwar	13.75	Nil	Nil	Nil
Vikasnagar	39.78	5.88	2.26	3.62
PMU	2.70	Nil	Nil	Nil
Thatyur	13.51	4.35	4.35	Nil
Pauri	46.23	1.66	Nil	1.66
Total	149.53	14.35	8.51	5.84

Analysis of FIG earnings and savings

Farmers' Interest Groups (FIGs) are formed to provide collective production, cultivation and marketing services to farmers so they can earn increased profit through economies of scale and collective marketing of produce. The FIGs also collect contribution from member farmers as savings which are significant in strengthening the FIGs and helps in providing sustainability to their operations. An analysis of the profit earnings and savings of FIGs has been done for a sample of 809 FIGs formed between 2014 to 2018. The income from sale of produce, profit earned from this sale, expenditure and inputs costs and savings in bank have been recorded for two years 2017-18 and 2018-19.

Table 95: FIG financials 2017-18						
FIG Formation Year	No. of FIGs	Total Produce Sold (Qtls)	Sale Value (Rs in Lakh)	Profits (Rs in Lakh)	Savings in bank of FIGs (Rs in Lakh)	Other Expenditure & Input cost (Rs in Lakh)
2014	6	687.29	12.79	10.09	0.15	2.55
2015	292	41409	907.26	661.74	25.09	240.81
2016	252	22257	480.61	358.03	15.70	109.87
2017	202	10246	237.71	193.01	10.05	35.19
2018	57	1840	39.79	30.53	0.52	9.02
TOTAL	809	76439	1678.17	1253.40	51.51	397.44

Table 96: FIG financials 2018-19						
FIG Formation Year	No. of FIGs	Total Produce Sold (Qtls)	Sale Value (Rs in Lakh)	Profits (Rs in Lakh)	Savings in bank of FIGs (Rs in Lakh)	Other Expenditure & Input cost (Rs in Lakh)
2014	6	848.315	15.67	12.29	0.37	3.17
2015	292	52733	1021.71	745.43	30.07	268.62
2016	252	27885	606.12	451.23	21.23	135.30
2017	202	14136	346.67	280.59	20.96	51.21
2018	57	5188	113.83	87.24	2.92	26.24
TOTAL	809	100790	2103.99	1576.78	75.55	484.53

The sale value is the total income from sale of produce done through FIGs by the farmers for different produce over the year. The Profit earned from this sale of produce is the amount remaining after deducting the cost of input provided by the FIGs either in cash or kind. This profit is distributed amongst the farmers proportionately based on the volume of produce sold by them.

The savings comes through contribution by the FIG members. It ranges from Rs 50 to 100 per member on monthly basis. The savings are utilised by the FIG for inter-loaning among members for farm input purchase or to purchase collective input for the member farmers. This amount along with the savings amount in the bank is the total corpus of the FIGs.

Table 97: Average profit earnings and savings of FIGs					
Year of FIG formation	No. of FIGs	Average Sale Value (Rs in Lakh)	Average Profit of FIG (Rs in Lakh)	Average Savings in Bank of FIGs (Rs)	Average Expenditure & Input Cost (Rs)
2014	6	2.37	1.87	4318.75	47644.95
2015	292	3.30	2.41	9445.95	87231.10
2016	252	2.16	1.61	7326.33	48643.58
2017	202	1.45	1.17	7677.77	21386.20
2018	57	1.35	1.03	3012.36	30928.60
TOTAL	809				

A further analysis of this data to determine the average profit earnings and savings of FIGs showed that FIGs formed in 2015 are showing the best average earnings of profit followed by those formed in 2014 owing to the longer duration of their existence and strengthening of the operations. Newer FIGs formed in 2017 and after are still finding their foothold and support is being provided to increase their profit percentages and increase contribution of members as well. The role of ABSOs in this regard is important as in they will guide regarding market conditions (commodities in demand, suggestions for increasing productivity, marketing of produce at the best prices, etc.).

The FIGs are earning an average profit of 76% in the range of Rs 1.62 lakh per year from an average sale of Rs 2.13 Lakhs. The average net profit (excluding input cost and including labour) of these FIGs is Rs 1.15

lakh. The average corpus of the FIGs i.e. savings in bank and expenditure on input cost is an average Rs 60,000 across the 809 FIGs listed here.

2.5 Farmer Federations in Gramya I

The project adopted two types of agribusiness activities in Gramya I, one was Marketing of raw surplus produce (mainly vegetables) and the other was marketing after value addition (processed products and commodities). Under Gramya I there were 27 FF formed,

- 1) Farmer's Federations linked with processing centres -18 no's
- 2) Farmer's Federation linked with collection centres -09 no's

As of MTR, 8 of these 27 Farmer Federations are being provided training and guidance by the ABSOs for increasing their sustainability. The following tables detail out the farmers' federation status under Gramya I.

Table 98: Division wise Farmers' Federations Gramya-1				
S.no	Division	No. of Federations	FIG	farmers
1	Pithoragarh	1	23	172
2	Bageshwar	1	8	109
4	Pauri	1	35	130
5	Almora	1	10	505
6	Thatyur	2	30	553
7	Vikasnagar	2	18	233
Total		8	124	1702

The status of these 8 Farmers' Federations as assessed during MTR study, is given below.

Table 99: Status of Federations in Gramya I						
Sl. No.	Gramya-I Divisions	Name of Federation	ABSO	Nodal UDWDP-II DPDs	Capacity building for revival	Revolving fund generated (Rs)
1	Haldwani/ Nainital	Paharpani Utpadak Evam Vipnan Self Cooperative	CHEA	DPD- Almora	Done	3,17,500.00
2	Bageshwar	Gomati Ghati Swayatta Sahakarita Samiti	SUDHA	DPD- Bageshwar	Done	54,800.00
3	Kotdwar/ Pauri	Gramya Kisan Bahudeshiya Swayatta Sahakari Samiti, Ghandalu	HELP	DPD- Pauri	Done	61,250.00
4	Gangolihat/ Pithoragarh	Kalika Devi Kisan Sangh	SUDHA	DPD- Pithoragarh	Done	6,00,000.00
5	Vikasnagar/ Dehradun	Dev Bhumi Fal Evam Sabji Utpadak Krishak Samiti	SPD	DPD- Dehradun	Done	55,000.00
6	Vikasnagar/ Dehradun	Tamsa Ghati Fal Avam Shabji Utpadak Samiti	SPD	DPD- Dehradun	Done	1,00,000.00

Table 99: Status of Federations in Gramya I

Sl. No.	Gramya-I Divisions	Name of Federation	ABSO	Nodal UDWDP-II DPDs	Capacity building for revival	Revolving fund generated (Rs)
7	Gairsain/ Chamoli	Nanda Devi Swayat Sahakarita, Malsi	ATI	DPD- Tehri	Done	13,00,000.00
8	Gairsain/ Chamoli	Fal Evam Masala Swayat Sahakarita, Gairsain	ATI	DPD- Tehri	Done	17,00,000.00

2.6 Farmer Federations in Gramya II

Following on the success of cluster approach and creating farmer federations in Gramya I, GRAMYA II activities have also focused on forming Farmer Federation by organizing the FIGs and making them self-sustainable through institutional and capacity building support.

Under Gramya II, a total of 18 sustainable Farmer Federations are proposed to be formed till end of Project. Till March 2019, 12 FF have been established, 6 remaining FF are to be formed (including 3 at Uttarkashi). Out of the 12 federations formed, 8 have initiated business operations as of midterm and are involved in production or are in the various stages of start up in production, the details of which is given below;

Table 100: Farmers' Federation Status –Gramya 2

Sl. No.	Division	No. of Federations	FIGs	Farmers
1	Bageshwar	2	59	722
2	Pithoragarh	2	105	985
3	Vikasnagar	3	47	757
4	Pauri	2	193	1695
5	Almora	1	18	215
6	Thatyur	1	14	183
7	PMU	1	28	219
	TOTAL	12	464	4776

4.4.4 Community and Beneficiary feedback

i) Capacity Building Initiatives

From the Sectoral assessment process in MTR, all the members ascertained that Training on FIG formation, training of FIG/FF treasurers in Financial management and training on technical production has been completed. However, two thirds of the respondents were affirmative regarding training on value addition while for the rest, it is yet to be done. On being enquired as to the type of activity the FIGs were involved, all of them affirmed that they are involved in production. Almost all the respondents (97%) expressed that now group members have availability of improved seeds, agriculture tools which are helpful for them in response to the query about

benefits due to group activity.

ii) Savings of FIGS

From the sectoral assessment process, all the respondents were articulate that their group has the ability to function on the basis of financial contributions made by its members, the group maintains a set of records relating to their financial transactions, membership register and minutes book. There was transparency among the groups as the members have the freedom to check the financial records maintained in the group name. Democratic process is followed in the decision-making process in the group.

iii) FIG Production and sale

Production coupled with proper sale of produce is one of the most critical pointers to access the sustainability of the project implementation in terms of linkages established. It has been observed that, more than three fourth of the FIG members have knowledge about where to sell the OSVs cultivated. They are engaged in collective marketing and sell their produce at a better price. More than two third of the FIGs ensure that the members are aware of prices of agricultural products (fruits under cultivation and OSVs) in different markets. A majority of Group farmers have been able to improve production after joining the group. On analysing multiple responses from the respondents during the sectoral assessment of FIG, the respondents pointed out that majority of sale is on farm sale followed by Mandi and then local sale.

The following table reflects the Division wise production and sale

Table 101: Division wise FIGs' Productivity, Production, and sale						
S. no	Division	Area (ha)	Production (qt)	Quantity sold (qt)	Sale value (Rs)	Sale value (Rs in Lakhs)
1	Almora	237.7096	14021.15	10845.94	28154186.6	281.542
2	Bageshwar	284.564	23410.2	17815.4	37020978	370.21
3	Pithoragarh	410.318	36132.4	25709	47957015.6	479.57
4	Vikasnagar	233.226	12390	10702.8	15631412	156.314
5	PMU	72.365	1392.8	1101.85	4961760	49.6176
6	Rudraprayag	229.28	8510.2	5469.1	10646470	106.465
7	Pauri	166.31	4769.2	10933.7	14910876	149.109
8	Tehri	244.04	13529	10992.5	31787139	317.871
9	Uttarkashi	143.04	9603.9	8952.79	14600000	146
	TOTAL	2020.852	123758.9	102523.1	205669838	2056.698

4.4.5 Key Impacts

1. Increased membership of FIGs and inclusion of women

Earlier the women in the region were not organized into groups and were not involved in Agribusiness. After the implementation of Gramya II, women members showed their willingness to get involved with income generating activities. The Project staff organized series of meetings and initiated the organizing of women into groups. Currently, out of 15006 farmers organized into 1358 FIGs, 9137 are women which indicates 61% participation rate. This is a very good indicator of inclusion of women in agriculture and agribusiness activities. A stepping stone in the right direction as it will go a long way in term of organizing women, increasing their participation and finally their empowerment and sustainability.

Efforts of the Project staff pays off

Due to constant efforts of the Project staff, two FIGs were formed in GP –Chandeanu. One of the FIGs showed their willingness for Juice processing. The Project staff organized 2 days training on Buransh juice production. The FIG members learned the process of Juice processing, they understood the profitability in it, and decided to go for Buransh juice production as income generating activity for their FIG, thereby earning Rs 13,000 /- from their first sale. The FIG members are now becoming self-sufficient and confident. They have set example to the women members in nearby areas about the significance of being organized into groups.

2. Increased sale of products via integration with e-channels

In order to provide a thrust to the agribusiness, the produces, and products under Gramya –II are packed and marketed under the common brand name of ‘Gramyashree’. This brand has given an identity to the products and are sold through an outlet in Dehradun.

A real time reporting tool in the form of a mobile application - *Gramyashree Mobile App*, has also been developed to facilitate the marketing linkages through online marketing system. The mobile app has been pivotal in empowering the FIGs by direct selling of their harvested produce to vendors through Agribusiness Support Organization (ABSO). It supports the FIG to collect the production data through mobile App and create a structured database of the produce link between FIGs (seller) and vendors (buyers) at WMD level.

Table 102: Sale through Gramyashree App

Division	Sale value (in Lac)
Bageshwar	47.21
Vikasnagar	11.91
Almora	45.41
PMU	23.64
Pithoragarh	96.23
Rudraprayag	52.32
Pauri	24.87
Sub Total (A)	301.59
Sale through Outlets Sub Total (B)	2.45
Total (A+B)	304.04

As the table above shows, the total sale achieved by Gramyashree is Rs 3,04,04,000 of which little sale is achieved through the outlets and maximum sale through the mobile app.

The mobile app is real time business intelligence and the number of sales corroborate its success. Other speciality of app is that it works in remote areas, and low bandwidth environments. It reduces the operation cost and has better forecasting accuracy and yield management. Further, it ensures premium for certified farms/commodities and has efficiently increased internal control. Gramyashree Mobile App includes details pertaining to FIGs including Production details, Crop Details, Vendor Details, etc. The Impact of Gramyashree mobile application include;

- Vendors/Buyers registered - Till March 2019, the app has seen 238 registrations from vendors/buyers (refer Annexure Table 2 for details).
- Farmers registered in Gramyashree mobile app – Till March 2019, 13815 farmers in 1259 FIGs have been registered across all Divisions (refer Annexure Table 3 for details).
- Production details – Detailed production details, crop wise and season wise across all Divisions can be accessed through this app (refer Annexure Table 4 for details).
- Micro Finance- A overall amount of Rs 32172745 in 8 Divisions has been accessed through microfinance (refer Annexure Table 5 for details).

3. Improved access to weather and forecasting information

The farmers in FIGs are encouraged to register under the Gramin Krishi Mausam Sewa (GKMS) services provided by Indian Meteorological Dept. This way the farmers have wider access to weather forecasting to adjust their crops for efficient agribusiness. In 1052 Revenue villages 8801 farmers have registered for GKMS services. The service gives farmers access to information regarding weather and forecasting allowing them to adjust their crops & package of practices for better production. Regular SMS are sent to farmers for advice on critical cropping practices based on the crops grown, farm area and location. The following table reflects the status of GKMS;

Table 103: Status of Gramin Krishi Mausam Sewa (GKMS)

S. no	Division	No. of GP	No. of RV	No. of farmers Registered
1	Bageshwar	43	78	1623
2	Pithoragarh	63	147	1019
3	Vikasnagar	56	76	1783
4	PMU	7	23	282
5	Rudraprayag	61	107	1025
6	Pauri	62	175	509
7	Tehri	78	143	1148
8	Uttarkashi	68	120	328
9	Almora	87	188	1084
	TOTAL	525	1057	8801

4. Buyer seller meets for demand-based production

As an initiative in Gramya II, Buyer-Seller meets at Division level were planned and organized in all divisions. The main idea behind organizing the buyer–seller meets was to provide a common platform to Buyers and Sellers for viable market linkages and efficient supply chain management. This meet was a way forward as it is for the first time that the buyer and seller (FIGs) were able to interact and exchange their views through open discussion. The Buyer- Seller meet was successful in providing a common platform to both the parties. At the end of the discussions, the farmers had better understanding of demand-based production for effective marketing. Also, the farmers realized the significance of grading of the harvested produce. It was agreed by both Buyer and sellers that Collection centre are the integral part of Agribusiness, which shall be a way forward in establishing marketing linkages.

5. Economies of scale achieved through cluster-based approach

Cluster approach is being followed for promotion of Agribusiness activities and has been useful as it allows functioning collectively, lowering the production costs, delivery of inputs and movement of produce economically. For achieving economies of scale and developing compact supply chains, farmers were encouraged to adopt agribusiness activities in cluster of two to three villages. One or two crops were selected per cluster for bulk production so that effective models can be developed for dissemination of technology & collective marketing of the produce. Organising the produce in bulk for transport reduced cost and helped increasing farmers' income.

In hills, the land holdings are small, fragmented and irregular in size and shape. The *chakbandi* i.e. consolidation of land holdings has been adopted by the Govt. of India so that collective production can be facilitated but it has not been completely implemented. Under these circumstances, cluster approach can be a better substitute to achieve the desired goal. Cluster approach allows to function collectively and saves costs including transportation. The farmers are also encouraged to adopt the demonstrated interventions and the promising ones will be replicated in project area. It is expected to facilitate viable market linkages, efficient supply chain management and impetus on Agribusiness development.

Reaping success through Cluster Approach

In GP-Mohana, a group of farmers produced 604 qtl of cabbage under the cluster farming approach. The produce was marketed in Chakrata and nearby areas. The FIG got a sale value of Rs 9.00 lakh. The net profit the FIG was Rs 5.00 lakh. The farmers in the area have now understood the significance of cluster approach to reap better profit margin. Now many farmers have showed willingness to adopt cluster approach in coming years. Cluster approach seems to be the best approach that the farmers can adopt after being organized into FIG.

The ABSOs promote a cluster-based approach i.e. collective production allowing bulk production of produce. The cluster based farming approach helps in getting better price by producing in bulk and also achieve economies of scale in post-harvest processes, transport and marketing.

Clusters of different vegetables have been developed based on regional climate and market demand. e.g. capsicum cluster in G.P. Thik, Tehri and potato cluster in Bari Paniyali, Shama and Leeti GPs of Bageshwar division. In Bageshwar division, farmers are also cultivating Tomato and Potato in clusters of 4.2 Ha and 12 ha respectively. Hybrid varieties of both tomato and potato are utilized for increased production along with micro irrigation techniques, mulching, soil and seed treatment (*Trichoderma viridi*, *Buberia bassiana*), IPM and INM techniques (Solar light trap, *Trichoderma viridi*, *Buberia bassiana*, Vermi Manure, Bio fertilizer). In Thatyur over 100 ha of land is under cluster farming of different vegetables such as, Peas, Tomato, Cucumber, French Bean, Capsicum, Tuber crops, Ginger, Chilly and other Exotic vegetables such as Purple Cabbage, Lettuce, Broccoli, etc.

The cluster farming approach has also been helpful in reclaiming fallow land that was left uncultivated due to menace of wild animals like monkeys and wild boars. In these fallow lands, farmers were encouraged to grow spices, aromatic and medicinal crops that are not particularly damaged by wild animals. Farmers in villages Siri, Pothing, Chirabagar, Chetabagar and Sumgarh in Bageshwar division have cultivated ginger and turmeric crop in 4 ha of previously fallow land, In Kimu, Jhuni and Gasi, Kutki, Kala Jeera and Mahameda are grown in 4.5 Ha area. Along with increasing income of the farmers, the fallow land brought under cultivation has increased overall gross area under cultivation.

The cluster farming gives large volume for sale, and farmers (FIGs) are able to sell their produce in larger mandis through support of Federations. The price realisation in mandis as against local markets ranges from 10% to up to 30% for off-season vegetables.

6. Wider reach by adopting ‘watch and learn’ methodology

Demonstrations are a particularly powerful method to train farmers who are not generally conversant in understanding from reading documents and pamphlets. The demonstrations showcased important practices like mulching-covering the spaces between crops with grass or legumes to provide seasonal soil cover to protect bare land. Mulching helps conserve moisture, improve soil micro flora, reduce weed growth, regulates soil temperature, improves soil structure, fertility, saves cost and increases yield. Farmers can see how these practices work over time, ranging from one season to another and also over years. HYV seeds being distributed to the farmers through the input support and demonstrations. This has received good response and adoption by the farmers in and around the project area thus corroborating the success of ‘watch and learn’ method.

7. Establishment of Agribusiness Growth Centres

Traditionally, whatever the individual hill farmers are growing is not enough for marketing to the nearby *Mandis*. Farmers with surplus produce are not able to market it at a good price and also the infrastructure facilities available nearby to semi process- mill, grind, and grade and store their surplus produce are expensive due to low volumes. To address these issues, establishing Agribusiness Growth Centres has been helpful as it supports the farmers in exploring, developing, processing, marketing, knowledge sharing, information dissemination and financing of the bulk farm produce from the village clusters. The Agriculture Business Growth Centre centres established until Midterm are listed below:

Table 104: Growth Centre of Farmers Federations				
Division	Name of growth centre	Farmer's Federations	No. of RVs	No. of Farmers
Bageshwar	Shama	Danpur Kisan Ekta Swayat Sahakarita	44	380
Almora	Falyat	Dhauladevi Gramyashree Self Reliant Cooperative	31	126
Vikasnagar	Punah pokhri	Athgaon Phal Evam Sabji Utpadak Swayat Sahakarita	13	178
Thatyur	Khyarsi	Gramya Krishak Swayat Sahakarita	16	184
	Simar	Chandkot Navjyoti Swayat Sahakarita	135	1212
Pauri	Amohta	Tilu Rautali Swayat Sahakarita	58	483
PMU	Thano	Mallakoti Swayat Sahakarita	28	209
	Total		325	2772

The Growth centres are important as they provide input and output support facilities to the farmers in the nearby village cluster. There are 2772 members from the 7 federations linked to the growth centres. The maximum number of members are in federation in Pauri division (1212 & 483) followed by Bageshwar division (380). The Growth centres provide input and output support facilities to the farmers in the nearby village cluster. The following common facilities provided to the farmers;

7.1 Input, advisory and extension support

- i) Input delivery providing high yielding varieties of seeds, fertilizers, insecticides, and pesticides.
- ii) Mobile Soil testing facility
- iii) Animal health vaccination and A.I. facility.
- iv) Farm machinery bank run by the farmer federation/ FPO
- v) Advisory services to the farmers regarding value chain development.
- vi) Establishment of Kisan call centre
- vii) Enhancement in the skills of the farmers through trainings and orientation Programmes
- viii) Establishment of Agro met station.

7.2 Value addition, Marketing and Logistic Support:

- i) Facilitating market linkages through e-marketing and networking.
- ii) To create a platform to provide service providers for logistic support.
- iii) Grading and packaging services.
- iv) Solar dehydration facility.
- v) Storage facilities so that there are options for collective marketing of the farm produce.

These Agri-business Growth Centres have been established with institutional support of the UDWDP-II project. In terms of exit strategy, sustainability of the ABGCs will be ensured by handing them over to the Farmer Producer Organisations created by the project.

8. Better Pricing due to Production of Off-season Crops:

As a result of project interventions and support in terms of seeds, technology, post-harvest handling, marketing and above all, modification in crop calendar to produce off season crops, the farmers were observed to have been able to fetch better price in the market which has helped in increasing their income considerably. This trend is expected to continue in the coming seasons as well.

The increased price fetched by the farmers can be seen from the below data of Vikasnagar division.

S. No.	Crop Name	Change in Pricing (Rate Rs Per Qtls)	
		Before	After
1	Tomato	700.00	1800.00
2	Pea	1000.00	2500.00
3	Ginger	3000.00	4500.00
4	Potato	800.00	1500.00
5	French Beans	1800.00	2500.00

The table above shows that the price for off season vegetables has increased 1.5 times more than what was before project interventions. The farmers' earnings are thus increased by 50%.

9. Wider market reach through innovative marketplaces

ABSOs have also been successfully providing forward market linkages especially with identifying platforms and guiding FIGS wherever possible. This does not only help in sale of local products but also aids in generating marketing demand and brand building of various items, besides building farmers' confidence and developing entrepreneurship skills in them. The exhibitions and Haat bazars provide a suitable platform to the farmers where they can directly deal with the end user of their products and have one to one interaction with them helping them understand the customer demand, feedback, and also assess the real worth for their products.

Following this intellection, Vikasnagar division facilitated the participation of the FIGs at two exhibitions during the year 2018-19, i.e., one during Climate Change Summit at Forest Research Institute and Colleges, Dehradun during May 2018, and another at Raj Bhavan, Dehradun on 9th and 10 March 2019 on the occasion of Spring Festival. As a result of these exhibitions, sales worth Rs. 29,965.00 and Rs. 23,970.00 were respectively made. The exhibition at Raj Bhawan was inaugurated by Her Excellency, the Governor of Uttarakhand and was also attended by Shri Trivendra Singh Rawat, Hon'ble Chief Minister of Uttarakhand. The participation at such platforms also provides a state- and nation-wide exposure to the products and motivates the farmers to engage more enthusiastically.

OVERALL PROJECT LEVEL INITIATIVES UNDERTAKEN BY FIGS AND THE POTENTIAL IMPACTS ON PRODUCTIVITY

There are many pilot initiatives that have been undertaken in the Project area in different villages. The cost benefit analysis of these initiatives at the village is given below. Also, these initiatives are need based as well as region specific and undertaken with thorough research of markets and regional feasibility. Replication of the same as well as increasing its scale may not be feasible on a project wide scale. Although, the initiatives

that have proven successful in one division are being recommended in others places where possible. The potential impact of these activities if undertaken on a wider scale will be analysed further in the subsequent monitoring reports.

AGRI BUSINESS GROWTH CENTRES

The Agri-Business Growth Centres (ABGCs) are a significant initiative of the Uttarakhand Government that have been converged with GRAMYA II activities. The ABGCs intend to provide a centralised hub to farmers for post harvest management of produce like sorting, grading, packaging and processing. This will help in reducing the cost of these activities through economies of scale and also benefit in price realisation by collective marketing of produce.

Agribusiness Growth Centres have been helpful as it support the farmers in exploring, developing, processing, marketing, knowledge sharing, information dissemination and financing of the bulk farm produce from the village clusters. The seven Agriculture Business Growth Centre centres established until Midterm encompass 325 revenue villages covering 2772 farmers. The Growth centres are important as they provide input and output support facilities to the farmers in the nearby village cluster. The Growth centres are important as they provide input and output support facilities to the farmers in the nearby village cluster. There are 2772 members from the 7 federations linked to the growth centres. In terms of exit strategy, sustainability of the ABGCs will be ensured by handing them over to the Farmer Producer Organisations created by the project.

The Growth centre at Bageshwar has envisaged the following business plan for its first year of operations. A portfolio of products has been selected and the cost benefit analysis done to support in the selection of products along with market demand. The plan is to purchase local produce from farmers, add value through processing and sell under the Gramyashree brand. This will allow farmers to sell their produce locally and also provide employment to those engaged in the processing value chain.

Table 106: Expected Income Expenditure of ABGC Bageshwar								
Product	Raw Material (Kg)	Purchasing Cost (Rs per Kg)	Processing cost per Kg/Litre	Total cost	Quantity after processing (kg/Litre)	Price after processing per Kg/Litre	Total Sale value (Rs)	Total Benefit
Ginger Powder	900	110	4	102600	860	400	344000	211400
Turmeric Powder	2400	90	4	225600	2250	170	382500	156900
Kiwisquash	2500	80	84	221000	2500	160	400000	179000
Chilli Powder	1200	100	3	123600	1120	165	184800	612000
Malta Juice	800	30	60	720000	1000	100	100000	280000

Table 106: Expected Income Expenditure of ABGC Bageshwar								
Product	Raw Material (Kg)	Purchasing Cost (Rs per Kg)	Processing cost per Kg/Litre	Total cost	Quantity after processing (kg/Litre)	Price after processing (Rs per Kg/Litre)	Total Sale value (Rs)	Total Benefit
Buransh Juice	400	20	70	36000	600	80	48000	12000
Mustard Oil	500	35	3	19000	210	100	21000	2000

FLORICULTURE

Floriculture is a fairly unexplored avenue for earning higher income in the hilly regions. Under GRAMYA II, cultivation of flowers has been promoted and marigold cultivation has been initiated in Almora division and Lilium in Almora and Pauri division.

Marigold cultivation was demonstrated with 6 farmers (0.06 ha) of Almora division in 2018 and has now reached to 60 farmers (3.2 ha) in 2019. Marigold being a short duration crop, it is cultivated in two seasons, July-August and October-November. The cost benefit analysis for 2018 and 2019 for marigold crop is given below.

Table 107: Marigold production Cost benefit analysis					
Year 2018	Production Time	Area Sown (ha)	Sale Production (kg)	Rate (Rs/kg)	Sale Value (Rs)
	Jul-Aug	0.06	110	100	11000
Input Cost (Rs)					4200
Net Saving					6800
	Oct-Nov	0.4	790	80	63200
Input Cost (Rs)					28000
Net Saving					35200
Year 2019	Production Time	Area Sown (ha)	Sale Production (kg)	Rate (Rs/kg)	Sale Value (Rs)
	Jul-Aug	1.6	6311	70	441770
Input Cost (Rs)					224000
Net Saving					217770
	Oct-Nov	1.6	6300	80	504000
Input Cost (Rs)					224000
Net Saving					280000

Lilium is high value flower crop with high demand in urban markets like Delhi. The demonstration of growing Lilium was undertaken in 0.25 Ha (37500 bulbs) in Almora and 0.07 Ha (10000 bulbs) in Pauri. The cultivation of Lilium in PolyHouse has proved to be more profitable than cultivation of vegetables. With assured buyback linkages and technical assistance by the experts, the crop has given high profits in beginning.

The cost benefit analysis of Lillium cultivation in 0.25 Ha is given below:

Table 108: Lillium production Cost benefit analysis			
Items	Quantity	Total Cost (Rs)	Remark
Seed (bulbs)	37500 nos	937500	Costs for 2 seasons as the bulbs of Ist sowing are resown IInd time.
Fertilizer	DAP/NPK	25000	
Man power		200000	
Packaging	400 box	60000	
Transport	71250 sticks	80000	
	Total	13,02,500	
Flower Sticks	71250 nos @ Rs 40/sticks	28,50,000	5% spoilage is assumed
Net Saving		15,47,500	

In addition, about 150000 seed/bulb worth Rs. 37,50,000 are available for next 2 years produced.



MEDICINAL AND AROMATICS PLANT CULTIVATION

Echinacea is a medicinal plant important source of alkaloids and essential oils, which has huge demand in pharmaceutical industries. Echinacea was introduced and is being cultivated in the Dhaspad village of Pauri Division along with a buy back agreement from buyer. The cost benefit analysis of echinacea in this location is given below:

Table 109: Medicinal and Aromatics Plant Cultivation							
Year	Crop	Area (ha)	Annual Production (qt)	Total Sale	Cost of Production (Rs)	Net Profit (Rs)	Farmer nos
2016	Echinacea purpurea	0.6	33	198000	66000	132000	
2017			31.8	192000	0	192000	
2018			33.6	184000	0	184000	
3 Years	Total	0.6	98.4	574000	66000	508000	30
The potential increase in area and corresponding income is projected below:							
2019	Echinacea purpurea	1.6	96	576000	176000	400000	
2020			96	576000	0	576000	

Table 109: Medicinal and Aromatics Plant Cultivation							
Year	Crop	Area (ha)	Annual Production (qt)	Total Sale	Cost of Production (Rs)	Net Profit (Rs)	Farmer nos
2021			96	576000	0	576000	
3 Years	Total	1.6	288	1728000	176000	1552000	40

The above analysis shows that farmers can earn more than Rs 8.46 lakhs in 3 years from 1 Ha of land.

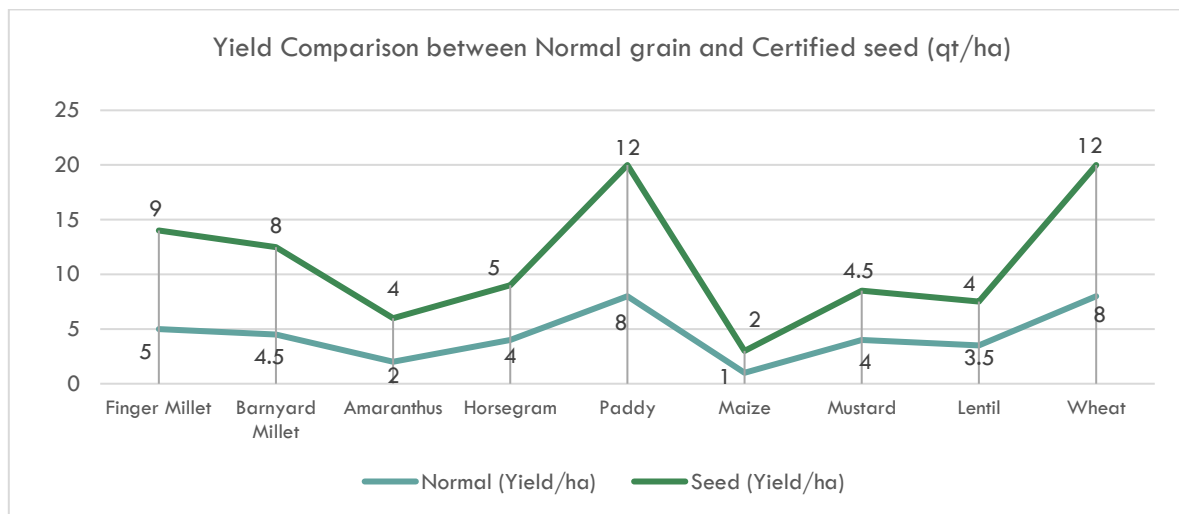
SEED PRODUCTION

In Bageshwar division, converged with buy back agreement with **UPL Advanta** company, Knol Khol seed production is being undertaken in 5 GPs (Gasi, Supi, Liti, Sama, Baripanyali). Seed plant was sown in 1.6 ha area and the cost benefit analysis of the same is shared below:

Table 110: Cost benefit analysis of seed production						
Name of crop	Area Ha	Production Qtls	Sale value	COC	Total benefit	No of farmers
Before						
Wheat	0.9Ha	19.8	33660	18000	15660	10
Potato	0.7 ha	73.5	132300	24500	107800	6
Total	1.6	93.3	165960	42500	123460	
After						
Knol Khol	1.6 Ha	25.6	640000	56000	584000	16

The above analysis shows that the cost of cultivation for seed crop is same as that of traditional crops. But seed production gives a premium in benefit and this activity has been able to provide farmers with 5 times more benefit when compared with the previous practice of cultivating wheat and potato in the same patch of land. If appropriate demand is available and buy back agreement possible, such seed production can be undertaken on a larger scale to give farmers more income. Additionally, local demand for seed can also be created and satisfied which will also help in providing locally adapted high yielding quality seed with better climatic resilience.

Certified seed production in Almora by Jagnath Krishi Beej Utpadak Sangh has produced 118.45 Qtls seed of Finger millet, Amaranthus, Horse gram, sorghum and Rice in rain fed condition during 2018-19. In Almora, seed replacement with certified seeds is achieved in 314.5 ha (1481 farmers) under Kharif and 286.9 ha (1009 farmers) under Rabi. The yield comparison of certified seed and normal seed given below shows the advantage of using quality seed for cultivation.



BAMBOO HANDICRAFTS IN ALMORA

Bamboo handicrafts are a traditional art form in rural Uttarakhand that was usually practiced in the winter months after sowing. The handicrafts are made from Ringal, a smaller species of bamboo grass. The bamboo is used to make containers, storage, mats, baskets, winnows (sieve used when the crop is harvested to clear impurities in grains), etc. One of the vulnerable group activity has been to produce Bamboo handicrafts for sale. The group has made various items such as Hanging Lamps, Table Lamps, Trays, Pen Stands, Dustbins, Tokris, Flower Basket and pots, Jewellery Box etc. for sale and have generated an income of Rs 2.4 Lakh in the first cycle of sale. The sale was done in Jageshwar Dham temple premise during Shravan months, Saras Fair Haldwani, Kisan Mela Almora and Pithoragarh, SSB Fair Delhi and Gramyashree outlet.



NATURE BASED AGRO & CULTURAL HERITAGE TOURISM DEVELOPMENT

Nature-based Cultural and Natural Heritage Tourism has been identified as one of the avenues for livelihood generation. Considering the existing high potential of the Jageshwar Dham, 3 villages in the area have been identified to develop 6 homestays and initiate some other income generation activities based on agro tourism, nature trails and heritage trails. These activities will provide a sustainable mode of livelihood especially for the local youth and also contribute in reducing the negative impact of heavy tourism on the biodiversity.

A two-day training programme was organized at Aartola for the interested youth of Jageshwar, Kujagunth and Dhaspad villages conducted by experts in the field.



OYSTER Mushroom production

Support for production of Oyster mushroom was provided to vulnerable group individuals in Pauri and Pithoragarh. In Pauri, 1 unit and in Pithoragarh 10 units are set up for oyster mushroom production. The unit in Pauri has savings of Rs 11700 till date from sale of 475 kgs of Oysters mushrooms in the local market.

The 10 units in Pithoragarh are marketing their produce to local markets as well as local hotels/restaurants. The 10 units have produced 2000kgs of mushrooms with an input cost of Rs 30440 and earned a profit of Rs 269560.

COMPREHENSIVE DEMONSTRATION PLOT IN BALTIR, PAURI DIVISION

Over 15 Ha of land belonging to 22 families in Baltir village was uncultivated for almost 4 decades. This fallow land was invaded by Lantana weed and cultivation had become impossible. Moreover, these thickets became a protected habitat for wild animals causing total depredation of whatever little produce was being grown under rainfed conditions in adjoining areas. Patchwork efforts were made by the aggrieved community to remove Lantana to contain the aggressive weed but it simply proved to be beyond their capacity and the efforts had to be abandoned.

Fortuitously, the plight of the community came to the notice of Gramya II team and they intervened to change the situation. Heavy earth moving machinery (JCB, etc.) were hired to uproot the extensive Lantana thickets and the land cleared of Lantana infested areas has been regraded into agriculture fields and provided with irrigation by conveyancing water from a perennial water source (Hatta Dewal) through a 2 km HDPE pipe line and creating on site storage consisting of one community irrigation tank of 50,000 L capacity and 4 MLCL/ LDP lined dug ponds having 18,000 L storage capacity. Further to conserve, water sprinklers have been provided initially over 1 Ha. In addition to agriculture, the project also envisages promoting commercial Pisciculture, Floriculture (3000 liliun and 35,000 gladiolus bulbs), growing off-season vegetables and horticulture crops (including 275 pineapple plants). Napier grass has been planted along the field bunds, which has shown good growth and can serve as a nursery for further propagation.

This reclaimed patch of land is also purposeful as farmer field school to show live demonstrations of the different initiatives being undertaken across the project. It is a replicable success story of converting 'green Lantana unculturable areas' into wide range of commercial crops with ready markets and this may be developed as one of the models that can be implemented in other project location.

Table 111: Comprehensive Demonstration Plot

Input / Expenditure details		Output / Income details		
S. No	Input Details	Expenditure details (Lakhs)	Output Details	Total Income (Lakhs)
1	Fisheries Pound	7.45	Fisheries (for 2 years)	6.00
2	Orchard establishment		Floriculture (Gladiolus and Lilium)	3.00
3	Floriculture (Gladiolus & Lilium)	1.67	Orchards (Peach, Citrus, Guava, Mango)	21.5

Table 111: Comprehensive Demonstration Plot				
Input / Expenditure details			Output / Income details	
4	Fisheries (Common carp & Grass carp)	0.024	Vegetables (Tomato, Capsicum, French Beans)	1.05
5	Medicinal plants cultivation (Satavar)	0.16	Spices Production (Ginger, Turmeric, Onion, Garlic)	1.5
6	Sprinkler system	2.46	Medicinal Plants (Satavar)	4.5
7	Poly house (45 sq. M and 100 sq. M)	2.07	Pine apple Cultivation	1.20
8	Vermi bed	0.088	Seedlings raising (Capsicum, Tomato, Brinjal, Cucumber, Chili)	1.5
9	Miscellaneous (seeds, fertilizers, manure, pesticides, labor etc.)	0.15	Total Annual Activities	18.75
Total		14.09	Total Orchards	21.5
Total Expenditure (Input): 14.09 Lakhs				
Total Income (Output): 18.75 Lakhs				
C:B Ratio: 18.75-14.09 = 4.7 Lakhs				



ROPEWAY FOR TRANSPORT OF PRODUCE IN THATYUR

There are 66 farmers associated with Gramya –II in this area who are engaged in cultivation of tomatoes, peas, beans, garlic and also have mango orchards. The agricultural fields are located 2.5 kms (in the valley) from the nearest road head. Each household has a mule or horse for carrying/transporting farm produce to the road head, from where it is sent to the nearest market at Vikasnagar in trucks etc. Each mule/horse carries four plastic crates weighing around 25kg and costs Rs 150 for one round. The average cost of transportation per crate comes out to be around INR 37.5 or INR 150 per quintal (or INR 37.5/crate). Transportation losses are high as the mules/horse have to go through difficult uphill terrain of the region. Moreover, the time taken for transporting one quintal of produce take around 45 minutes and one man’s labour.

To overcome this adversity, a ropeway was built to transport the produce from the farm to the road head. The installation cost of the ropeway was approximately INR 8.00 lakhs. The ropeway has a capacity to lift more than one quintal at a time over the distance and it takes around 60 to 80 seconds per run. A charge of INR 10/crate and INR 12 for small gunny bags is charged so 4 crates can now be transported for INR 4

instead of Rs 150 by mules. The intervention is being appreciated by local farmers and many have benefitted from the ropeway transport as it is cheaper and also time saving and enables produce to reach the markets in time.

The ropeway cost benefit analysis till date are shared below:

Table 112: Ropeway intervention					
SN	Commodity	Total quantity (Qtls)	Transport cost by Mules @200/ Qtls	Transport cost by Rope way @ 30 -45 Rs / Qtls.	Total saving by farmers (Rs.)
Year- July 2018- March 2019					
1	Mango	87	17400	2610	14790
2	Paddy	62	12400	1860	10540
3	Pea	36	7200	1440	5760
4	Other-agri input seed/ fertilizer etc.	28	5600	840	4760
5	Cement and other material	75	15000	2250	12750
	Season Total	288	57600	9000	48600
Year- March 2018-16 July 2019					
1	Garlic	9	1800	270	1530
2	Onion	24	4800	720	4080
3	Bean	42	8400	1890	6510
4	Tomato	448	89600	17920	71680
5	Capsicum	8	1600	320	1280
6	Cucumber	17	3400	680	2720
7	Mango	126	25200	5040	20160
8	Other input- seed/ fertilizer	14	2800	420	2380
9	Cement and other material	56	11200	1680	9520
	Season Total	744	148800	28940	119860
	Grand Total	1032	206400	37940	168460

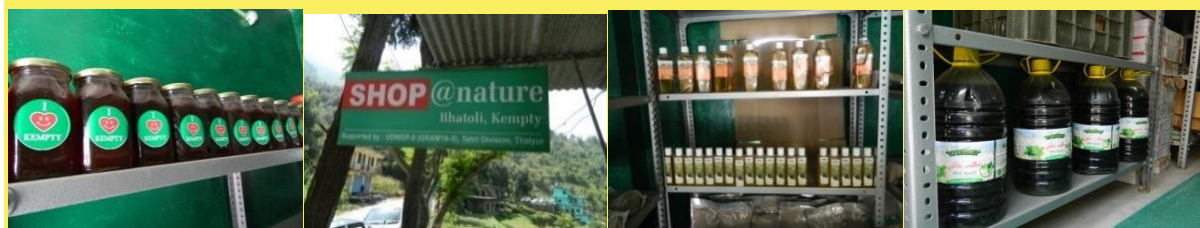
The FIG has also purchased 0.02Ha land adjoining the ropeway and that will be developed as a grading and sorting centre. Two individuals will also be employed for operating the ropeway from each end. Training on operation and maintenance will be provided to these people so that minor repair work can be handled on site.

Success Story 9: Adoption of Innovative Technologies & Business Development

Location: Thatyur Division Bhatoli Village FIG name: Jai Nag Devta, 12 members.

Traditionally the villagers were cultivating maize, beans (Red beans, mixed beans, and white beans), ginger and millets. Some houses rear honeybees in traditional boxes. The villagers follow a system of seasonal migration to different locations locally. Maximum time of the year they are present in middle altitude areas rather than hilltops or valley areas due to availability of road at Bhatoli. A farmer in the area, Mr. Ravinder Singh Rawat showed interest in opening an outlet here selling different items produced/processed and packaged by local FIGs. The products on sale include Sesame, Mustard and Wild Apricots oil, Cereal crops like Jhangora, Maize flour, Mandua flour and red rice (traditionally grown),Pulses such as Lentil, Rajma (Red, white, and mixed strains), Naurangi, Gehat, Urad (Packed in 1 kg packets with labels), honey collected locally from traditional beehives (in packages of half and one-kilogram bottles), Squash of Rhododendron and mint (prepared by FIG in Kyari) among others

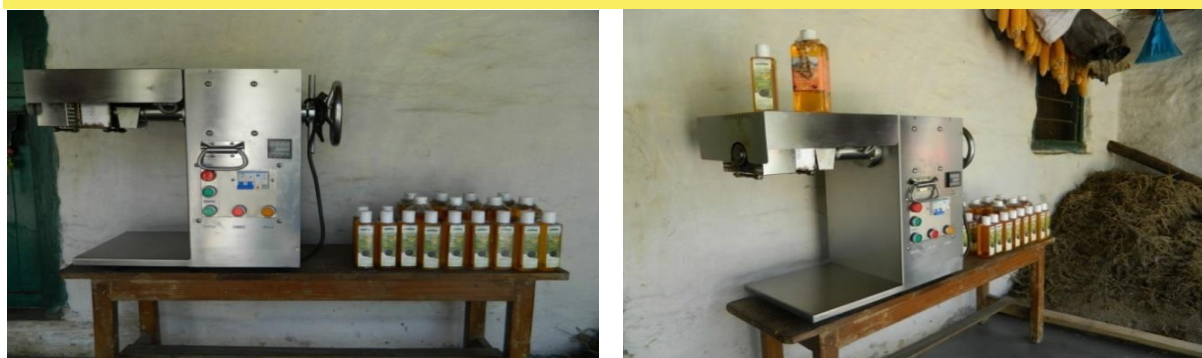
Polyhouse (10X30 feet dimension) is provided to the stakeholders on demand basis for nursery and cultivating vegetables. Apart from this strawberry cultivation trial in one Nali (200 sq. m land) with drip irrigation and mulching sheets was also undertaken in the area. Hanging pots have been provided to the stakeholder (200 numbers) for growing ornamental plants which can also be sold in the shop. Trials are also being conducted for Seeds of HYV of carrots, radish, Chinese pink radish, beet root, broccoli, colored capsicum, zucchini/summer squash, red cabbage as this produce is in high demand with tourists.



Success Story 10: Oil Extraction

Village Rampur, Nagyana Intervention: Oil Expeller Machine

Mr. Arjun Singh a beneficiary of the Gramya II project has been provided support to start oil extraction activity from Sesame and wild Apricot seeds. The area of Nagyana has number of wild apricots trees and also Sesame is cultivated in the region as it renders no damage from monkeys and wild boars. Villagers from the area travelled to Vikasnagar for oil extraction from mustard, sesame, and apricot where the exchange was often a barter system. For 1 kg of apricot kernels or sesame seeds, farmers received 700 gms of mustard oil. Not only the low returns, the farmers also had to spend time and money in travel to Vikasnagar.



As part of the project, an oil expeller (electrically operated) has been provided to Mr. Arjun Singh. For trial run of the expeller, around 24 kg of dried kernels of apricot were purchased locally at INR 120/kg and nine liters of oil was extracted from it. The machine has a maximum capacity of using 4 kg raw material in a single run. Presently Mr. Singh is purchasing sesame seeds from the villagers at INR 100-120/kg and wild apricot kernels at INR 120/kg for oil extraction purpose. Apart from this mustard oil is also extracted in the same oil expeller. The charges for extracting oil from 1 kg of mustard are fixed at INR 5/kg. Sesame oil is packed and sold at Gramya outlet at Bhatoli in packing of 400 Gms for INR 320 and 200 Gms bottles for INR 170. The packing and labelling material were also provided by Gramya project.

Villagers have benefitted from this intervention as their need of oil extraction is being provided for locally and has also provided income generating activity to the beneficiary Mr. Arjun Singh.

Success Story 11: Food Processing Unit

Gram Panchayat: Khyarsi; Village Kyari

Value addition to the produce is being promoted by the ABSOs in order to reduce the risk of spoilage and damage to fresh produce which is far more than that to processed items. Processed items also fetch better price than fresh produce and provide additional income to locals especially those not engaged in agriculture and also women. One such case study is of a women's FIG in Kyari village of Khyarsi GP.

The FIG has 16 members and is engaged in food processing. The FIG prepares squash of rhododendron and mint. Raw material for rhododendron squash is collected by the women from the forest area. These FIG members were given training in food processing in the village itself and an amount of INR 80,000 for purchase of equipment for starting up the food processing unit.



The women are very enterprising and along with squash production they are also engaged in production

of other items. In a previous season, the garlic produced in the village did not fetch a good market price so the FIG women made pickle out of it and sold it in the local market. Packaging and labelling material for the products are also provided by Gramya to the FIG. The FIG has a savings of INR 60,000 from the sale of its products this year.



Success Story 12: Floriculture Intervention

FIG name: Jai Durga FIG with 18 women members

Under Gramya project, a village near Jageshwar Dham was selected as pilot for floriculture activity. Flowers offered in the temple are currently brought from Haldwani and nearby areas. Marigold was selected for cultivation as it is easier to cultivate and requires very little technical knowledge. The flowers of marigold have better shelf life than most flowers and it can be grown throughout the year. Market for these flowers is Jageshwar Dham where the FIG members can sell these flowers at good price. Presently the women FIG is selling flowers to the temple authorities at INR 100/kg.

The FIG started with 9 members and has increased to 18 members. Marigold is cultivated in 22 Nali. The FIG was provided support through Gramya-II for farm tools and other agricultural equipment needed for cultivation and harvesting of the flowers. Savings in the FIG account amount to INR 9,500 with monthly contribution of INR 50 by each member.

It is suggested that the group can start cultivating other varieties of flowers and also explore newer markets for the flowers locally as well as outside the area.



Success Story 13: Innovative approach towards economic sustainability by FIG

FIG name: Jai Jagnath FIG, 11 women members

Jai Jagnath FIG was provided support by the District administration for making Prasad offered to the temple deities in Jageshwar Dham. Temple committee was also involved in this initiative and the FIG received training support from Hotel Management Institute, Almora to develop a quality product. The final product was prepared using locally available materials i.e. amaranths, sugar, fennel seeds and cardamom.

Gramya has assisted the FIG by providing utensils for making Prasad and packaging material. Presently the FIG is making packets of Prasad and selling it to temple committee for INR 15/packet, the temple committee is further selling it for INR 20/packet. Each packet contains 9 – 10 laddus. Similarly using grinded amaranths and sugar Panjiri Prasad is prepared, packed, and sold at the same price to temple committee.

Previously the temple authorities procured prasad from the mandi and other local markets, which was higher in price and which also included transport. This initiative has provided employment to the local women and also made quality product available to the temple locally. At the time of midterm, the FIG had a saving of INR 22,000 in their bank account.



Success Story 14: Certified Seeds Intervention

Jagnath Krishi Beej Utpadak Sangh, Aartola

Number of beneficiaries: 40

More than 90% area in this location is rainfed and with extreme climatic conditions. Certified seed production provides an opportunity for premium price and better returns per unit area and can be undertaken in rainfed areas with similar cultural practices as normal crop production. With this view, Seed Production Programme was introduced by Almora division Gramya II in the year 2015-16, and the Federation Jagnath Krishi Beej Utpadak Sangh got its Marketing and Production License from State Authorized Certification Agency in 2015. It was reconstitution and registered under Self Reliant Cooperative Act in 2017. The cooperative has 9 members in their Board, 154 members directly involved in seed production and benefited through the federation. The member beneficiaries are provided with breeder seeds which are planted and foundation seeds are taken. Further foundation seeds are planted to get certified seeds. The certified seeds are lab tested and then planted in the field.

Certified Seed Production Programme was initiated with procurement of Foundation and Breeder seeds of Irrigated Paddy, Finger millet, Ramdana (Amaranthus), Black Soybean and Horse gram from VPKAS, Almora, State Agriculture Department and TDC. Training of Farmers in certified Seed Production was undertaken to make them know the importance of the technicalities of the process regarding market, procedures, and prices at field level. During the year 2016-17 Rabi season 16 farmers from the FIG produced 2499 kg of seeds of Wheat and mustard but there was no production in case of lentil due to scarcity of rainfall. The total value for the produce was INR 85,008. In the year 2017-18 Kharif season 26 farmers from the FIG produced 11018 kg of seeds for Finger Millet, Barnyard Millet, Amaranthus, Paddy and Horse Gram for a total amount of INR 7,62,232.

The farmers earned a profit under this activity due to premier price for certified seed. The table below will give an idea about the pricing difference which resulted in increased income for the beneficiaries.

Table 113: Price difference between Normal and Certified Seed

Crop	Production (Kg)	Rate for normal grains (INR/kg)	Rate for certified seed (INR/kg)	Increased income (INR) or price difference
Finger Millet	7,308	15	49	2,48,472
Barnyard Millet	2,353	14	50	84,708
Amaranthus	600	60	280	1,32,000
Paddy	713	12	34	15,686
Horse Gram	44	100	210	4,840
Wheat	2419	17	32	36,285
Mustard	80	25	95	5,600



Success Story 15: Cluster Approach to Farming

Beneficiary- 10 farmers

Kwansi is one of the Units under Dehradun Division in Vikasnagar area with 16 Gram Panchayats forming part of the Decentralized Watershed Development Project (Gramya-II). Kunna is one GP in the area with a population of 391 persons comprising of total 73 households. The GP is situated 90 kms away from the Unit Headquarter in Kwansi at a height of 1700– 1722 meters above sea level.

Before project inception, the villagers mainly engaged in cultivation of traditional crops. Although cultivation of vegetable crops was also in practice, but on very small scale and unplanned manner. With the initiation of ABSO activities in the year 2017-18, the village was selected for bulk production of high yielding variety of crops under cluster approach. For this purpose, 10 farmers of the village having their land in Danda Tok of GP Kunna were mobilized and a cluster of 3.12 hectares of land was formed for cultivation of off-season pea crop. Fields were prepared and sown in the month of August 2017 with GS-10 a high yielding variety of peas. Complete technical support was delivered to the farmers by the ABSO team of experts for after care of the crops by providing organic fertilizers and spray of pesticides at required intervals. As a result of the efforts made by the farmers and complete technical support and monitoring by the ABSO team, the crop was ready for harvest by the end of October and early November 2017, which is an off-season period for peas. The peas were sold in the nearby Vikasnagar Mandi at a whopping price of Rs. 6000.00 per quintal. Having struck such a lucrative bargain from the crop, the farmers were pleased and have shifted to cultivation of High Yielding Varieties of vegetables. According to one beneficiary Shri Geeta Ram, “Gramya has shown us the right way of farming and brought a ray of hope in our live.”

Table 114: Economics of pea cultivation (success story)					
SN	Beneficiary Name	Land Pooled (ha)	Production (Qtls)	Total Output (in Rs.)	Net Profit (in Rs.)
1	Shri Manavir Doibhal	0.6	24	1,44,000.00	1,10,000.00
2	Shri Ajab Singh	0.4	16	96,000.00	80,000.00
3	Shri Babu Ram	0.3	12	72,000.00	60,000.00
4	Shri Geeta Ram	0.32	14	84,000.00	70,000.00
5	Shri Pyare Lal	0.28	11	66,000.00	50,000.00
6	Shri Sunil	0.24	10	60,000.00	42,000.00
7	Shri Suresh	0.2	9	54,000.00	40,000.00
8	Shri Deewan Datt	0.2	9	54,000.00	40000
9	Shri Kamla Das	0.18	8	48,000.00	34,000.00
10	Shri Baru Datt	0.4	16	96,000.00	80,000.00
Total		3.12	129	7,74,000.00	6,06,000.00

4.5 Environment and Social Safeguard

The project as part of its various components is undertaking a range of environment safeguard interventions such as afforestation, silvipasture, fuel wood plantation, agricultural diversification, introduction of high yielding varieties and social mobilization to name a few. Several of these interventions would have an impact on the environmental and social setting in the areas of influence. This chapter provides an overview of the environmental and social safeguards that are triggered by the project in context of the interventions planned, institutional arrangements that are in place for implementation of safeguards, key environmental and social results and appropriate suggestions.

The Himalayan region stretches across states in the western and eastern Himalayas and provides critical ecosystem services for communities in mountains and downstream plains. This region is highly vulnerable due to geological factors, stress caused by exploitation of natural resources, increased population pressure and other related challenges. These effects are likely to be exacerbated due to the impact of climate change, which is set to adversely impact the Himalayan ecosystem through increased temperatures, altered precipitation patterns, episodes of drought and biotic influences.

The state of Uttarakhand is highly vulnerable to climate-mediated risks. According to the Intergovernmental Panel on Climate Change (IPCC), impacts are expected to range from reduced genetic diversity of species to glacial melt in the Himalayas leading to increased flooding that will affect water resources within the next few decades. Some of the reported climate change induced impacts include receding glaciers and upwardly moving snowline, depleting natural resources, erratic rainfall, irregular winter rains, advancing cropping seasons, fluctuations in the flowering behaviour of plants, shifting of cultivation zones of apple and other crops, reduction of snow in winter, rise in temperatures, increasing intensity and frequency of flash floods, drying up of perennial streams etc.¹⁶.

The social fabric of the state too is complex with variations across rural and urban areas and hills and plains. The population of the state as per Census 2011 was 100.7 Lakhs with 70 percent residing in rural areas and 50.9 percent being male. Of the 13 districts in the state, 10 are categorized as hill districts and account for 48.1 percent of the population. However the growth of population in hill areas at 0.7 percent is much lower than the plains where it is around 2.8 percent. This points towards the fact that the growth in plains is being fuelled by migration of the population from hill districts leading to an increasing divide between the hills and plains in several outcomes.

There is significant variation in indicators related to gender. For instance the sex ratio for the state as a whole is 963. However on closer study it can be seen that the sex ratio in hill areas is much higher at 1037 compared to plains at 900. Similarly the Work Participation Rate (WPR) for females is 26.6 percent for the state as a whole, but much higher at 39.3 percent in case of hill areas. Research confirms that women residing in hill areas of Uttarakhand show a high inclination to participate in natural resource schemes and in fact form the backbone of the farming system in the state¹⁷.

Scheduled Caste (SC) and Scheduled Tribe (ST) population together comprise over 21.6 percent of the state population. A key vulnerable group unique to the Indian hill states comprises of transhumants, who are full

¹⁶ State Action Plan on Climate Change- June 2012

¹⁷ Social Development Status Report- UDWDP II

time nomads and settled farmers who take their livestock to summer pastures. *Gujjars* and *Bhotiyas/Anwals* are the primary communities practicing transhumance in Uttarakhand and keep mixed flocks namely sheep, goats, buffaloes and cattle etc. for wool, meat and milk purposes.

Considering the fragile bio-physical and socio-economic fabric of the region, an Environmental and Social Management Framework (ESMF) was developed. It provided for mitigation measures developed based on experience from previous projects, especially the UDWDP I. The purpose of the development and application of ESMF is to ensure that the impacts of project interventions are environment-friendly, socially acceptable, economically feasible and sustainable.

The ESMF developed and adopted during the first phase of the project (UDWDP I) was reviewed and based on the experiences gathered an Environmental and Social Code of Practices (ESCP) was developed for UDWDP II. The environmental and social guidelines were made an integral part of the project planning process. A number of plans are being developed as part of the project including the Revenue Village Committee (RVC) Plans, the Gram Panchayat Watershed Development Plans (GPWDP) and the Transhumant Action Plans (TAP). Capacities of stakeholders responsible for development of these plans including community members were developed on environmental and social guidelines so as to ensure that the plans that they developed met the basic requirements. The RVC proposals and TAPs therefore follow the ESMF and conform to the ESG.

Environmental and Social Safeguards

The project does not envisage any significant, irreversible impacts due to the small scale of the proposed interventions. The interventions would in fact yield positive environmental and social impacts if planned, implemented and designed with environmentally and socially sound practices. It is in this context that relevant safeguards have been triggered. The environmental and social safeguards triggered by the project are summarized as follows.

Safeguard Policies	Description	Applicability
Environmental Assessment (OP 4.01)	Environmental Assessment (EA) evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. EA takes into account natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources);	Applicable as watershed-related interventions if improperly planned, designed and/or implemented could adversely impact the hydraulic and geological regime in the area. As several inter-related interventions are being implemented there could be a cumulative impact of these. Temporary adverse impact may also be caused due to improper construction or other practices leading to long-term slope instability, changes in surface water flow, improper disposal of debris or changes in water availability.

Safeguard Policies	Description	Applicability
	and trans-boundary and global environmental aspects.	
Natural Habitats (OP 4.04)	Bank's economic and sector work includes identification of (a) natural habitat issues and special needs for natural habitat conservation, including degree of threat to identified natural habitats (particularly critical natural habitats) and (b) measures for protecting such areas in context of country's development strategy	Applicable as the project include silvopastoral activities which may affect habitats or important species.
Pest Management (OP 4.09)	The objective of this policy is to promote use of biological or environmental control methods and reduce reliance on chemical pesticides	Applicable as improvement of farming and livestock systems would require pest management for crop and livestock protection. Inappropriate application of techniques on pest management may cause harm to the environment, including humans and Livestock.
Physical Cultural Resources (OP/BP 4.11)	Physical cultural resources component includes (a) an investigation and inventory of physical cultural resources likely to be affected by project; (b) documentation of significance of physical cultural resources; and (c) assessment of nature and extent of potential impacts on these resources.	Applicable as while important cultural resources have not been identified in the project area, an increased focus on agri-business could lead to construction activities near settlements.
Indigenous Peoples (OP/BP 4.10)	This policy refers to a distinct, vulnerable, social and cultural group such as Scheduled Tribes or Tribal Folks. People who have lost collective attachment to geographically distinct habitats or ancestral territories in project areas because of forced severance remain eligible for coverage under this policy. Majority of tribals are socially and economically weak, prone to vulnerability and often feel excluded from development initiatives.	Applicable as the local population including tribal and transhumant benefit from the project.
Forest (OP 4.36)	The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global	Applicable as the project area is largely reserved and protected forest and activities would affect the health and quality of forests.

Safeguard Policies	Description	Applicability
	environmental services and values of forests.	

4.5.1 Project Interventions

Certain core principles have to be followed while addressing various social and environmental issues arising as part of the project. These principles are summarized in the following table¹⁸.

Principle	Description
Environment	
Using indigenous practices for natural resource management	Efforts should be made to use indigenous practices so that local skills can be protected and promoted and employment can be generated.
Ensuring source sustainability	Emphasis should be laid on ensuring source sustainability so that there is assured availability of water for domestic and irrigational use.
Undertaking repairs using traditional methods	Repairs of traditional water sources (Naula) should be done using traditional methods only so that their capillaries do not get sealed.
According preference to local endemic species	Local endemic species serving multiple purposes (fodder, fuel wood, fibre, fruits and fertilizer) should be given preference over exotic species.
Reducing man animal conflict	Wild fruit plants and local shrubs and grasses should be given preference for plantation as part of forestry activities so as to reduce man animal conflict.
Undertaking environmentally friendly technological interventions	Technologies should be introduced only after an assessment of their environment friendliness, effectiveness and sustainability.
Using alternative energy sources	With a view to reduce dependence on forests for fuel wood alternative sources such as bio-gas, solar devices, gharats etc. should be promoted.
Using loose boulders for construction	Quarrying of stones prior to construction of any structure is prohibited. For drainage line treatment engineering structures should be constructed through boulders/stones lying alongside the line.
Social	
Consulting with vulnerable groups	Members of vulnerable groups should be consulted regarding project activities so that their livelihoods are safeguarded and promoted.
According important role to women	Women play a pivotal role in natural resource management and therefore should be given a key role in planning, implementation and monitoring processes. A related aspect is that it has to be ensured that Women Aam Sabhas are formed and their proposals are appropriately included in the GPWDPs.
Obtaining consent for land use	Individual or community land can be used for construction purpose with the consent of beneficiaries/ Gram Panchayat. Land should not be donated to the project and ownership should be retained with beneficiaries/ Gram Panchayat.

¹⁸ UDWDP II- ESMF

Principle	Description
Implementing Transhumant Action Plans (TAPs)	TAPs have been developed as part of the project and these aim to improve transhumant quality of life and also improve livestock. These plans are to be implemented

Safeguard Strategies related to Agricultural Interventions

Agriculture is one of the focus sectors under this project, with interventions including introduction of high yielding varieties (HYV) and off-season vegetables cultivation. Specific strategies have been adopted with the intent of facilitating the use of chemicals, where inevitable and ensuring that this is optimized as was done during UDWDP I. A summary of the specific strategies is provided as follows.

Strategy	Description
Integrated Plant Nutrient Management (IPNM)	System where in the overall nutrient requirement of a crop is assessed on the basis of soil test crop response and accordingly nutrients are supplied. Assessment practices under IPNM helps farmers to know the exact nutritional requirement for a given crop.
Integrated Weed Management (IWM)	Combination of mechanical, cultural, manual, biological and chemical method of weed control. Potential yields of any crop can be obtained only when the weeds are properly managed. Weeds compete for moisture, nutrients, space and they act as hosts for many pests and disease.
Integrated Pest and Disease Management (IPDM)	Management tool for pests and disease management, where in mechanical, cultural, biological, chemical, use of resistant varieties, and quarantine methods are carefully combined to keep pest and diseases at below economic injure levels to obtain optimum crop yields.

4.5.2 Implementation Arrangements

The Environmental and Social Guidelines (ESG) have to be an integral part of the GPWDP and sub-projects. The implementation of these guidelines spans across levels and can be categorized into four stages which are depicted in the following exhibit.

Stage	Responsibility	Activity	Target Group	Outcome
I	Environmental and Social Assessment (ESA) cell of WMD, MDT/PNGOs/ FNGOs, Village Level Institutions	Imparting training on environment and social issues to be considered in the project	Village, district, state level project functionaries Members of WWMC, formal and informal institutions and transhumant	Village community is aware of ESG and capable of applying ESG to process RVC Proposals. Similar outcome on action plan for transhumant
II	Gram Panchayat level (WWMC), MDT/PNGO, FNGO	During PRA exercise undertaken by RVC / transhumant proposals for activities to be undertaken will be put forth. Each sub-project/ activity will be screened using Format 1-a (Criteria for exclusion of sub-projects/activity) & 1-b (Criteria for limited ESA of sub-projects/activity) Subprojects / activities selected after screening using Format 1 (b) will be subjected to ESA. This exercise will result in inclusion of mitigation measures to reduce or eliminate negative impacts. These sub project/activities will be incorporated in GPWDPs		Draft GPWDP and action plans for transhumant follows the ESCP and conforms to ES Guidelines
III	DPD/PD	Financial approval to Draft GPWDP of WWMC of GP and action plan for transhumant will be granted after its review. If it is found to not-conform to guidelines the plan will be referred back to WWMC/MDT with observations and suggestions WWMC of GP /MDT and the transhumant will incorporate required changes Field appraisal of GPDWP/Transhumant Action Plan will be completed within 15 days of receipt by DPD office		GPWDP/action plan for transhumant approved in compliance with ESG
IV	MDT, DPD/PNGO, GP, RVC, VP, UG, SHG, M&E Consultant, PD, WMD	Adoption of draft appraised GPWDP by WWMC of Gram Sabha GP will implement GPWDP with assistance from MDT/PNGO/FNGO WWMC may itself monitor or authorize RVCs to monitor processes and impacts at village level		Attainment of project objectives in conformity with ESCP and ESGs and learning for improvement in future

Figure 11: Implementation arrangements

Grievance Redressal Mechanism

Grievance Redressal Mechanism (GRM) is one of the important tools for project management which helps record and address the key issues faced by the community and other project stakeholders. The grievance redress process is continuous, transparent and participatory and is an integral part of the project’s accountability and governance agenda. The institutional arrangements designed for recording and resolution of grievances under UDWDP II are depicted in the following exhibit.

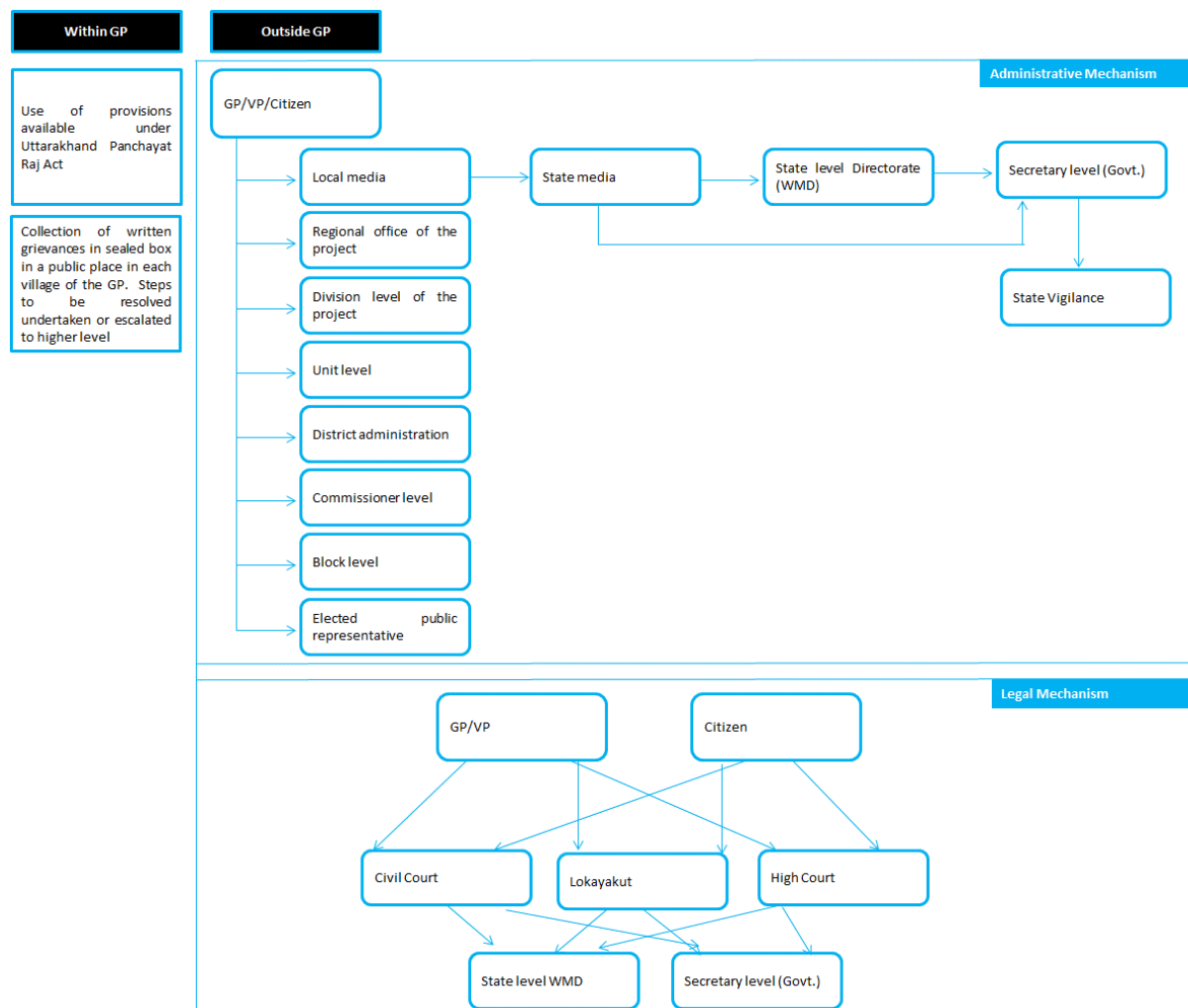


Figure 12: Grievance Redressal mechanism

The various trainings and capacity building exercises conducted as part of the project have been effective and have resulted in heightened participation of community members. They have started using the various forums such as meetings to discuss activities and plans in a threadbare manner and discuss anticipated issues and concerns. This is expected to have a positive impact on the overall satisfaction level with the project as community involvement at all stages would ensure that there is less chance for complaints and grievances.

4.5.3 Key Results

The ESMF for the project lays down a set of monitoring indicators for assessing environmental and social effects. The status of key monitoring indicators is discussed as follows.

Area Covered under Afforestation

The project aims to cover additional area through afforestation measures. The project has covered an area of 3597 ha through afforestation (1000 plants/ha). In addition, 25 ha have been covered under inter GP Fund in Reserve Forest areas and 2 ha in inter GP areas. The total area covered under afforestation is 3624 ha which is 85 percent of the end project target of 4263 ha.

Table 115: Area covered under afforestation				
Component Activity	Unit	End of project target	Progress till MTR	Progress (%)
Afforestation (1000 plants/ ha.)	Ha.	4263.0	3597.0	85.0
Afforestation - Inter GP Fund in RF Areas	Ha.	-	25.0	-
Afforestation - Inter GP Fund in GP Areas	Ha.	-	2.0	-
Total		4263.0	3624.0	85.0

Assisted Natural Regeneration (ANR) is a method for enhancing the establishment of secondary forest from degraded grassland and shrub vegetation by protecting and nurturing the mother trees and their wildlings inherently present in the area. It aims to accelerate, rather than replace, natural successional processes by removing or reducing barriers to natural forest regeneration such as soil degradation, competition with weedy species, and recurring disturbances (e.g., fire, grazing, and wood harvesting). The area under ANR of Oak areas, inter GP Fund in Reserve Forest areas and GP areas is 210 ha which is 82.4 percent of the end of project target of 255 ha.

Table 116: Assisted Natural Regeneration of Oak Areas				
Component Activity	Unit	End of project target	Progress till MTR	Progress (%)
ANR of Oak Areas	Ha.	255.0	95.0	37.2
ANR of Oak - Inter GP Fund in RF Areas	Ha.	-	115.0	-
ANR of Oak - Inter GP Fund in GP Areas	Ha.	-	0.0	-
Total		255.0	210.0	82.4

Fodder Production

Napier grass is one of the important perennial tropical forage crops belong to family Poaceae. It is mainly used as a fodder crop and is fed directly to livestock or converted into silage or hay. It produces biomass and can be harvested multiple times in a year making it a good raw material for biofuel production. Napier grass is planted in marginal lands and slopes to increase soil fertility and to reduce soil erosion. The progress with respect to Napier crop border plantation has been exceptionally good with plantation of 299.2 Ha as compared to an end target of 274 Ha, an achievement of 109 percent.

In terms of forage row plantation, the progress at the mid-term review stage is around 85 percent of the end target. The cumulative achievement under the fodder plantation target is 99.6 percent of the end target which is largely due to the performance with respect to Napier crop border plantation.

Table 117: Fodder Plantation

Component Activity	Unit	End of project target	Progress till MTR	Progress (%)
Napier Crop Border Plantation	Ha.	274.0	299.2	109.2
Forage row plantation	Ha.	181.0	154.0	85.1
Total		455.0	453.2	99.6

Effort for Fodder Collection

Interventions for enhancement of fodder production are expected to result in reduction of effort and energy involved in collection of fodder. This is especially in case of women who are typically responsible for such activities. Over 87 percent women interacted with in course of a sample survey indicated that they now found it much more convenient to collect fodder and take care of animals. Over 44 percent respondents indicated that there was a high level of availability of fodder at their door step and over 43.6 percent reported that the quality of fodder was good.

Forest Fire Management

The state Forest Department statistics reported that Uttarakhand lost 4538 hectares of vegetation to forest fires in 2018, incurring a loss of Rs 86 lakh in the process. Keeping in mind the extent of damage caused by such fires, the project included interventions for creating better preparedness against forest fires. An activity proposed to be undertaken as part of the project was training at the village on forest fire management. Forest fire training are being done by the Forest Department in the respective regions and GRAMYA II's role is to contribute as need be. Until now, no trainings have been demanded by the locals.

Table 118: Forest Fire Management

Component Activity	Unit	End of project target	Progress till MTR	Progress (%)
Village level training on fire management	No.	Lumpsum	0	-

Despite the lack of trainings, 26.7 percent respondents in sample survey stated that fire protection measures were good and 73.3 percent mentioned that these were average. Around 33.3 percent of the respondents mentioned that no instances of forest fires were reported.

Practices for Handling Drugs and Pesticides

There are a number of practices that need to be followed while handling drugs and pesticides. These include use of protective gloves, shoes and clothes and nose masks, washing after use of pesticides, washing protective clothing, proper storage of pesticides and proper disposal of pesticides. A relatively small proportion of project farmers were found to be utilising chemical drugs and pesticides in the farms. Of these 7.6 project farmers used protective gloves, shoes and clothes; 10.2 percent used nose masks; 14.3 percent washed after use of pesticides; 12.4 percent washed their clothes after usage of pesticides; 3.4 percent stored pesticides properly and 9 percent disposed pesticides properly.

Mulching Practices

The project makes special effort to promote use of crop residue as mulches. Around 14.3 percent of farmers reported that they had used organic mulch in any crop in the last cropping season.

Utilisation of Non Chemical Applications (Bio Pesticides)

Among the key principles guiding the implementation of the pest management plan is the promotion of biological pesticides and reduced reliance on synthetic chemical pesticides. The usage of bio-pesticides in crops in the last cropping season was reported to be around 9.2 percent as per the sample survey. The highest usage was reported in Dehradun (24.9 percent) and lowest in Tehri (0.4 percent). It is evident that there is scope for creating further awareness and training on usage of bio-pesticides among farmers.

Usage of Bio-Compost

Usage of bio-compost was reported in any crop in the last cropping season by 50.6 percent of project farmers. The highest usage was reported in Dehradun (67.4 percent) and the lowest in Tehri (25.5 percent). Similar information was sought from farmers in a control sample and it was found that only 21 percent farmers had used bio-compost. There was therefore a 29 percent difference between project and control farmers.

Division/District	Project		Control	
	Yes (%)	No (%)	Yes (%)	No (%)
Almora	51.3	48.7	40.6	59.4
Bageshwar	65.0	35.0	35.5	64.5
Dehradun	67.4	32.6	29.4	70.6
Dehradun-II (PMU Model)	44.9	55.1	4.8	95.2
Pauri	41.3	58.7	14.9	85.1
Pithoragarh	58.1	41.9	0.0	100.0
Rudraprayag	41.3	58.7	0.0	100.0
Tehri	25.5	74.5	0.0	100.0
Uttarkashi	62.0	38.0	16.1	83.9
Total	50.6	49.4	21.0	79.0

Adoption of Soil Moisture Conservation Measures

The adoption of various natural resource conservation measures, namely vegetative boundaries, terraces, diversion drains, bunding and trenching. The results of the survey indicate that a higher proportion of project farmers adopted these measures. The most commonly followed method by project farmers was bunding (41.9 percent), followed by Napier plantation (39.7 percent). Over 89 percent project farmers reported that they had adopted at least one of the natural resource conservation measure.

District/Division	Project							Control						
	Vegetative Boundaries	Terraces	Napier Plantation	Diversion Drains	Bunding	Trenching	At least one SWC	Vegetative Boundaries	Terraces	Napier Plantation	Diversion Drains	Bunding	Trenching	At least one SWC
Almora	26.0	30.7	39.7	27.3	30.1	23.3	86.7	3.3	4.2	5.4	9.6	5.0	4.2	19.2
Bageshwar	29.0	35.6	34.6	30.4	30.6	27.0	88.0	3.9	5.3	5.3	9.2	3.9	2.6	18.4
Dehradun	26.2	27.6	39.9	40.9	47.8	38.2	88.4	7.8	7.8	9.8	24.5	27.5	21.6	47.1
Dehradun-II (PMU Model)	22.4	20.4	44.9	32.7	32.7	26.5	93.9	2.4	4.8	23.8	28.6	33.3	23.8	52.4
Pauri	31.8	39.0	49.6	60.6	59.4	50.8	91.7	32.2	31.0	17.2	46.0	46.0	42.5	54.0
Pithoragarh	45.3	32.2	38.8	33.9	28.4	24.6	87.2	3.9	5.3	5.3	0.0	0.0	3.9	10.5
Rudraprayag	34.7	35.4	37.7	43.5	45.9	36.6	90.3	12.0	14.7	4.0	17.3	20.0	22.7	42.7

District/Division	Vegetative Boundaries	Terraces	Napier Plantation	Diversion Drains	Bunding	Trenching	At least one SWC	Vegetative Boundaries	Terraces	Napier Plantation	Diversion Drains	Bunding	Trenching	At least one SWC
Tehri	27.0	34.0	37.2	48.2	53.5	49.6	92.6	18.2	18.2	9.1	18.2	18.2	18.2	45.5
Uttarkashi	35.3	28.9	41.2	41.7	56.1	39.6	90.4	12.5	10.7	8.9	22.5	35.0	22.1	48.2
Total	31.2	33.3	39.7	39.6	41.9	34.6	89.2	9.8	9.9	8.6	18.7	21.5	16.7	36.1

4.5.4 Community Feedback

Community members are a pivotal stakeholder group in the project and play a critical role at all stages, from planning till monitoring. It is therefore crucial to ensure that they have an understanding of the Environment and Social Guidelines of the project and are able to conduct their activities in line with the mandate of these guidelines. As part of the project’s monitoring strategy, periodic Participatory Monitoring and Evaluation (PME) activities are undertaken by community members. PME has been introduced for ensuring community involvement in tracking, monitoring and evaluation of project activities.

As part of the third round of PME which was carried out between 2017 and 2018, an assessment of awareness of community members on key project features and systems was undertaken. A specific indicator that was tracked as part of this exercise was the proportion of community members who were aware of screening of GPWDP activities on the basis of ESMF guidelines. It was heartening to note that nearly 86 percent of respondents were aware of these aspects. A slightly higher proportion of male respondents recorded awareness (88.4 percent), compared to female respondents (83.7 percent).

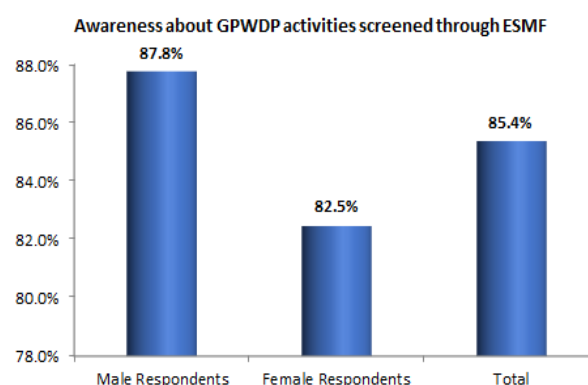


Figure 13. Awareness about GPWDP activities screened through ESMF

4.5.5 Impacts

The ESMF and corresponding ESG focus upon ensuring that interventions are planned and undertaken in an environmentally and socially sustainable manner. There is a clear focus on adopting practices that are locally relevant and contribute towards overall socio-economic development. The project adopts a highly participatory approach, involving communities in planning and designing of plans that conform to the ESG. Importantly, women form a core stakeholder group and are able to ensure that their voices are heard through institutions such as the Women Aam Sabha. Women centric plans are developed and incorporated in the GPWDPs thus ensuring that specific steps are taken to address their requirements. The project also emphasizes the need to improve the condition of transhumants and ensure that they are able to access basic facilities such as healthcare and education to the extent possible during their period of residence in project areas.

While the project is ensuring that the ESMF is adhered to and ESG are followed while undertaking various interventions, there is a need to maintain this focus going forward as well. As the project reaches a mid-term stage, it is important to initiate refresher trainings on ESMF and related aspects for project staff and other stakeholders including the community. Data suggests that while recommended practices related to usage and handling of pesticides are being followed to some extent, it is far from being adequate. Similarly there is a need to focus on adoption of bio-pesticides and other environment friendly applications. Efforts are being made to support transhumants and there is a need to institutionalize these so that they sustain beyond the project cycle.

4.6 Institution Development and Capacity Building

UDWDP-II draws from the learnings of previous project giving greater emphasis to community participation and community ownership. The project is built to develop greater ownership, planning and management by community through participatory approach involving all stake holders at Gram Panchayat (GP) level. The project staff and project partners (Facilitating NGOs, Partner NGOs) have a facilitating role to facilitate community regarding planning, implementation and management of the project.

Institutions at various levels have been created to promote the above fundamental principles at community and state level. These institutions were strengthened by building the capacities on variety of thrust areas ranging from natural resources management, agriculture systems development, skill development, livelihood enterprise development, gender sensitization, governance, legal issues and general awareness building.

Institution building for creating various community based groups for collective working and smooth implementation of the activities has also been the focus area of the project. For this purpose, the FNGO and PNGO field staff have facilitated in the formation of various institutions and groups, such as Water and Watershed Management Committee (WWMC), Revenue Village Committee (RVC) and Farmers' Interest Groups (FIG's) across the divisions.

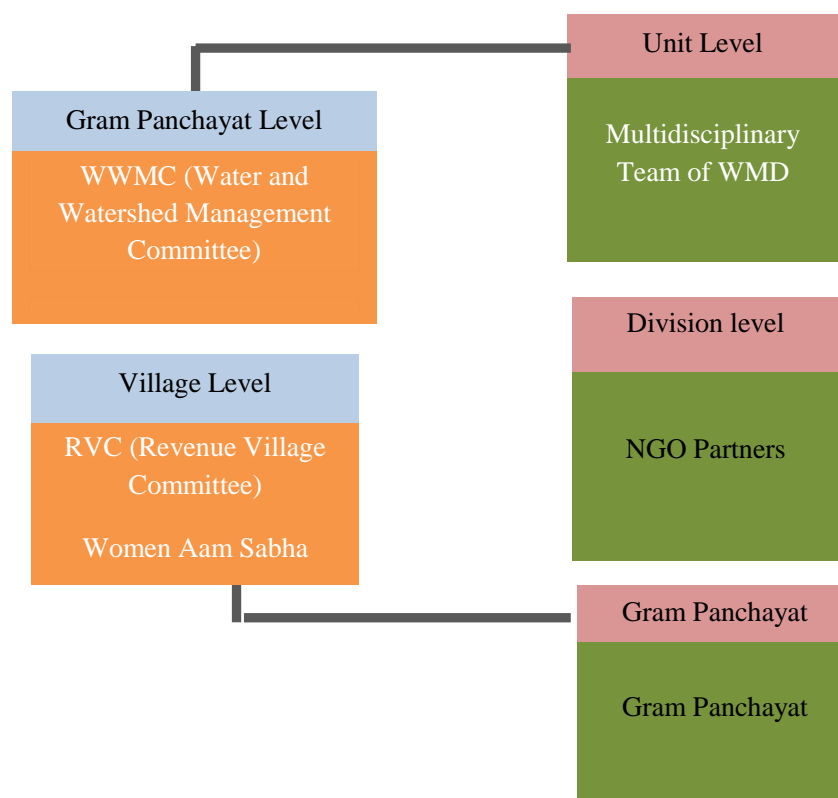


Figure 14: Institutions under Gramya II

The institutions and the stakeholders whose capacities are built have been entrusted with roles and responsibilities which have been an enabler in the smooth and effective implementation of the Project. The existing institutions were strengthened and the newly formed institutions were capacitated. The institutions

at the level of community include the officials working at Gram Panchayat and Village level including the ABSOs and FNGOs. The institutions at the level of state include the officials and the committees formed for implementation of the project.

Capacity building measures particularly at Gram Panchayat level have been aimed towards building the capacity of the institutions in project management and social accountability, in particular preparing and implementing Gram Panchayat Watershed Development Plans (GPWDPs).

4.6.1 Community Level Institutions - Roles and responsibilities

Gram Sabha-Approves key decisions related to GPWDP, ensure inclusion of disadvantaged groups; women, poor, SC/ST, transhumant and monitors the working of GP and implementers.

Gram Panchayat-Organizes Gram Sabha meetings, gets all necessary project agreements signed by WMD. It supports NGOs in mobilization of village communities, initiates and completes the preparation of GPWDP as per project guidelines, manages project funds and expenditure as per AWP of GPWDP, ensures transparency and accountability by all GP level institutions and individuals involved in the project and ensures the beneficiary contribution.

Water and Watershed Management Committee (WWMC) - It comprises of a committee of GP headed by the Gram Pradhan. The committee supports NGOs in mobilization of village communities, lead the process of planning, preparation and implementation of GPWDP, manage fund of vulnerable groups, delegates responsibility for implementation of Village Watershed Development Plans to RVCs, submits timely monthly and annual financial reports to WMD and ensures timely audit of GP annual accounts and submission of the audit report to the WMD.

Revenue Village Committee (RVC) - The committee is headed by Gram Pradhan/Ward Members and it consists of the remaining ward members of that revenue village, members of SHG, Mahila/Yuvak Mangal Dal and other village level institution. At least 50% of the committee members are women. It is responsible to lead the process of preparing RVC proposals, implement GPWDP activities at the village level when GP gives them a contract and ensures equity for all, especially the disadvantaged groups.

Mahila Aam Sabha (or Women Aam Sabha) - It is constituted of all adult women voters of GP and is responsible to ensure that proposals of Mahila Aam Sabha are included into the GPWDP. It is envisaged as an Institution responsible for the empowerment of the women in the Project area

Van Panchayat (VP)-It is constituted as per provisions of Uttarakhand Van Panchayat Act 2005. The committee develops inter GP space plan, implements all plantation related activities under the project and coordinates with concerned Forest Department office for technical and management issues.

Women Motivator- This is the designated women at the revenue village level, who have at least passed high school or equivalent examination. The responsibility lies in mobilization of village women to ensure their effective participation in the project through Mahila Aam Sabha and facilitate formation of livelihood groups of vulnerable households and extending all possible support to them.

Co-Signatory WWMC- It is an elected women ward member nominated by the GP as co-signatory for operating project account. Its responsibility is to act as co-signatory along with Gram Pradhan to operate the

Watershed Development Project account. In case the Gram Pradhan is a woman, the Co-signatory can be male.

Panchayat Secretary (Village Development Officer)-The person is employed by the state government and member secretary of WWMC. The person is responsible for organizing Gram Sabha meetings and upkeep of minutes of the meeting and record the assets created under the project in the asset register prescribed under Panchayat Raj Act.

Account Assistant (AA)-The person has passed at least Intermediate with accounts/mathematics and nominated by GP and trained by project. The person is responsible to maintain all accounts books and records related to the project, make all vouchers and prepare cheques, collect dues from beneficiaries and issue receipts, prepare all financial documents and reports as required by the project and assist RVCs and other beneficiaries in preparation of bills, formats and other accounts related documents of the project.

Multi-Disciplinary Team (MDT)-It is constituted of 4-5 experts from Forest, Agri/Horti, Animal Husbandry, Civil engineering and Facilitators from FNGO. It provides technical guidance to GP and village communities for planning and preparing GPWDP and Inter GP space plans, their consolidation into MWS plans and implementation of these plans, ensure compliance of ESMF at all levels of planning and implementation of GPWDP and MWS plans, verification, signing of bills and prepare completion reports of activities after due verification along with member of the RVC and Chairperson.

Field Level NGO (FNGO)-It is hired by WMD. It is responsible for the mobilization of village communities, facilitate PRAs with MDT at the Revenue Village and GP levels, focus on gender sensitization and social equity as per the ESCP, support GP to plan and implement the project, facilitate Women Aam Sabha, formation of livelihood enhancing vulnerable groups, conduct PME and ensures monitoring of project interventions and timely reporting to WMD.

Unit Officer-The officer is appointed by WMD and is responsible for coordination between MDT, FNGOs and GPs, provide technical guidance to GP and village communities, ensure compliance of ESCP guidelines in all project interventions, ensure proper verification of bills and required reports on activities, ensure signing of bills and reports by concerned persons, coordinate between different stakeholders in the development of MWS plans for inter-GP spaces , field appraisal of GPWDPs and MWS plans during preparation stage and its compliance and technical review and implementation of GPWDP and MWS plan.

PNGO-It is hired by WMD for project implementation in certain project areas. It is responsible for mobilization of village communities and share complete information on the project, facilitate PRAs at the Revenue Village and GP levels; focus on gender sensitization and social equity as per the ESCP, support GP to plan and implement the project provide technical guidance to GP and village communities, sign bills and completion reports of activities after due verification, coordinate between different stakeholders in the development of MWS plans for inter-GP spaces. It is also involved in technical review and implementation of GPWDP and MWS plan, ensure monitoring of project interventions and timely reporting to WMD, represent project at all district level committees and Watershed Committee meetings at district levels and recording its proceedings.

Agri business Support Organization (ABSO)-It is hired by WMD and is responsible to facilitate formation of FIGs and FFs in the project area and provide technical support for agribusiness activities in the project,

provide marketing support for agribusiness activities, ensure compliance of ESCP in all agribusiness interventions, ensure monitoring of agribusiness interventions and timely reporting to WMD.

Deputy Project Director (DPD)- This is the member hired by WMD who is responsible for planning, implementing and monitoring of project at division level as administrative and financial head, technical review and approval of GPWDP and MWS plan as per ESCP guidelines, ensure implementation of GPWDP and MWS plans as per project guidelines, provide technical support to MDT, FNGOs and ABSO, sign project agreements with GPs and transfer project funds to it, conflict resolution among GPs, MDTs and FNGOs, ensure timely submission of all project level and other reports to WMD, represent project at all district level committees, as member secretary, convene district level Watershed Committee meetings at district level and recording of proceedings.

District Level Watershed Committee- It comprises of district level officers, chaired/by the Zila Panchayat Chairperson and members secretary concerning DPD. It is responsible to facilitate inter-departmental coordination and convergence with other programmes.

State Level Institutions

Project Director (PD)-He/she is responsible for overall supervision, approval of proposals and direction, coordination and monitoring at regional level, monitoring the progress of project activities and timely submission of reports.

Watershed Management Directorate (WMD) - The institution is headed by Chief Project Director. It is responsible for overall planning, supervision, approval of proposals and direction, support, coordination and monitoring of the project at state level. Ensure capacity building of project staff, GPs, RVCs, UGs and individuals to ensure effective implementation of the project as per its objectives, coordinate with external stakeholders such as the State Government and the World Bank and resolve all disputes placed before it.

State Steering Committee-It comprises of secretary level officers and concerning head of department chaired by the Forest and Rural Development commissioner (FRDC) Govt. of Uttarakhand. It is responsible to facilitate inter-departmental coordination, policy decisions and overall approval to work plans of WMD.

State Steering Committee-This committee facilitates inter-departmental coordination, policy decisions and overall approval to work plans of WMD.

4.6.2 Institutional Arrangements

Field Offices Under Watershed Management Directorate -Eight Divisional offices and one PMU unit headed by Deputy Project Directors under two regional Project Director's offices i.e. Garhwal and Kumaon are functional since July 2014.

Consultancies- Hiring of all major consultancies i.e. PNGO Rudraprayag, FNGO Kumaon and Garhwal, M&E Consultant and Hydrology Consultancies, Internal Auditor and Six Agri Business Support Organizations is being finalized and all are in place.

Key institutional stakeholders in watershed development: They have benefitted under Gramya II through expanded knowledge outreach to Partner NGOs, Field NGOs, agribusiness support agencies, six district headquarters, regional headquarters in each of the two regions of the State of Uttarakhand and the Watershed Management Directorate (WMD).

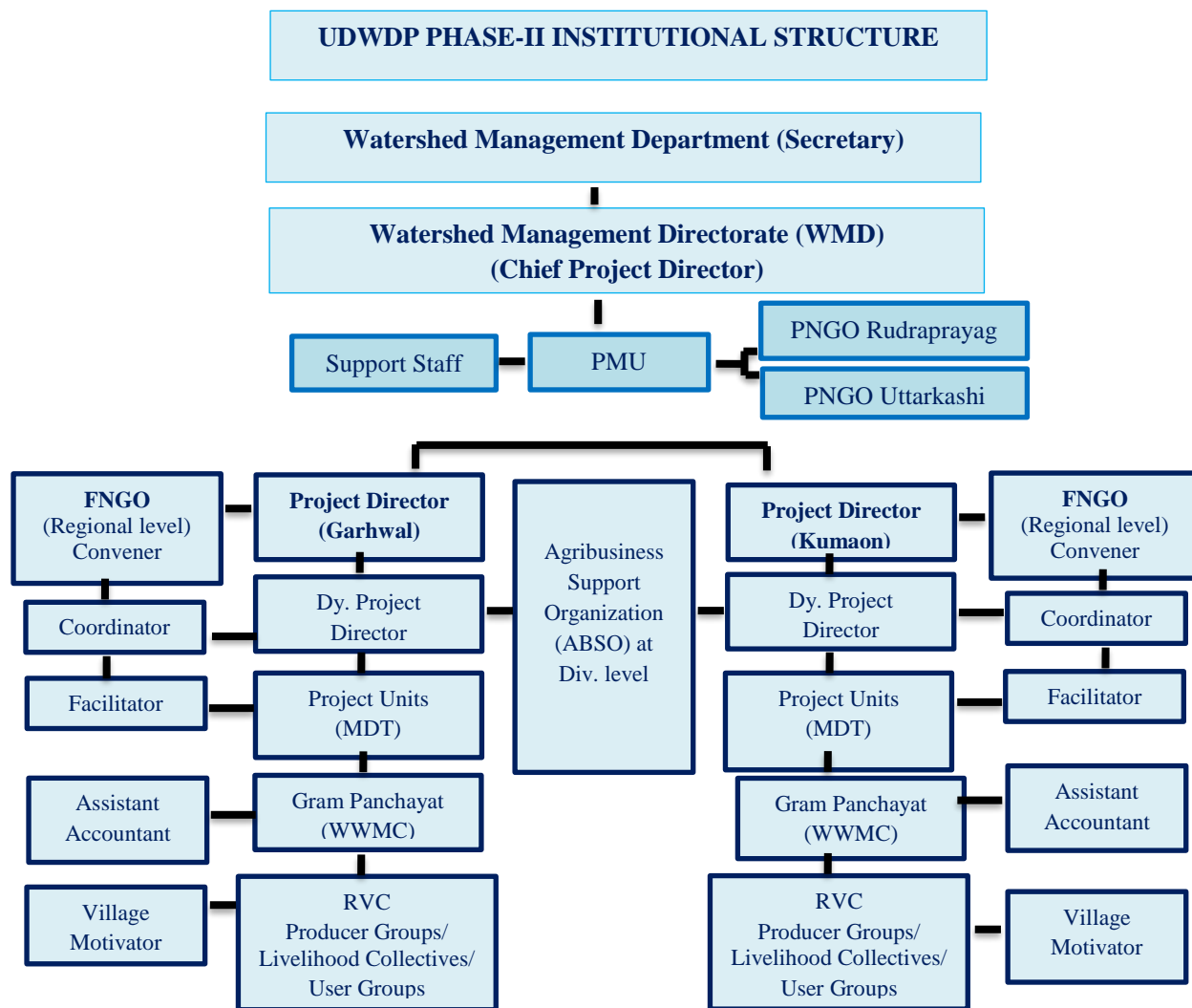


Figure 15: Organogram of Gramya II

4.6.3 Details and role of FNGO and PNGO

The need for FNGO arose from the lack of adequate staff required for community participatory approach and the prevailing social structure, attitudes and dynamics in the project area. The FNGO filled this gap by providing support of qualified professional staff to cover the social aspects of the project. The ability to mobilize local community, especially women folk, understanding the diverse issues related with communities and facilitating their participation in a project are the strengths of FNGO. They have talent and skills for promoting social mobilization, awareness generation, group formation etc.

Society of People for Development (SPD) for Garhwal Region and (HSC) for Kumaon Region are mobilized as FNGO under UDWDP II. The Field and Partner NGOs are playing a significant role in implementing participatory watershed development projects in planning, implementation, monitoring and evaluation activities of the project. FNGOs and PNGO ensured and facilitated the participation of village communities in project activities. There is social structure, attitude and dynamics prevalent in the community for participation in implementation of participatory project. Field and Partner NGOs have successfully filled this gap by providing support of qualified and professional staff in the project villages under Gramya-II. The main roles of these NGOs in mobilizing the communities in the intervention areas under UDWDP-II are being achieved through the following benchmark activities:

Social Mobilization, Planning and Implementation by FNGO

- Carrying out social mobilization, rapport building, awareness generation and formation of village/GP level project committees.
- As part of MDT, the FNGO have assisted the community/GP in conducting PRA, survey and collection of baseline information.
- The FNGO as part of MDT have acted as resource persons and assisted in the preparation of RVC proposals, IGA proposals, GPWDP planning process and integration of ESMF into project interventions, Farming system improvements and activities for Transhumant population
- FNGO have carried out identification of vulnerable households in the villages through participatory approach and facilitated their organization into vulnerable groups. They have planned in such a way so that maximum coverage is given to the vulnerable groups and the poorest of the poor.
- Ensured participation of women in programmes and management of project activities.
- Facilitated the project level committees in developing and adoption of byelaws and participation in project implementation.
- Provided necessary inputs in design and estimates required for developing the watershed plan and other components of GPWDP
- Facilitated awareness generation regarding ESMF and facilitate the communities in the integration of ESMF in all project interventions.
- Ensured mobilizing of vulnerable groups to take up IGA activities for alternative livelihood.
- Provided assistance to MDT in preparing and implementation of capacity building action plans for various village/GP level project committees to enable them to function effectively.
- Ensured regular monitoring of the activities of vulnerable groups, UGs Cluster organization and other project level committees.
- The FNGO facilitated discussions with the community and local institutions, formed in the project villages, important social and environmental issues relevant in the area e.g. sustainability of NRM, Soil and water conservation, stall feeding of animals, health, education, harmful effects of pesticides, alcoholism, sanitation, IGAs, equity, Social cohesion, gender issues, social auditing, social fencing, forest fires etc.
- Supervised record keeping, book-keeping, management of group fund, collection of contributions, compliance to the byelaws and GPWDP
- The FNGO facilitated conduction of participatory M&E (PME) in project GPs at half yearly interval as per the PME strategy of the Project.
- Assisted in organizing field visits, field tours, on the job training for village level functionary e.g. accounts and exposure as and when required. Ensure sharing of training/ learning/ exposure visit out comes with the community.

Social Mobilization, Planning and Implementation by PNGO

- Facilitation and implementation of project in the project divisions.
- Providing technical guidance and support to Gram Panchayats which are the Project Implementation Agency, undertake social mobilization and capacity building of GPs, communities and community based organizations.
- Facilitate/implement the project as per guidelines agreed upon and prescribed in the Project Operation Manual, Financial Manual, GP Manual, Procurement Manual and the guidelines as prescribed in the Environmental & Social Management Framework (ESMF).

Consolidation and Sustainability

- The FNGO assists in the consolidation of the village level VGs/ UGs and other CBOs into cluster federations within their program areas.
- Develops and implement mechanisms to strengthen the local institutions formed under the project. This includes the following:
- Facilitates the Preparation/strengthening of by-laws by CBOs detailing aspects related to membership, power and functions
- Assists the vulnerable groups, UGs in conducting self-assessment and drawing- up of forward action plans for future O&M.
- Assists in establishing linkages with external agencies departments and private sector entities and marketing of IGA products.

Process Documentation

- Carried out comprehensive process documentation of the social mobilization process in the project area.
- The FNGO generates specified reports and follows the reporting mechanism as laid down by WMD.

4.6.4 Constitution of Institutions and their Role

4.6.4.1 Women Aam Sabha (WAS)

Mobilizing women for ensuring their participation in project activities is one of the major objectives of the project. The project envisages empowering women, thus enabling them draw maximum benefits from the project and help reduce their drudgery. The concept of WAS was introduced in the project to provide suitable platform to women to express and share their experiences and have their say without any gender based hesitation. In WAS meetings, the women are encouraged to raise their voice through series of discussions and debates to include their demands; resolve problems and accomplish solutions thereof with the consent of every participant.

WAS meetings were firstly organized during the planning phase wherein women were encouraged to raise their proposals so that the same could be included into the Gram Panchayat Watershed Development Plans of their respective GPs and could be appropriately addressed. The viable proposals made in WAS meetings were discussed and incorporated in respective Revenue Village Committee (RVC) plans. In these meetings social and environmental related issues were discussed at length keeping in view the Environment and Social Management Framework (ESMF) mandated in the project manual. There is a provision of mandatory

participation of women representative from each household. In the initial stage of the project, WAS meetings were conducted every month in all the divisions for effective planning of project activities. During implementation phase, WAS meetings are essentially conducted at the time of annual plan preparation and revision of GPWDP. However, presently two WAS meetings are conducted annually in each RV which definitely is a good practice and an positive aspect of women empowerment..

The rules of WAS include

- Participation of adult female of the village.
- Participation of woman should be more than 50% of the total household of revenue village.
- Proceedings of the meeting and final decisions should be recorded and documented in WAS register.
- Issues raised should relate to social and natural resource development.

The issues raised through WAS meetings and resolved through project and other sources generally included the following:

- **Social issues:** Social issues, such as, girls' education, employment, sanitation, widow / old age / handicapped pension, rural road connectivity, etc. were raised and were resolved through convergence with different social welfare schemes, skill development programmes of Rural and Social Welfare Departments.
- **IGA related interventions:** IGA related interventions addressed through the project included Goatry, poultry, cattle rearing, tailoring, trainings on mushroom cultivation, poultry, tailoring and exposure visits within and outside the state.
- **Vulnerable Activities:** FNGOs/PNGO supported the project in the formation of women vulnerable groups and identification of individual vulnerable women headed households and also suggested activities for their economic upliftment.
- **Infrastructure Development:** Issues relating to development of rural infrastructure, such as, village roads, small bridges (culvert) and bridal paths etc. which were raised by women in WAS meetings were also included into GPWDPs and resolved through the project.
- **Environmental issues raised by women in WAS, RVC and GPWDP included:**
 - Plantation of species of fuel, fodder, firewood trees and Napier grass, etc.
 - Orchard Development
 - Rejuvenation of water sources, such as Nuala, dhara, etc.
 - Construction of animal shelters, mangers, compost pits, terrace repair, protection walls etc.

Status of Women's participation & Proposals

Status of Women Aam Sabha (WAS)

During Planning Phase of the project preparation, extensive WAS meetings were organized across all the Gram Panchayats in the Project area for preparation of Gram Panchayat Watershed Development Plan. During these meetings, proposals highlighting need of women and vulnerable were invited for being incorporated into GPWDPs of respective Gram Panchayats. Currently the participation of Women in Aam Sabha stands at 59% which is a good representation of women involvement and subsequent participation. The tables below represents the year wise participation of women in Aam Sabha as well as the detailed participation Division wise in 2018-19.

Table 121: Year wise Status of Women Participation in Aam Sabha			
Financial Year	Total Female Population	Female Participation in WAS	Percentage participation
2014-15	8073	2063	25.6
2015-16	12469	5092	40.8
2016-17	13102	6366	48.6
2017-18	13104	6207	47.4
2018-19	13101	7730	59.0

Table 122: Division wise Participation of Women in Aam Sabha (WAS)						
S. No	Name of the Division	No. of Gram Panchayats	No. of adult women in GP	No. of WAS Organised	No. of adult women participated	% of adult women participated
1	Almora	87	19278	186	11060	57.37
2	Pithoragarh	51	9123	63	6214	68.11
3	Bageshwar	43	13401	43	6211	46.35
4	Dehradun	48	10260	61	6473	63.09
5	Tehri	78	13968	140	8954	64.10
6	Pauri	62	10521	164	7403	70.36
7	PMU	7	1106	23	500	45.21
8	Rudraprayag	32	7795	41	4591	58.90
9	Uttarkashi	30	6690	35	3268	48.85
Total		438	92142	756	54674	59.34

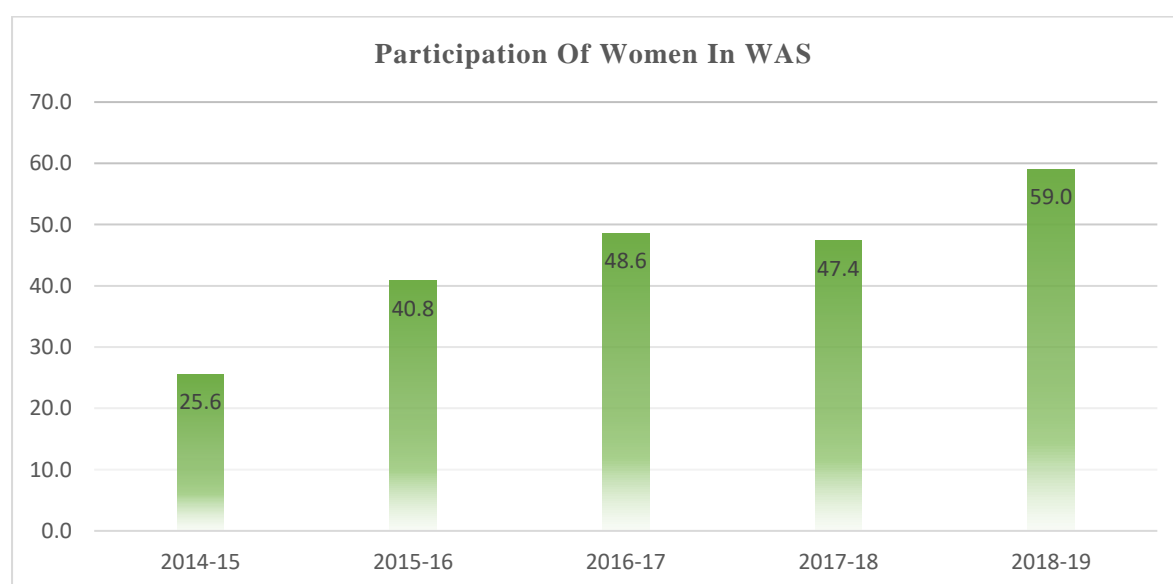


Figure 16 : Women Participation in Aam Sabha

Status of Proposals in Women Aam Sabha (WAS)

As evident from the following table, total 12786 women's proposals were received of which 9806 viable proposals were incorporated into the GPWDPs of respective GPs. Out of the proposals incorporated, 6485 were addressed through GPWDP, 1209 through convergence with other government schemes and 825 through other sources. Presently, there are 4867 proposals remaining to be addressed, of which 1398 are proposed to be completed through GPWDP and remaining 2869 to be accomplished through other sources. Overall, 66.6% of proposals were incorporated in the GPWDP Plan against the total proposal raised by Women Aam Sabha

During the field verification process, the M&E Team made a detailed analysis of the type of proposal, no's received and no's incorporated in the GPWDP plan on a sample basis for Thatyur, Pauri and Dehradun Division, results of which are attached in the Annexure. A matrix of type of Proposals is elucidated in the following table

Table 123: Women Aam Sabha proposals							
Division	Total Proposals Raised in WAS	Proposals Incorporated in GPWDP	Proposals Completed through			Remaining Proposals to be addressed	
			GPWDP	Convergence	Other Sources	GPWDP	Others
Dehradun	547	321	304	14	174	15	40
Pauri	685	480	371	121	192	1	0
PMU (MWS)	187	186	133	0	54	0	0
Tehri	1201	1053	1013	33	79	28	48
Almora	6613	5201	2982	732	209	471	2219
Bageshwar	1005	761	407	78	59	354	107
Pithoragarh	1786	1420	987	231	58	433	77
Rudraprayag	762	384	288	0	0	96	378
Total	12786	9806	6485	1209	825	1398	2869

* Proposal included issues related to income generation activity as tailoring, mulching animal, tent house etc., and improved variety of seeds/hybrid seeds. It included those proposals also which broadly are not mandate of Watershed Development Plan as health, drinking water, road, electricity etc.

** No. of proposal incorporated in GPWDP after ESMF scrutiny and applicable for watershed development.

NRM Proposals	Other Proposals
<p>NRM proposals included –</p> <ul style="list-style-type: none"> • Fodder development • Water resource rejuvenation • Plantation work • Orchard Development • Pipelines • Construction of Irrigation Channels • Irrigation tank • Roof water harvesting tank s • Biogas plants • Construction of Check Dams • Solar water lifting pumps • Terrace repair • Crate wire and Vegetative check dams • Protection walls • Bio composting pits • Poly houses 	<p>Other proposals raised by women included -</p> <ul style="list-style-type: none"> • IGA for Vulnerable households • Training and exposure visits • Mushroom cultivation • Exposure visits for IGA activities • Flour/ spice mills, • Goatry, Poultry, dairy units • Improved variety of seeds • Agricultural tools • Construction of animal shelters, mangers, compost pits and animal chari, etc. • Solar lights

4.6.4.2 Revenue Village Committee (RVC)

Revenue village Committee (RVC) formed at the Revenue Village level comprises of 7to 11 members depending upon the size of the village. The RVC is headed by the Gram Pradhan or Ward Member belonging to the concerned village. The Gram Pradhan may head the RVC of the village of which s/he is a voter or may nominated someone on his behalf. At least 50% of the members in any RVC should mandatorily be women voters of the concerned village. To ensure fair representation of SC/ST category, at least one male and one female member must be from SC/ST category. The Secretary of the RVC should necessarily be

Women Aam Sabha (WAS)

Since Mahila Aam Sabha is not a statutory body, it was formed to bring about women issues in the platform. However, the purpose for which the forum is created seemed to be served as women members seem to have greater belongingness towards the purpose of the institution and are preparing need based proposals. As it is not a statutory body it may lose its essence after project closes. Therefore some measures are suggested which will make this institution to continue functioning:

Like Gram Sabha, there should be compulsory Aam Sabha done at least twice in a year along with Gram Sabha meetings and any decision taken should be signed by representatives of Women Aam Sabha. As a compliance, the quorum of 50% women should be maintained to ensure that their participation is encouraged.

The budget approval for disbursement as per budget envelop should also accompanied with resolutions passed in Women Aam Sabha so that women members are aware of the fund allotted, disbursed and utilized for the purpose.

women and in case Chairperson of the RVC is a female, in that case Secretary can be a male. The Bank account of the RVC is operated jointly by the Chairperson and Secretary.

The Gender and Social Category-wise Distribution of RVC members is reflected in the following table which clearly shows that RVCs have more than 50 percent woman members with highest in general category in Almora. From the other categories SC, ST and OBC, highest woman members in OBC category is in Tehri, SC in Uttarkashi and ST in Dehradun. From the table it can be seen that 55% of the RVC members are women, which is a testimony to empowerment of women through Gramya-II and speaks how women have been mobilized to participate in project institutions and activities.

Table 124: Gender and Social Category-wise Distribution of RVC members										
S. No	Name of Division	Total no. of GP	Total no. of RV	Total members in RVC	Total no. of woman member					
					SC	ST	OBC	Gen	Total	% of women
1	PMU	7	23	161	8	0	0	83	91	56
2	Dehradun	56	76	617	164	173	7	0	344	56
3	Tehri	78	143	1129	152	1	433	0	586	52
4	Pauri	62	175	1134	126	0	0	561	687	61
5	Pithoragarh	63	147	963	130	10	126	207	473	50.5
6	Almora	87	188	1342	83	0	31	548	662	49.3
7	Bageshwar	43	78	537	62	9	1	208	280	52.4
8	Rudraprayag	61	107	1031	127	1	5	486	619	59.8
9	Uttarkashi	68	120	982	250	150	170	25	595	60.59
	Total	525	1057	7896	1102	344	773	2118	4337	55.3

Revenue Village Committee (RVC)

Consultation undertaken with RVCs shows that each RVC has 7-11 members with 50% women which is the mandate. The woman members are from SHG, Mahila/ Yuvak Mangal Dal and other village level institutions and have active participation.

4.6.4.3 Water & Watershed Management Committee

Water & Watershed Management Committees (WWMC) comprises of six members each including the chairperson were formed at each of the selected Gram Panchayats of the project under the chairmanship of Gram Pradhan. At least one Ward Member represents the WWMC from each Revenue Village of the GP concerned, besides at least one woman, one OBC and one SC/ST member. One Female Ward Member of WWMC is nominated as a co-signatory to the project account along with the Gram Pradhan. In case of Gram Pradhan being a female, male co-signatory to the project account can be nominated at the discretion of the WWMC.

The woman members in WWMC spread across 9 divisions are about 60% with highest in Almora. From SC, ST, OBC and general category the highest woman members in SC category is in Uttarkashi, in ST category in Dehradun, in OBC in Tehri and general category in Almora.

Gender and Social Category-wise Distribution of WWMC members

Table 125: Status of Woman Members in Water and Watershed Management Committee									
S. No	Name of Division	Total no. of GP	Total members in WWMC	Total no. of woman member					
				SC	ST	OBC	Gen	Total	% of women
1	PMU	7	42	2	0	1	21	24	57
2	Dehradun	56	312	69	103	8	0	180	58
3	Tehri	78	467	74	2	188	0	264	57
4	Pauri	62	382	51	0	0	190	241	63
5	Pithoragarh	63	334	63	4	57	74	198	59.3
6	Almora	87	551	101	0	16	214	331	60
7	Bageshwar	43	217	31	4	1	91	127	58.5
8	Rudraprayag	61	366	67	1	4	149	220	60
9	Uttarkashi	68	408	110	40	70	12	232	56.9
Total		525	3079	568	154	345	751	1818	58.9

The details of WWMCs formed in different divisions of the project, along with the details of members and their gender and social category-wise distribution is given in the table above. From the table it can be seen that 59% of the WWMC members are women, which clearly speaks about women empowerment through Gramya-II.

Water and Watershed Management Committee (WWMC)

It was found that the importance of the committee is being understood and appreciated by the beneficiaries. Need based proposals on cowshed, animal husbandry, agriculture were included.

80 to 85 % of the proposals passed in MAS were included in GPWDP. MAS meeting of RVC Jaintoli Malli, dated August, 2016, approved 82% proposals while MAS meeting of RVC Jaintoli Talli, in July 2017 passed total 17 proposals and almost 89 % have been approved.

4.6.5 Training, Workshops and Exposure Visits

From FY 2014-19, highest trainings were conducted in FY-2017-18, workshops in FY 2015-16 and exposure visits in FY 2016-17. The initial years of the project reflects more capacity building with very large number of participants covered.

Table 126: Status of Training, Workshop and Exposure Visits

Training /Event	Status of		Status of		Status of		Status of		Status of		Cumulative Status	
	FY 2014-15		FY 2015-16		FY 2016-17		FY 2017-18		FY 2018-19		(Till March 2019)	
	No.	Participants*	No.	Participants*	No.	Participants*	No.	Participants*	No.	Participants*	No.	Participants*
Training	535	22306	652	30699	926	33677	1578	57733	897	28255	4588	172670
Workshops	1649	80082	2571	130086	1750	164323	2083	98160	2165	107447	10218	580098
Exposure Visits	111	2440	87	2029	107	2778	73	1796	60	1244	438	10287
* Participants are repetitive												

The capacity building programmes are organized at Division Level and at WMD/Directorate / State level. Trainings was imparted by various organizations like VPKAS, 'Beej Bacchao' team, MDT, Water and Soil Conservation Research Institute, KVK Dhakrani, Green Foundation, GNA Management Services, Dehradun on various subjects. Training was imparted on Social Development (Project Orientation, Participatory Rural Appraisal and Social Mobilization, Environment and Social Framework, Wealth Ranking process, planning of GPWDP) and on Technical aspects (Food Processing, Production Technology of Vegetable and Horticulture Crops, Agri-Horti Technology, Livestock, Mixed Crop Production, Watershed Development, Soil and Water Conservation, Income Generation, Fishery, Account and Book Keeping).

Exposure Visits was organized to G.B.P. Agri. and Tech. University Pantnagar/Rishikesh, Kotdwar, Indian Veterinary Research Institute Bareilly, Y.S. Parmar University, Potato Research Institute, Watershed Project Solan and Nahan, HP and Biodiversity Conservation Kotamalla, Srinagar University

4.6.6 Transhumant Action Plan

Van Gujjars, buffalo-herders and Bhotiyas, who keep mixed flocks of sheep and goat for wool, meat and rituals; horses for baggage transport and dogs for protection are the two major nomadic tribes of Uttarakhand. They are one of the many tribes who have lived in deep dependence on wild habitats in India and for whom, "transhumance" (the practice of moving livestock from one grazing ground to another in a seasonal cycle) has been a way of life for centuries. Also, much before the concept of inviolate spaces for wildlife conservation descended onto Indian "environment" policy in the form of the 1972 Wildlife Protection Act. And yet, today, the idea of "home" for Van Gujjars has been made precariously tentative.

However, the project has full regard to the hardships encountered by these transhumant people as a result of the life chosen by them and has a Transhumant Action Plan for such tribal people to provide them with certain items of day to day use and look after their general welfare. Project fosters full respect for these indigenous peoples' dignity, human rights, and cultural uniqueness and ensures that they; (i) receive culturally compatible social and economic benefits and (ii) do not suffer adverse effects during the implementation of project activities.

Transhumance and agro pastoral systems are commonly practiced in Uttarakhand involving both full time nomads and settled farmers taking their livestock to summer pastures. A strategy was formulated under the project for traversing and semi-sedentary transhumant population to assist them in an attempt to improve their quality of life through project interventions. The transhumance systems in Garhwal and Kumaon regions are of the vertical type wherein transhumants and livestock inhabit warmer zones during winters, moving upwards as the weather warms during spring until they reach alpine pastures in summers. *Gujjars* and *Bhotiyas* are the primary communities practicing transhumance in the project area. While *Gujjars* move with their herds of buffalo and cattle, *Bhotiyas* keep mixed flocks of sheep and goat for wool, meat and rituals; horses for baggage transport and dogs for protection. A Transhumance Action Plan (TAP) has been prepared for improving the socio- economic condition of transhumant Bhotiya/Anwal and Gujjar communities.

The basic objectives of the TAP included the following:

- Sensitization of project stakeholders/partners regarding transhumant issues
- Ensuring quality of life of transhumant population in the project area.
- Ensuring that all interventions are culturally compatible
- Boosting epidemiological surveillance and tools for control of major animal diseases associated with transhumance through awareness and preventive measures
- Implementation of mechanisms for supervision of animal movement linked with transhumance practices
- Creation of an environment for harmonizing aim of natural resource management with improvement in quality of life of transhumant in the project area

Under the Project a strategy has been formulated for traversing and semi-sedentary transhumant population to assist them in an attempt to improve their quality of life through project interventions. [Ref: World Bank's safeguard policy - Indigenous Peoples -OD 4.20]

Transhumant Routes in project area

Table 127: Transhumant Routes in project area					
Transhumant Communities	District	Transit Duration (days)	Route		Type of Migration
Van Gujjars	Dehradun	7	Vikasnagar-Kalsi- Chakrata	Shaiya-	Traditional with families
		8	Vikasnagar-Kalsi- Koti-Tuni		
		6	Vikasnagar-Kalsi- Chakrata	Shaiya-	
		6	Khothibhandi ko Devvan		
		6	Jokla to Devvan		

Table 127: Transhumant Routes in project area				
Transhumant Communities	District	Transit Duration (days)	Route	Type of Migration
	Tehri	9	Vikasnagar-Kalsi-Juddo-Yamunapul-Nainbag-Purola	
	Rudraprayag	7	Mohankhal to Pokhri	Traditional with families
		15	Rudraprayag to Simal bend	
		7	Mohantag to Gangnani	
	Uttarkashi	6	Vikasnagar to Nagtibba	Semi sedentary with families
Bhotiya/ Anwal	Almora	10	Sheraghat-Bhaisiyachana-badichina-lamgada-saharfatak-Ramgarh-Bhawali-Bhimtal-Haldwani	Traditional, migrate without families
		10	Panar-Dhaydi-Danaya-Badichina- Bhawali- Bhimtal-Haldwani	
		10	Sheraghat-Bhaisiyachana-badichina-lamgada-saharfatak-Ramgarh-Bhawali-Bhimtal-Haldwani	
	Pauri	9	Joshimath- Chaudikhal-Thalisain-	
		8	Yamunapul-Nainbag-Damta-Naugaon-Purola	
	Dehradun	3 month	Kahanehra to Pikhagram	Semi sedentary with families
	Uttarkashi	10	Sahastradhara to Harsil	Traditional with families
		8	Phakot to Harsil	
		8	Shivpuriteg to Harsil	
		8	Raipur to Naugaon	
Champawat	8	Ghat to Champawat	Traditional migrate without families	
	8	Ghat to Devidhura		
Pithoragarh	7	Raiagar to Saraghat	Traditional migrate without families	
	7	Gangolihat to Panar		

Table 128: Transhumant Population stay in various Divisions of the Project				
S.No.	Division	Places Where Transhumant Population Stays	Departure to Bugiyals (Grass lands)	Back to villages
1	Vikasnagar, Dehradun	Haripur, Quansi, Chakrata & Sahiya	March/ April	September/ October
2	Thatyur, Tehri	Nainbagh & Thatyur	March/ April	September/ October
3	Rudraprayag	Bansbada, Kund & Jakholi	March/ April	September/ October
4	Uttarkashi	Naugaon-Baghasu & Mori-Sandra	March/ April	September/ October
5	Pithoragarh	Thal & Nachani- Chinkiya	May/ June	September/ October
6	Almora	Garunabaz, Kafli and Dodam	Feb/March	September/ October
7	Bageshwar	Talsar Patiyyasar, Munar, Chauda Sthal, Badi Paniyali (Shama), Gogina, Bhanar and Vinayak.	March/April	September/ October

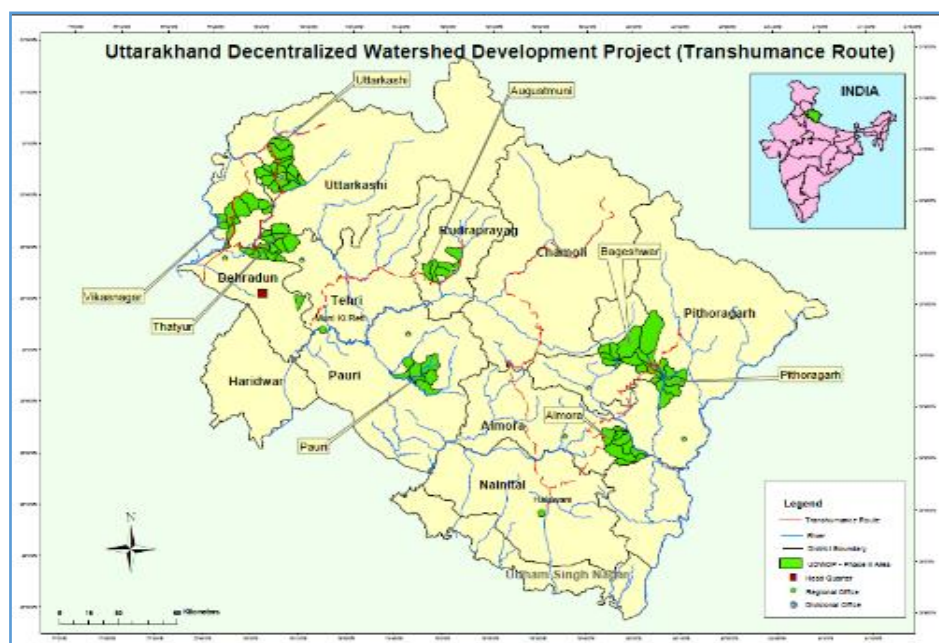


Figure 17: Transhumant routes in project area

The following table depicts the Transhumant Census

Table 129: Families And Livestock Census Of Transhumant In UDWDP II								
SN	District	No. of families staying/ passing through project area	Details of livestock					Total
			Cow	Buffalo	Sheep/ goat	Mule/ horse	Other (calves, Dog etc.)	
1	Rudraprayag	23	8	230	5	39	212	494

Table 129: Families And Livestock Census Of Transhumant In UDWDP II								
SN	District	No. of families staying/ passing through project area	Details of livestock					Total
			Cow	Buffalo	Sheep/ goat	Mule/ horse	Other (calves, Dog etc.)	
2	Uttarkashi	50	166	566	45	82	197	1056
3	Tehri Garhwal	125	209	1525	242	350	0	2326
4	Dehradun	148	253	1791	242	351	0	2637
5	Almora	55	0	0	4500	60	30	4590
6	Bageshwar	500	60	10	9222	12	0	9304
7	Pithoragarh	450	9300	0	32360	480	400	42540
	Total	1351	9996	4122	46616	1374	839	62947

Need Assessment

Group Discussions, personal interactions conducted by the project MDT with the transhumant groups during their passage through project areas with the objective of gaining an insight into the community's perception regarding their problems and possible mitigation measures. The major problems identified include:

- Degradation of and reduction in pasture land
- Reduced availability of fresh fodder
- High incidence of diseases in animal
- Lack of veterinary services
- Loss of livestock due to accidents, wild animals, diseases etc.
- High incidence of human diseases
- Low productivity of animal products
- Exploitation by middlemen
- High prevalence of indebtedness
- Lack of education in the transhumant communities
- Information and Communication gap with the outside world.

Table 130: Detailed Physical and Financial Achievement of TAP											
S. No.	Activities	Unit	Cumulative Progress till Year 2017-18			Year 2018-19			Cumulative Progress since Inception of the Project		
			Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries	Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries	Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries
1.	Human Health Camps	No.	2	0.260	47	0	0.000	0	2	0.260	47
2.	Veterinary Health camps	No.	41	12.411	1041	8	2.005	50	49	14.416	1091
3.	Distribution of utilities to transhumant										
3.1	Distribution of tarpaulin sheets/poly sheets for young born calves.	No.	123	24.403	1017	544	11.29	350	1781	35.702	1367
3.2	Distribution of tents for human	No.	444	12.280	371	70	1.870	70	514	14.150	441
3.3	Distribution of feed tubs	No.	126	8.918	1082	95	0.398	93	1362	9.316	1175
3.4	Distribution of Blankets	No.	975	4.950	900	393	3.408	280	1368	8.358	1180
3.5	Distribution of First aid kits for human	No.	660	7.348	594	39	0.429	34	699	7.777	628
3.6	Distribution of First aid kits for animals	No.	197	7.281	181	29	0.946	29	226	8.227	210
3.7	Distribution of Concentrate Cattle feed	No./ Qtls	12	1.676	117	13.7	1.730	72	25.7	3.406	189
3.8	Distribution of Torch/ Solar Lantern	No.	133	7.973	952	378	2.667	302	1716	10.640	1254
7	Other (Dari/Raincoats/Buckets/Umbrella etc.) Specify:										

Table 130: Detailed Physical and Financial Achievement of TAP

S. No.	Activities	Unit	Cumulative Progress till Year 2017-18			Year 2018-19			Cumulative Progress since Inception of the Project		
			Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries	Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries	Physical	Financial (Rs. In Lakh)	Total No. of Beneficiaries
a	Dari/ Cow Mats	No.	1038	6.814	778	275	6.243	211	1313	13.056	989
b	Raincoats	No.	227	2.302	227	225	2.065	225	452	4.367	452
c	Umbrella	No.	783	3.440	708	243	0.963	140	1026	4.402	848
d	Buckets/ water bottle/ Water Cans, Milk Cans etc.	No.	1902	11.490	1743	322	1.798	247	2224	13.288	1990
	Shearing Scissors	No.	35	0.135	35	0	0.000	0	35	0.135	35
e	Bells for Sheep/ Goats	No.	200	0.160	200	7000	4.048	100	7200	4.208	300
f	Shoes with Shocks	No.	40	0.340	40	110	1.285	110	150	1.625	150
g	Bag Pitthu	No.	0	0.000	0	80	0.919	60	80	0.919	60
h	Tripal canvas	No.	48	1.464	48	40	1.184	40	88	2.648	88
j	Cooker 5 Litre (Prestige)	No.	15	0.284	30	30	0.395	40	45	0.678	70
k	Cotton mat	NO	0	0.000	0	25	0.688	25	25	0.688	25
l	Transportation Charge	LS	0	0.041	0	0	0.750	0	0	0.791	0
Total				113.97	10111		45.09	2478		159.06	12589

The table above shows the details of physical and financial interventions extended to the nomadic population in the project area under Transhumant Action Plan. As can be observed from the table, various utilities items which included tarpaulin/poly sheets, tents, feed tubs, blankets, concentrated feed for the cattle, torches/solar lanterns, daris/cow mats, raincoats, umbrellas, buckets, milk/ water cans, shearing scissors, bells for cattle, shoes, socks, pitthu bags, tripal canvas, cookers, cotton mats, first aid kits, etc. were assisted to the transhumant population in the entire project area at a financial cost of Rs. 159.06 lakhs benefitting 12589 persons during the entire project period.

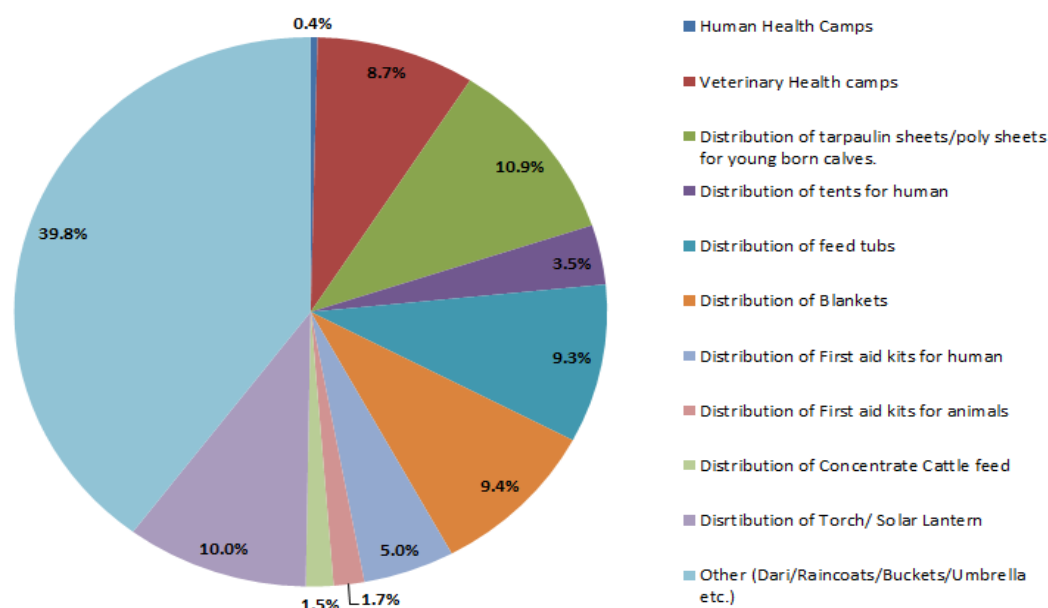


Figure 18: Breakup of beneficiaries by types of benefits

The break-up of beneficiaries by the type of benefits they have been provided is provided in the above exhibit. A majority of transhumant were provided assets such as mats, raincoats, buckets, bells etc. This was followed by provision of torches and solar lanterns for 10% beneficiaries and blankets (9.4%) and feed tubs (9.3%). It is expected that the provision of such benefits will lead to improved health and other indicators of well-being among the transhumant population.

Another key group the project focuses upon is women. They have been viewed as important contributors to the project and efforts have been made to institutionalize mechanisms for recording and incorporating their requirements and views. The Women Aam Sabha which serves as a platform for women to discuss and develop plans customized to meet their needs incorporates plans in the broader GPDWP and thus an actual difference is brought about in the lives of women.

SECTION 5

PROJECT COORDINATION



5. Knowledge Management and Project Coordination

The success of a project depends to a significant extent on the effectiveness and efficiency of institutional structures, systems and processes that are required to support interventions. Keeping in mind the criticality of ensuring that a strong project management bedrock is created, Gramya II focuses upon Component 4 which relates to Knowledge Management and Project Coordination. This component aims to ensure effective implementation of project activities and monitor and evaluate progress, outputs and outcomes. It has been built upon the learnings of Gramya I and supports the strengthening of the Watershed Management Directorate (WMD) and community institutions set up under the project. A wide gamut of processes and activities are covered under this Component as depicted in the following exhibit.

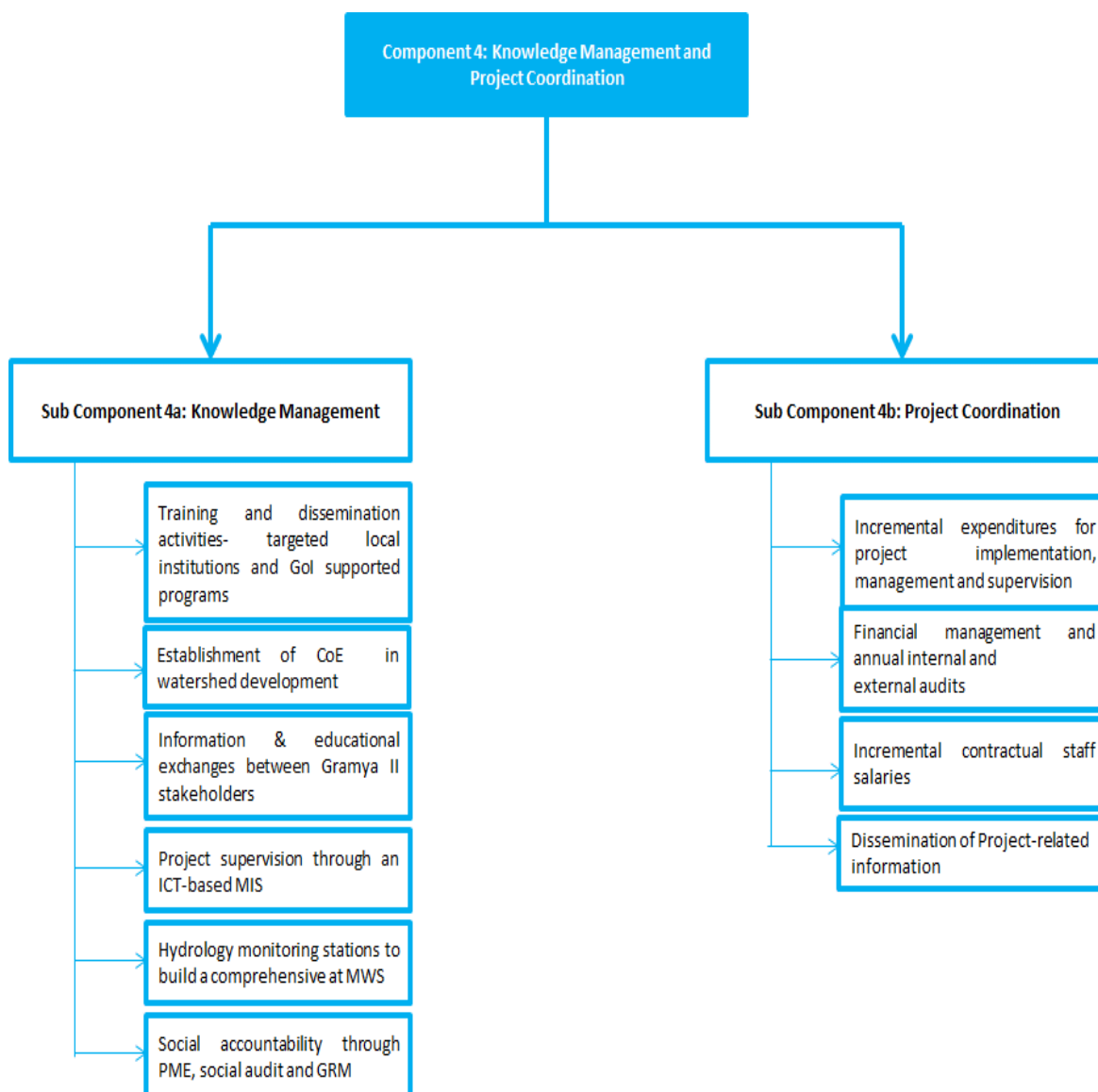


Figure 19: Knowledge management & Project Coordination

This chapter discusses the overall implementation structure and arrangements, key systems and processes developed and implemented and progress of activities undertaken as part of Component 4 of the project.

5.1 Implementation Structure and Arrangements

A clearly defined implementation structure has been designed for implementation of Gramya II, which includes units at the Panchayat, district and state levels. An overview of the implementation structure is provided in the following exhibit.

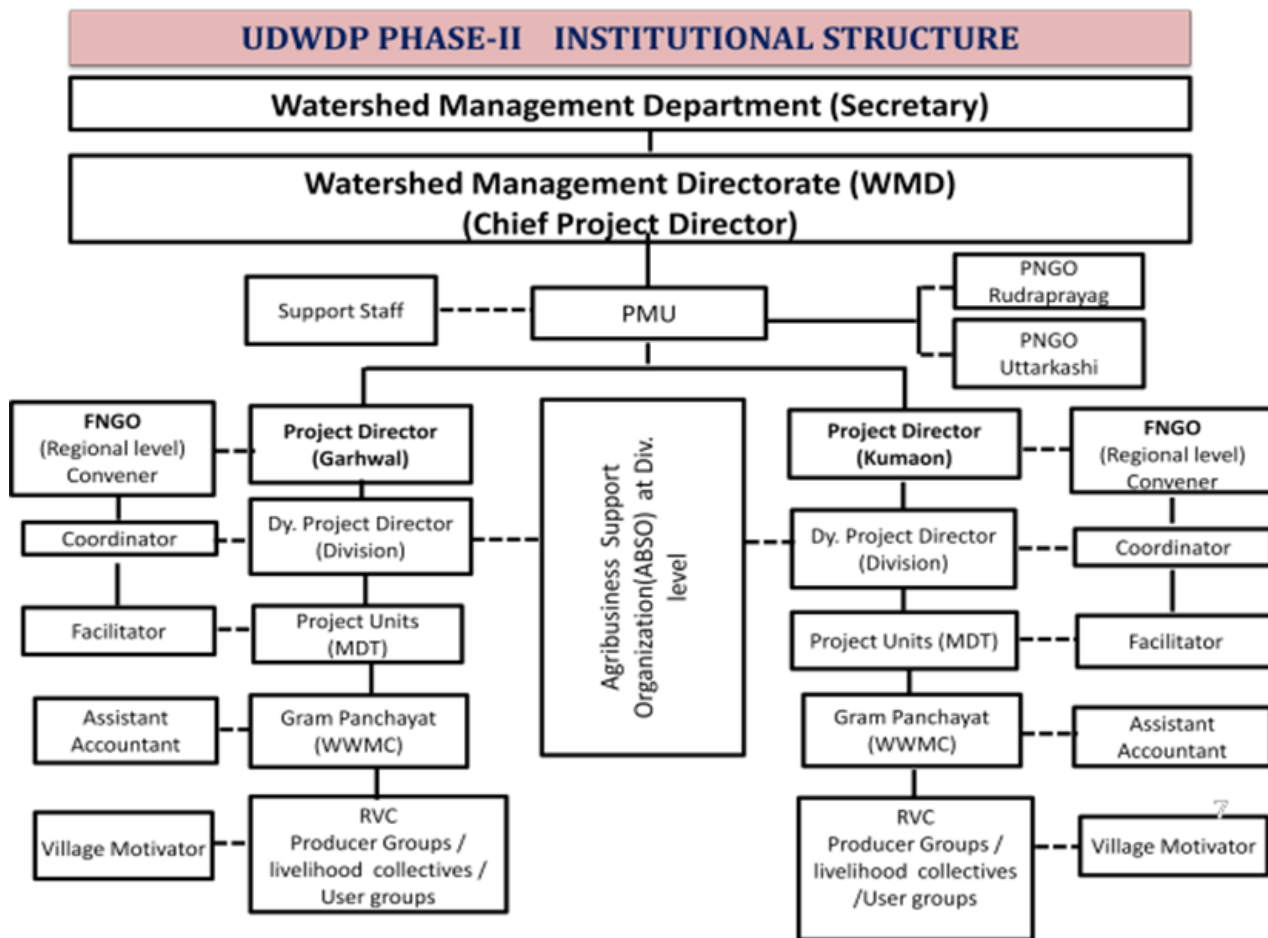


Figure 20: UDWDP II Institutional Structure

Panchayat Level

At the Panchayat level the Gram Sabha is a key forum wherein major decisions relating to the GPDWP are made and approved. The Gram Panchayat members including the Pradhan and the Ward members play a key role in preparing the GPDWPs, convening Gram Sabha meetings and supporting mobilization of village communities. They are required to open a project bank account and manage funds as per the Annual Work Plans of the GPDWP.

A key Committee formed at the GP level and headed by the Pradhan is the Water and Watershed Management Committee (WWMC). This is an important body and is responsible for leading the process of planning, preparation and implementation of the GPDWP. The WWMC is also responsible for managing the

Vulnerable Group Fund (VGF). It has been given the option of delegating the responsibility of Village Watershed Development Plans (VWDP) to the Revenue Village Committees (RVC). The WWMC submits monthly and annual financial reports and ensures completion of annual audit of the GP's accounts and submission of the reports to the Directorate.

The RVC which comprises of the Pradhan/Ward Member, remaining Ward members of the village and members of various village level institutions prepares the RVC proposals and if contracted by the GP also implements the GPDWP activities at the village level. An important feature of the RVC is that at least half of its members are women.

One of the important groups formed as part of the project is the Mahila Aam Sabha which includes all the adult women voters of the GP and is held to ensure inclusion of women specific issues into the GPWDP.

Finally, the Van Panchayat which is a Committee constituted as per the provisions of the Uttarakhand Van Panchayat Act 2005 ensures development of inter GP space plans, implements plantation activities under the project and also coordinates with the Forest Department for technical and management issues.

Other key stakeholders at the Panchayat level include Women Motivators, Co-signatory of the WWMC, Panchayat Secretary and a GP level Accounts Assistant.

Field Level

A number of bodies and stakeholders are responsible for ensuring that field level operations are conducted smoothly. One of the key bodies at the field level is the Multi-Disciplinary Team (MDT) which comprises of 4-5 experts from various backgrounds including forestry, agriculture/ horticulture, animal husbandry and civil engineering and facilitators from the Field NGOs. The MDTs have an important role to play in providing technical guidance to GP and village communities for developing GPDWP and inter GP space plans, integrating them into MWS plans and implementation of these. They are also required to ensure that all plans are ESMF compliant.

Field NGOs (FNGO) have been engaged by the Directorate for conducting a range of activities including mobilization of communities, facilitation of Participatory Rural Appraisal (PRA) activities, organisation of Women Aam Sabha, supporting livelihood enhancement of vulnerable groups, supporting Participatory Monitoring and Evaluation (PME) and monitoring of interventions. The field level NGO's hired by WMD include Society of People for Development (SPD) for Garhwal Region and Himalayan Study Circle (HSC), engaged to execute the assignment.

Partner NGOs (PNGO) is engaged by the WMD for implementation of project activities in specific areas. Like the FNGOs, the PNGOs too are responsible for implementing and supporting the implementation of a wide range of activities including community mobilisation, facilitation of PRAs, provision of technical guidance, coordination for development of MWS in inter GP spaces, technical review and implementation of GPDWP and MWS plans and convening district level Watershed Committee meetings. The PNGO is entrusted to carry out the works in the entire Division through designated Team Leader as executed through Deputy Project Director in a direct set up. Action for Social Empowerment and Economic Development (ASEED) as a PNGO operates from Rudraprayag Division, having withdrawn from Uttarkashi due to operational reasons.

Agri Business Support Organizations (ABSO) has been hired for facilitating the formation of Farmer Interest Groups (FIGs) and Farmer Federations (FFs) and provision of technical and monitoring support for agri-business activities. Currently all the ABSO's are in place and include the following;

Table 131: Name of Agri Business Support Organizations (ABSO)		
S.No.	Division	Name of ABSO Deployed
1	ABSO Pithoragarh	Society for Uttaranchal Development & Himalayan Action (SUDHA)
2	ABSO Bageshwar	Society for Uttaranchal Development & Himalayan Action (SUDHA)
3	ABSO Almora	Central Himalayan Environment Association (CHEA)
4	ABSO Vikasnagar	Society of People for Development (SPD)
5	ABSO Rudraprayag	Action for Social Empowerment and Economic Development (ASEED)
6	ABSO Pauri	Himalayan Environmental Livelihood Promotion Society (HELP)
7	ABSO Thatyur	AT India

A District Level Watershed Committee has been established for inter-Departmental coordination and convergence across programmes. This Committee is chaired by the Zila Panchayat Chairperson and comprises of district level officers.

A Deputy Project Director (DPD) plans, implements and monitors the project at a divisional level. The DPD is also the Member Secretary of the District Level Watershed Committee and is responsible for convening meetings and recording proceedings.

State Level

The WMD headed by the Chief Project Director is responsible for overall planning, supervision, approval of proposals, coordination and monitoring of the project at the state level. The Directorate also ensures capacity building of project staff, GPs and other stakeholders as required for effective project implementation.

Project Director have been appointed by the WMD for overall supervision of the project, approval of proposals, coordination and monitoring at the regional level at Garhwal and Kumaon.

A State Steering Committee chaired by the Forest Rural Development Commissioner (FRDC) Govt. of Uttarakhand and comprising of Secretary level officers takes policy decisions and approves work plans of the WMD.

5.2 Project Costs and Expenditure

The total project expenditure over the period 2014-15 to 2018-19 is Rs.57, 296.14 Lakh of which 69.5% is IDA-World Bank financed, 25.3% is financed by the Government of Uttarakhand and the remaining 5.2% is financed through community contributions. The year wise break of project expenditure based on the source of financing is provided in the following table.

Project Financing Share- 2014-15 to 2018-19

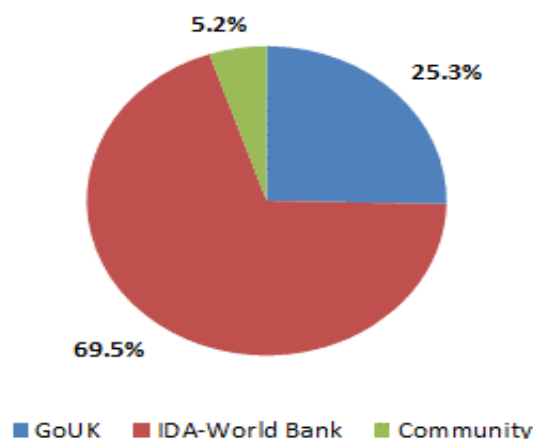


Figure 21: Project financing share 2014-15 to 2018-19

Table 132: Year wise break up of project expenditure

Source of Financing	2014-15	2015-16	2016-17	2017-18	2018-19
Govt. of Uttarakhand	1,592.6	2,154.0	2,876.7	3,980.8	3,914.6
IDA- World Bank	1,592.4	3,824.9	8,770.0	12,963.1	12,668.6
Community	100.1	263.0	713.1	960.5	921.8
Total	3,285.1	6,241.8	12,359.8	17,904.4	17,505.0

The share of financing over the five year period is indicated in the adjoining graph. It can be observed that IDA- World Bank financing has steadily risen and has stayed the same in 2017-18 and 2018-19 at around 72.4 percent of total financing. GoUK financing which was around 48.5 percent of total financing in 2014-15 has come down to around 22.4 percent in 2018-19. Community's share of financing has risen from 3.0 percent in 2014-15 to 5.3 percent in 2018-19.

Year Wise Proportion of Financing

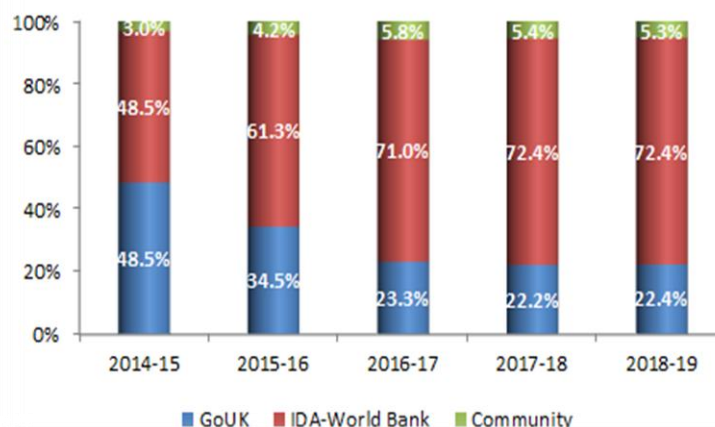


Figure 22: Year wise proportion of financing

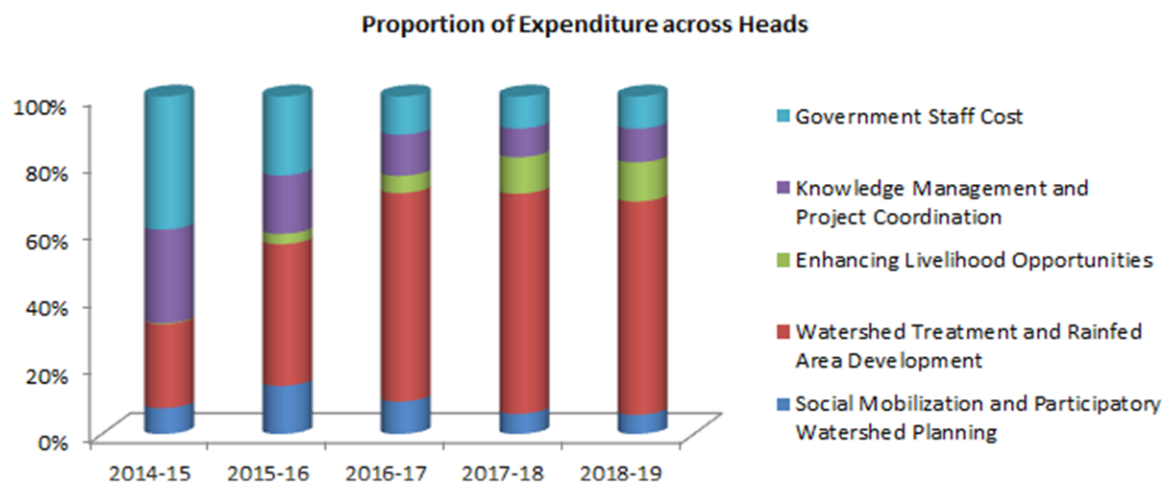


Figure 23: Proportion of Expenditure across heads

There are five key heads of expenditure: social mobilization and participatory watershed planning, watershed treatment and rainfed area development, enhancing livelihood opportunities, knowledge management and project coordination and Government staff cost. On analysing the trend of expenditure across these five heads in the last five years, certain interesting observations can be made. The share of expenditure on watershed treatment and rainfed area development has steadily risen from 24.9 percent in 2014-15 to 63.2 percent in 2018-19. The expenditure on enhancing livelihood opportunities has similarly risen from 0.2 percent in 2014-15 to 11.6 percent in 2018-19. The expenditure on social mobilization and participatory watershed planning has on the other hand declined from 7.7 percent in 2014-15 to 5.7 percent in 2018-19. Knowledge management and project coordination expenditure has gone down from 27.8 percent of the total expenditure to 10 percent in 2018-19. This could be a reflection of the fact that initially investments were made on establishing various systems and structures and this gradually stabilized once the project had taken off. In a similar manner Government staff cost expenditure also declined from 39.4 percent of total expenditure in 2014-15 to 9.5 percent in 2018-19.

5.3 Procurement

One of the key requirements for the project to be implemented in a transparent, accountable and equitable manner is the design and adoption of stringent norms and procedures for key project management activities such as procurement. Procurement for the project is being carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated January 2011, and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011, and the provisions stipulated in the Project Agreement and Financing Agreement and detailed in the Project Operational Manual and in the Procurement Plan.

Procurement activities are undertaken by the project at two levels, namely at the WMD level and at the GP level. At the WMD level procurement of works, goods, consultancies and trainings are undertaken. For works procurement typically NCB is followed. The NCB Standard Bidding Documents of the Bank and as agreed with the Government of India are used. Good procurement includes IT equipment, office equipment, furniture and also some more sophisticated research equipment and software. In case of goods and software ICB, NCB, Shopping or Directorate General of Supply and Disposal rate contracts within the shopping threshold are followed.

The project has appointed various consultancies for specific activities such as hydrological monitoring and M&E etc. For services estimated to cost less than US\$ 800,000 or equivalent, shortlists composed entirely of national consultants can be prepared. The Bank's Standard Request for Proposal Document is used as the base for procurement of consultancies under the project.

Procurement at the GP level is for obtaining goods, works and services required for GPDWP implementation. A Community Procurement Manual has been developed for guiding all community level procurement activity. The Manual provides step-by-step instructions to the GPs on how they should go about procuring various goods, works and services required for the implementation of the project. It includes the forms and formats to be used for procurement procedures applicable in the project. It aims to promote a consistent approach for planning, execution, reporting and monitoring of project related procurements through application of rules and procedures thereby enhancing the capacity of the GPs to undertake procurements to meet the project needs.

The project has already completed procurement of major consultancies including PNGO Rudraprayag and Uttarkashi, FNGO Kumaon and Garhwal, M&E Consultant and Hydrology Consultant, Internal Auditor and Six Agri Business Support Organizations.

Principles Governing Administration of Public Procurement

Accountability: Governments, public and various other agencies acting on their behalf must be accountable for correct and complete execution of their tasks and duties and accept responsibility for decisions and actions being made as a Procurement Officer

Competition: Procurement should be carried out through competition unless there are convincing reasons to the contrary

Consistency: Suppliers should, all things being equal, be able to expect the same general procurement policy across the public sector

Effectiveness: Public bodies should meet commercial, regulatory and socio-economic goals of government in a balanced manner appropriate to procurement requirement

Efficiency: Procurement processes should be carried out as cost effectively as possible

Fair-dealing: Suppliers should be treated fairly and without unfair discrimination, including protection of commercial confidentiality where required. Public bodies should not impose unnecessary burdens or constraints on supplies or potential suppliers

Integrity: There should be no corruption or collusion with suppliers or others; integrity means that the procurement processes are honest and in compliance with the respective laws, that the best available, most suitable technical expertise is employed in a non-discriminatory manner

Informed decision-making: Public bodies need to base decisions on accurate information and to monitor requirements to ensure that they are being met

Responsiveness: Public bodies should endeavour to make such procurements which serve the aspirations, expectations and need of the community

Transparency: Laws, regulations, institutions, processes, plans and decisions are made accessible to the public at large or at least to public "representatives" so that processes and decisions can be monitored, reviewed, commented upon and influenced by the stakeholders, and decision makers can be held accountable

5.4 Financial Management and Systems

The financial management system for the project has been developed keeping in mind the need to adhere to basic principles such as effectiveness, transparency, accountability and ease of implementation. The project has two systems for drawing and disbursement of money which are as follows:

- Treasury System: Funds are released by the financial wing of WMD to DDOs to pay salary of employees and meet expenditure required to be incurred for smooth running of offices
- Cash Credit Limit (CCL) System: Funds are released to DDOs in following two heads:
 - o 20-Grants-in-Aid: Utilized to meet expenditures incurred by GPs i for implementing sub project activities:
 - Implementation Fund
 - Vulnerable Group Fund
 - Incentive fund
 - o Other Expenditure: Utilized to meet expenditures incurred by Project Directors, field DPDs and other DDOs in the implementation of demonstration and training activities other than sub project activities

The funds provided under 20-Grants-in-Aid are summarized as follows:

- *Implementation Fund*: This fund is available to GPs in a separate bank account named as 'Watershed Development Project Account' and operated jointly by Gram Pradhan and Women Ward Member for implementation of activities proposed in GPWDP and inter GP space MWS plan. An additional amount to the extent of Rs. 80000, per annum is provided to each GP in the above account to pay honorarium to the Account Assistants and meet their expenditures. Nearly 20% of the watershed treatment fund has been set aside with the concerned DPD for treatment of inter-GP spaces which lie within the MWS but are out of the jurisdiction of GPs. The objective of this additional fund is primarily to ensure that holistic treatment of the complete MWS takes place in a manner that complements the efforts of the GPWDPs. For utilization of this additional fund, the PNGO/MDT in consultation with the concerned forest division, GPs and Van Panchayats develops a plan which is submitted to the Divisional Forest Officer of the concerned forest division for approval. The implementation of the project activities in this plan of inter-GP areas is carried out by the respective Van Panchayats.
- *Vulnerable Group Fund*: This fund is provided as a grant in the account of GP 'Watershed Development Project Account' to finance approved Income Generating Activities for individuals/groups in order to ensure equity amongst vulnerable households.
- *Incentive Fund*: This has been provided for GPs, CBOs and individuals in UDWDP-II with the objective of motivating them to work in an efficient, transparent and participatory manner.

Flow of Funds to the GP

Initial on-account payment to the extent of 10 percent of the each year's Annual Work Plan is given at the beginning of the financial year by the project to the GP and is adjusted at the end of the year. The WWMC appoints individual farmers (beneficiaries), RVC/VP/User Group or the GP for implementation of work. The first right of implementation of every work under the project rests with village-level entities such as individual farmer, RVC, User Group or the Van Panchayat. If these options are not available then the GP can decide to execute the works. If none of these options are feasible then works are awarded to independent contractors with a written statement from the WWMC regarding their inability to undertake the said activities. The WWMC outsources such work to contractors which village level stakeholders are not

competent to undertake. Appointment of contractors can be done only after the concerned beneficiaries have deposited their contribution for the activity.

Preparation of Estimates and Technical Sanction

Estimates for each activity included in the annual work plan are prepared by the WWMC with support from the MDT/PNGO subsequent to receipt of the on-account payment. Technical representatives from the MDT along with a WWMC member visit the site of work prior to preparing the estimates. Technical sanction is taken keeping in mind the sanctioning limits at various levels under the project.

Sub Project Agreement

A Sub Project Agreement is entered into between the GP and implementer through the WWMC in case of activities which the GP does not undertake directly. The design and cost estimates of the structure are a part of this agreement.

Implementation and Monitoring of Work

The Technical Representative from the MDT provides guidance to implementers and monitors activities so that they are completed as per schedule. The representative records observations in a Measurement Book (MB) after verification. The Accounts Assistant in each GP keeps the MB in his/her custody.

Registers at the GP Level and Payment Authorization

The registers maintained at the GP level are a Perforated Project Cash Book, a Sanction Register, an Integrated Activity Register and a Beneficiary Contribution Register.

The bills submitted by the implementer based on actual progress are cross checked with the Integrated Activity Register by the Accounts Assistant. All payments are then authorized by the WWMC in the course of meetings which are held on a weekly basis for this purpose.

Payment by Crossed Cheque and Reimbursements

Payments are preferably made to implementers by crossed cheque. For amounts not exceeding Rs 2000, cash payment is allowed. In exceptional cases this limit can be raised to Rs 5000 but in such cases a public witness is required before making the payment.

Reimbursement of expenditures incurred on works as per the approved work plan of GPWDP is claimed by GPs after submitting requisite financial statements. All expenditures incurred in a particular month are reimbursed by the DPD at the end of the month.

Funds for Various Sub-Components

Fund for implementation of demonstration activities are provided by WMD through the DPD. Division level officers inspect and unit level teams verify demonstration works before making payments.

Funds for implementation of activities under the enhancing livelihood opportunities sub-component are provided by the WMD. The field DPD offices and the PNGOs through their MDTs are responsible for implementation of various individual/group activities under this sub component. The expenditure and statement of accounts of expenditure under this sub component are made by the concerned project offices. The GP through the WWMC maintains records of beneficiaries and benefits accrued to them from this sub component.

Funds for income generating activities for vulnerable groups are used to finance small income generating activities for vulnerable individuals/groups. IGA proposals are developed by the FNGO in consultation with concerned individual/group. Funds are disbursed to the vulnerable individuals/groups, through the GPs after signing of an agreement with GP. Endorsement of each proposal by the MDT to ensure that it is in accordance with the ESMF is mandatory.

Disbursement Arrangements

A Designated Account (DA) for the project is maintained in the Reserve Bank of India (RBI) and is operated by the Controller Aid, Accounts and Audit (CAA&A) in accordance with the Bank's operational policies. There is a one-time fixed advance of US\$ 6 million which is maintained throughout the project and adjusted towards the end of the project implementation. Disbursements are made based on quarterly IUFRRs.

The project submits withdrawal applications supported by IUFRRs to CAA&A in DEA for onward submission to the Bank for DA replenishment. The Bank replenishes the DA in an amount equivalent to the eligible expenditures claimed by the project and as reported in the IUFRRs. All expenditures reported in the IUFRRs are subject to confirmation/ certification by the annual audit reports. Any difference between the expenditure reported in the IUFRRs and those reported in the annual audit reports are analysed and those expenditures which are confirmed by the Bank to be ineligible for funding (i.e., refundable to IDA), are adjusted in the subsequent disbursements.

5.5 FMIS

The Directorate of Treasuries, Pension & Entitlements has developed software for Financial Management Information System (FMIS) and is in the process of roll out. Currently field-testing is going on to make the FMIS robust and operational. The financial progress reports will be generated regularly using FMIS. The main features include

- Browser Compatible Application
- Single Login for multiple roles-ADHAAR/Mob No/Emp No
- Three Tier System (Operator/Supervisor/DDO)
- E-sign facility to Sign document digitally through ADHAAR
- OTP/Biometric base Authentication Through ADHAAR
- Scanning of documents at each stage
- No Need to Submit Physical Paper to Treasury
- Dash Board to Users
- Time Bound Disposal and Reconciliation
- Finance Data Centre UK
- Mobile App – IOS/Android
- Auto Generation of Reports in official mail id.
- Facility to receive reports through WhatsApp also
- Online Application for Leave , Loan, Advances
- Tax Returns Generation – 16/16A/24Q/26Q/GSTR7/GSTR7A
- Inter Treasury Transfer of Funds
- Online / Off line Challan
- Inter Treasury Refund within Department

5.6 Management Information System

Management Information System (MIS) and Geographic Information System (GIS) are vital pillars of the project. All information generated during PRA exercises for GPWDP preparation was captured by the MIS Cell in a uniform format to create a baseline database.

Land based activities such as plantation areas, fodder and orchard development etc. are captured using GPS to develop GIS. A GIS map of each GPWDP has been prepared by the DPD and geo-referenced on the project maps in the GIS Cell at WMD level. Process monitoring and onsite monitoring of GPWDP and MWS plan implementation using GIS tools is being carried out by the M&E Cell of WMD.

Pratyaksh: An in-house GIS based open data kit (ODK) App '*Pratyaksh*' has been developed and is being used regularly to obtain information, photos and GPS readings of assets created in the field on GIS platform as a tool of evidence based monitoring. The ODK App provides a way to collect and store geo-referenced information, along with a suite of tools to visualize, analyse and manipulate ground data for specific needs. As a multi-dimensional application, the objective of *Pratyaksh* is to provide an open source platform that can be expanded to address current and future needs of data collection and referencing.

Division	Received Geo Tag Image				Approved Geo Tag Image			
	Pre	Mid	Post	Total	Pending	Disapproved	Approved	Total
Rudraprayag	51	250	991	1292	15	40	1237	1292
Uttarkashi	11	62	352	425	3	10	412	425
MMWS (PMU)	40	63	289	392	1	19	372	392
Dehradun	47	211	581	839	85	23	731	839
Tehri	75	232	794	1101	20	24	1057	1101
Pauri	53	225	1044	1322	59	203	1060	1322
Almora	98	597	2038	2733	1031	146	1556	2733
Bageshwar	113	278	767	1158	473	7	678	1158
Pithoragarh	137	436	2267	2840	95	341	2404	2840
TOTAL	625	2354	9123	12102	1782	813	9507	12102

Gramyashree Mobile App: This is a real time reporting tool that empowers FIG's by direct selling of their harvested produce to vendors through Agribusiness Support Organization (ABSO) in Gramya. The project supports FIGs in collecting production data and creating a structured database linking FIGs (seller) and vendors (buyers) at WMD level. The App works in remote areas and in low bandwidth environments. It ensures greater transparency, reduced leakage, source traceability and enhanced quality control. The mobile app is real time business intelligence. The App helps reduce operational costs and has improved forecasting accuracy and yield management. Further, it contributed to ensuring a premium for certified farms/commodities.

The App includes the following information:

- (1) FIG & Farmer Details
- (2) FIG Production Details
- (3) FIG Micro Finance
- (4) FIG Crops Details
- (5) Vendor Details

The details as evident in the app have been attached in the Annexure

5.7 Project Monitoring, Learning and Evaluation

The project monitoring, learning and evaluation (MLE) framework has been designed to facilitate results-based management; learning and process enhancement; and impact evaluation. The project is monitored on the basis of various result framework indicators and core indicators finalized for each component. The progress of each core indicator is tracked on a six monthly basis. The MLE framework for the project comprises of three key components, namely M&E by an external agency, internal project monitoring and Participatory Monitoring and Evaluation (PME).

5.7.1 External Monitoring and Evaluation

Sutra Consulting Pvt Ltd has been hired as an external monitoring agency by WMD and its key deliverables include Baseline survey, Midterm impact assessment and Final impact assessment. Apart from this the M&E Agency submits a six monthly Monitoring Report to the WMD.

5.7.2 Internal Project Monitoring

In addition to the external monitoring aspect the project also has adopted a sound internal monitoring system, the key features of which are summarized as follows:

- Physical and financial information is collected through MPRs generated at divisional level and is consolidated at WMD level.
- The FMIS captures information related to category wise detail of expenditure and disbursement.
- Monitoring teams comprising of members drawn from various technical wings of Directorate regularly visit project areas
- Monthly meetings and, brain storming sessions are conducted with stakeholders at district and PD levels on a periodic basis
- At the district level the District Level Watershed Committees under Zila Panchayat Adhyaksh monitor project progress on a quarterly basis
- At the state level the State Steering Committee under FRDC, Govt. of Uttarakhand reviews project progress at half yearly and annual intervals
- Periodic monitoring is undertaken by World Bank Mission

5.7.3 Participatory Monitoring and Evaluation

PME is a social audit process as part of which primary stakeholders (those who are directly benefitted / affected by the intervention) take the lead in tracking project progress and draw actionable conclusions. ME serves multiple purposes including obtaining information, increasing beneficiaries' understanding of community-based development projects and enhancing their levels of ownership and commitment.

A 'PME management team' has been set up to lead the PME process in consultation with key stakeholders. This team includes staff from the implementing agency, consultants, FNGO staff and members from different CBOs/institutions. The team facilitates the PME process by providing clear guidance and methodologies, subject matter expertise, follow- up training and exchange events.

A workshop/ for community facilitators precedes the start of the PME at the community level. The workshop aims to reiterate PME principles and ways of working, building commitment to the process and ensuring equity. The WWMC with the help of MDT facilitates conduction and coordination of PME at GP level on a half yearly basis.

The data collection tools that are utilised during PME processes include semi structured/structured questionnaires, short studies/sample surveys, ballot box exercise, Focus Group Discussion, review of records and physical verification. At the end of the PME, an Action Required Checklist with clearly spelt out responsibilities of the WWMCs, UGs etc. and project staff is prepared. This is shared with the community in the subsequent cycle of PME. Actions which have been addressed are checked off the list appropriately.

Participatory Monitoring and Evaluation (PME), which is a benchmark activity of Gramya-II, is an effective tool in assessment of the changes brought about by implementation of Project activities and aims at involving the village community in the process of project implementation and social audit of these activities. Generally, this process is performed by involving external experts/agency in the project against set indicators. But with a view to adopting a complete participatory approach, this process has been introduced with the objective of involving the community itself in tracking, monitoring and evaluating the project activities. Participatory Monitoring & Evaluation is the process of social audit, which involves project beneficiaries and other stakeholders in the monitoring and evaluation of the project activities.



Methodology: Before initiation of PME process in GPs, Gram Pradhan of every GP presents the records of GPs in front of Gram Sabha for their information and assessment. The Account Assistants of each Gram Panchayat presents the progress of works undertaken against the AWP during last quarter of the PME along with Audit report for that financial year. Thereafter, Accounts Assistant presents the records regarding Project GPs and explains their importance. Accounts Assistant also explains the utility of R-1Format. R-1 is a report of the Activity-wise monthly abstract of expenditure based on Integrated Activity Register, whereas R-2 is a monthly Beneficiary Contribution Statement. It is based on Beneficiary Contribution Register of the Gram Panchayat. Project Cash Book, Bank Pass Books, Sanction Registers, etc. is displayed to community for their scrutiny

Frequency of PME: PME would be conducted on half yearly basis in all project GPs. The Action Required Checklist (ARCs) with corrective measures is compiled and a report generated accordingly.

Constitution of PME Team:



Figure 24: Constitution of PME Team

Till date total 4 rounds of PME exercise have been completed across the Gram Panchayats of all the project divisions. The table below gives the details of division-wise details of Gram Panchayats where PMEs have been conducted. In some of the Gram Panchayats of the divisions, PME exercise could not be conducted on account of some dispute among the villagers. In case of Dehradun Division of Garhwal Region, there were only 54 GPs during conduction of Round-1 & 2 and GP Mothi was added later on during Round 3 & 4.

Table 134: Division-wise Details of PME Conducted						
S. No.	Division	Total No. of GPs	No. of GPs in which PME conducted			
			Round - I	Round – II	Round – III	Round – IV
1.	PMU	7	7	7	7	7
2.	Dehradun	56	54	53	54	54
3.	Tehri	78	78	78	77	76
4.	Pauri	62	62	62	62	62
5.	Almora	87	87	87	87	87
6.	Bageshwar	43	43	43	43	43
7.	Pithoragarh	63	62	62	62	62
8.	Rudraprayag	61	61	61	61	61
Total		457	454	453	453	452

Planning for the PME: Before initiation of the PME in various Gram Panchayats, the following measures were taken for planning PME strategy and identification of indicators to be included in the same.

- *Discussion with PME team members on expectation from PME:* Discussions were held by the field team with the PME team members to understand their expectation from the PME. The members were also requested to collect the list of completed activities under their AWP which had been completed by the GP till the date of conduction of PME.
- *Information on Identified Indicators:* Apart from this, it was decided that the information community awareness regarding conduction of PRA for and planning of GPWDP; ESMF integration in project intervention, participation of women in gram Sabha meetings, budget capital, budget of AWP of the current year; grievances redressal and dispute settlement and level of transparency maintained by WWMC, RVC, Unit officer and Village in charge etc. should be collected during the PME
- *Reaching a consensus on PME methodology:* Both qualitative and quantitative methods to be applied for collecting the data and information on project works and activities were discussed. It was decided that during PME, the teams will visit the site of activity and physically verify the quality of work. At

some of the places participatory method, such as, review of activity records will be adopted. Semi structured interviews of some of the beneficiaries will be conducted on production of vegetables, use of irrigation water, deposit of user charges contribution etc. In case of discrepancies, corrective measures will be discussed at the community level during PME meetings for further action. Assessment was also made on information regarding in maximum number of GPs and information about the quality of activities was gather through rating by the community.

- *Analyzing information:* After collection of data and information from the stakeholders during PME process, the same was analyzed by the FNGO and PME teams. Report regarding PME of each GP was prepared and presented to their respective divisions for use of its findings for adopting corrective measures for improving the status of works and activities.

Analysis of Key Indicators of PME

1) Awareness on Community Mobilization and Watershed Planning

Under this indicator of PME, assessment was made as to the awareness of villagers on different aspects of the project, i.e., PRA exercises conducted for GPWDP preparation; villagers' participation in the PRA exercises; selection of beneficiaries for various project related activities and incorporation of activities in the GPWDP after screening through Environmental and Social Management Framework (ESMF). The responses received from the villagers during PME in their respective GPs; have been analysed as follows;

- Responses from participants of PME Round-4 were solicited as regards their level of awareness on organization of PRA for preparation of GPWDP in their Gram Panchayat. As can be seen from the table above, overall 97% of participants in Garhwal expressed their awareness regarding conduction of PRA in their village. Percentage of participants showing their awareness regarding PRA was respectively, 89% and 81% in Kumaun and Rudraprayag. The overall awareness of community on this count was reported to be 90% in the entire project area. This points towards the fact that PRA for preparation of GPWDP was conducted with good participation by the community.
- Further, the participants were asked as regards to their participation in PRA exercise conducted in their village for preparation of GPWDP. For this, overall 90% of the PME participants replied in affirmative. This indicates that there was reasonably good involvement of community in preparation o GPWDP.
- Through the PME conducted at the Gram Panchayat level, it was endeavoured to find out whether transparency was adopted in selection of project beneficiaries as also to see that the same was done in open meetings of the project. To this, 90% of the participants agreed that they are aware about the procedure followed in selection of project beneficiaries. This points towards the fact that transparency in selection project beneficiaries is maintained.
- Environment being one of the key issues in implementation of project activities, it becomes necessary to see the level of awareness amongst the community as a result of project implementation. To check this, responses of PME participants were solicited as regards their awareness about screening of GPWDP activities through ESMF. Overall 88 percent replied in affirmative. However, the level of awareness in women in this regards was found to be higher (82%) in Rudraprayag as compared to their male counterparts (75%).

2) Inclusiveness and Equity

To ensure that complete inclusiveness and equity was maintained in the project activities, PME participants were asked regarding the justification in selection of beneficiaries during GPWDP preparation. Overall 93%

of male and 91% of female participants responded in affirmative and agreed that complete justification was maintained in selection of beneficiaries while preparation of GPWDP.

Awareness generation amongst women through organization of WAS is one of the critical components of the project and had been effort of project implementers to ensure that women participation is ensured in project activities through organization of WAS at regular intervals and more frequently during planning phase of the project. In this regards, an effort was made through PME to check the awareness level of participants as regards organization of WAS prior to preparation of GPWDP. As can be seen from the table 2.2 above, overall 92% PME participants agreed to organization of WAS prior to preparation of GPWDP. An overwhelming 93% women participants replied in affirmation on this issue.

The participants of PME were also asked about where the project ensures selection of SCST/Widow/Divyangs as project beneficiaries. Almost equal percentage of male and female participants replying in affirmative. Overall 93.5% of participants agreed to transparency being maintained in the selection of beneficiaries from vulnerable and under-privileged section of the society.

Till March 2019 the project has provided wage employment to the project beneficiaries to the extent of 7,01,731 man-days with Kumaun region having a wage employment of 3,87,129 man-days and Garhwal with 3,14,602. This shows that the project has been able to generate enough employment to meet the livelihood needs of the community in the project area to quite an extent.

3) Transparency and Accountability

The perception of PME participants was also sought on information sharing regarding project funds. For this, overall 88% agreed that transparency as regards sharing of information on project fund is maintained and people are aware about project funds allocation in respect of their GP.

As regards display of project related information at conspicuous locations in the Gram Panchayats overall 91 percent PME participants agreed that they are aware on question of display of project related information.

Perception of PME participants was further sought on community awareness on display of information relating to expenditure of project funds in the Gram Panchayat. On this, overall 85% participants articulated that information regarding spending of project funds is displayed at the Gram Panchayat level.

Community perception was further solicited on the appropriateness of the place of display of project related information at the GP level. On this question, 90 percent of the PME participants replied in affirmative as regards to their awareness of the place of display of information.

PME participant's views were sought as regards maintenance of transparency regarding project related activities by WWMC/RVC/MDT. On this question, overall 91 percent of the participants of PME agreed that transparency regarding sharing of project related information is maintained by WWMC/RVC/MDT.

Timely payment of works conducted under GPWDP is the key issue which needs to be addressed in any project as it directly relates to the payment of wages of the community people engaged in project activities. On this question a significant 92% PME participants replied in affirmative and agreed that timely payments with regard to RVC, User Groups and Vulnerable Group Fund are released well in time. This is a testimony to the fact that payment mechanism across the project area is well in place and timely payment are released to project beneficiaries.

4) Financial Management

Maintaining and sharing of Gram Panchayat related records is an important issue and directly relates to proper functioning of WWMC and RVC at the GP and RV level. On this issue, the views of participants were sought on R1, R2, Sanction Register, Stock Register, Integrated Activity Register, Cash Book, VGF/VIG Expenditure Register and Beneficiary Register. As can be seen from the table above, the affirmative responses of participants on this issue varied from 86 to 88 percent accepting that the records are timely maintained and they have access to scrutiny of the same.



5) Knowledge Management and Dissemination:

Perception of PME participants was also sought on the technological advances made in traditional occupations of vulnerable individual and group beneficiaries. On this issue, an overwhelming 92% of the PME participants agreed that technical improvement as a result of project interventions is visible in the traditional occupation of vulnerable individuals and groups. This points to that fact that the project has been successful in not only reviving the ailing traditional occupations but has also been able to introduce technological advancement in them.

Views of PME participants were sought on the issue whether technological advancements in the occupations of vulnerable individuals and groups have been able to aid in income enhancement of project beneficiaries. On this, overall 91 percent of the participants agree that technological advancement has aided in enhancing income of vulnerable beneficiaries of the project.

Project has made several interventions in terms of capacity building of farmers through exposure visits and trainings on agriculture, horticulture and animal husbandry. People's perception was, therefore, sought to know if these capacity building interventions have had any positive impact on their productivity. On this question, a good 87 percent of PME participants agreed that increase in productivity has been observed as a result of technical trainings and exposure visits.

6) Performance of Committees and Groups

As to the performance of committees and groups like VGs, UGs, RVCs and FIGs formed in all the three divisions, villagers agreed to their performing properly as per the expectations. This is due to the fact that almost all the VGs and VIs across the project are engaged in income generating activities of their choice. The UGs formed in all the Divisions are taking benefit of assets created under the project and have opened their Bank Accounts to ensure sustainability of assets. Similarly, some of the FIGs of the project are engaged in useful Income Generating Activities and producing and selling their products.

7) Inputs/Support by MDT

View of PME participants were also sought as regards the support the community receives from Village-In-Charge. On this overall 84% replied in affirmative and agreed that they always receive this support. However overall 12% and 4%, respectively, responded that they receive this sometimes or never.

On the question of receiving assistance from Village Motivators, Facilitators and Coordinators, overall 85% agreed that they always receive their support View of PME participants were also sought as regards the support the community receives from Village.

View of participants were also solicited as regards the frequency of support they receive from the Unit-In-Charge. On this issue, a satisfactory number (81%) agreed that they always received the desired technical assistance from the Unit-In-Charge.

The overall rating of quality and distribution of Individual Assets across the divisions appears too satisfactory. There has been equitable distribution among various categories of project beneficiaries. Allocation of assets among 'C' category of beneficiaries is the highest with 45 percent of assets provided to this category, followed by category 'B' (36%) and category 'A' 19%.

5.8 Communication

Communication is an important element of project strategy keeping in mind its community driven nature. The communication strategy covers all aspects of the project, namely implementation strategy and planning, interaction among project functionaries, interaction between the target communities and the project functionaries, preparation and execution of GPWDPs and sub-projects, gender sensitivity among project functionaries, training of various project functionaries, media outreach and involvement of external stakeholders. The project has defined the target audiences for specific messages during the various stage of the project. These include the social mobilization phase, implementation phase and the withdrawal phase.



IEC activities are being carried out as part of the Centre of Excellence for watershed. An IEC expert has been appointed in the project. The IEC expert, in consultation with project functionaries and stakeholders is developing project specific and other relevant communication materials. At the field level, a decentralized approach is being followed through field level project functionaries, FNGOs, PNGOs and ABSO.A comprehensive media outreach strategy has been developed by the project. This includes important dailies in Hindi and English, TV news channels and magazines.

Activities related to communication commenced in 2017-18. These include development of calendars, Jalagram Darpan, brochure on vegetable cultivation, summit brochures, animal husbandry brochures, agriculture brochures and organizing Kendriya Abhi Sharan Pushtika. The key activities in 2018-19 included the design of the WMD newsletter and a calendar and table calendar.

5.9 Transparency, Accountability and Governance

5.9.1 Suo Moto Disclosure on Project Portal

The project has followed Suo moto disclosure policy on all important aspects of projects to ensure transparency and governance accountability of the project. The project portal carries all vital and necessary information of the project related to policies, plans, implementation, information and manuals followed and grievance redressal mechanisms. The project portal also discloses RTI procedure and process of the project.



- Legal and Policy Frameworks of the project. The related acts and rules have been disclosed in project website.
- Project Planning and Information. Project implementation plan, list of initiatives to be covered under project and manuals has been disclosed on the project website. ToR and contract for all the agencies had been disclosed.
- Project Implementation Information. This is also adequately disclosed on the website. At the Division level the project has also adopted similar disclosure norms.

5.9.2 Disclosure at Project Sites

All the project activities undertaken by WMD under Gramya II are disclosed to the community in several ways. The transparency boards are constructed containing all information related to the tank including cost, total budget and timeline of completion of the project. This ensures that project funds received for civil work and budgeted expenditure are brought under community knowledge. It is suggested that the disclosure of beneficiaries covered under various activities of the project be also disclosed through public notice or on the walls of Panchayat

5.9.3 Issues Affecting Project Implementation

As such there are no major issues affecting the Project Implementation. However, since PNGO ASEED withdrew from Uttarkashi due to operational reasons, the work in that Division has completely stopped since more than a year now. This has halted the development clock in that Division.

It is recommended that necessary step of Approval to be taken at the highest level to either select another PNGO or directly operate through WMD Divisional structure.

SECTION 6

PROJECT IMPACTS



6. Project Impacts

6.1 Social Impacts

Watershed programmes over the last few years have shown a shift in the paradigm from an intervention-based method to an approach promoting people’s involvement. The paradigm shift is seen from a participatory nature to a more decentralized approach where decisions for need based interventions are people driven. The intended impact of watershed projects now has been to bring together people first not only in the implementation phase but also in the design phase in order to disseminate conscious decision-making process for designing interventions. Gramya II in its design has given utmost significance to people’s involvement and have targeted interventions to encourage greater participation of people.



An assessment of the social impacts created by the project seeks to answer the following questions:

- *Has the project been instrumental in enhancing equity, strengthen social inclusion, cohesion and promote transparency in intervention to empower communities?*
- *What has been the mechanisms to identify, include and implement associated social risks in the project?*
- *How is the partnership seen with government department in order to sustain the interventions?*
- *What would be the framework way forward to mitigate the potential social risks?*

The section below seeks to answer the above mentioned questions in the mid-term to gauge the extent to which project has been able to create the intended social impacts as envisaged from the approach.

Earlier Watershed Project Designs (Approach)	Current Approach
Production and sectoral focus Technology focus Integration with Large Scale Projects Subsidy and allocations Emergence of Social	Structural reform Livelihood focus Environmental protection Empowering local participation Sustainability Food security Linkages and capital accumulation

Social Inclusion Strategies of the Project and related Impacts

Gramya II activities are focused on an inclusion strategy which covers all the social groups including vulnerable groups and therefore have targeted interventions for promoting the same. The project has the following approach towards social inclusion:

A. Inclusion of women and SC/ST in Institutions created by Project

Responsibility for identification of investment priorities, their implementation (including financial management and procurement responsibility), and operation and maintenance of GPWDPs is decentralized to GPs and a water and watershed management committee. (WWMC) is formed for the implementation of the same. The WWMC is chaired by the Gram Pradhan (elected Head of GP) and is responsible for:

- Assisting FNGOs in mobilization of villagers;
- Lead the process of planning, preparing and implementing GPWDPs including financial Management and procurement responsibilities;
- Submit monthly and annual financial reports to WMD; and
- Ensure that the GP annual accounts are audited on a timely basis and submitted to the WMD.

The Water & Watershed Management Committees (WWMC) comprises of six members which include at least one woman, one OBC and one SC/ST member. One Female Ward Member of WWMC is nominated as a co-signatory to the project account along with the Gram Pradhan. In case of Gram Pradhan being a female, male co-signatory to the project account can be nominated at the discretion of the WWMC.

Women Aam Sabha, has been initiated under the project to create greater participation of Women in governance forums and voice out their concerns about the need for work in the village. Due to WAS women are getting a platform to discuss and formulate need based proposals which is then placed in Gram Sabha for approval.

Total no. of GPs	Total members in WWMC	Total no. of woman member					% of women
		SC	ST	OBC	Gen	Total	
525	3079	568	154	345	751	1818	58.9

From the table above, it can be seen that 59% of the WWMC members are women, which clearly indicates that project has been conscious about the inclusion strategy and have included members in leadership position. Across the social class highest woman members in SC category is in Uttarkashi, in ST category in Dehradun, in OBC in Tehri and General category in Almora.

B) Training and Capacity Building

Gramya interventions focus on encouraging the participation of women as well as other vulnerable groups in the training and exposure visits organized. It has been observed that participation of women has increased. Participation of women in trainings/workshops and exposure visits has increased from 43% in 2014-15 to 59% in 2018-19. The training received in the farmer demonstrations, has resulted in them playing a more prominent in farm related decisions and their participation is not limited to only labor work.

Year	Total no. of Trainings/ Workshops/Exposure Visits	Participants		
		Men	Women	Total
FY 14-15	2295	59741	45087	104828
FY 15-16	3310	49261	50594	162814
FY 16-17	2783	60170	63997	200778

Year	Total no. of Trainings/ Workshops/Exposure Visits	Participants		
		Men	Women	Total
FY 17-18	3789	72357	86848	159205
FY 18-19	3823	65988	95118	161106

Although the overall percentage of SC participants is the same at 19%, there is a significant increase in the total number of participants from the SC category.

Year	Total no. of Trainings/ Workshops/Exposure Visits	Participants			Total
		SC	ST	OBC/General	
FY 14-15	2295	20576	36247	48205	104828
FY 15-16	3310	22198	22513	55144	99855
FY 16-17	2783	29781	14238	86148	130167
FY 17-18	3789	27917	30792	100496	159205
FY 18-19	3823	30722	32540	97844	161106

Capacity building is an important tool to enhance the capacity of FIGs. Under Agribusiness sub component-3, the capacity building is done through Trainings and Exposure. From FY 2014-19, highest trainings were conducted in FY-2017-18, workshops in FY 2015-16 and exposure visits in FY 2014-15. The initial years of the project reflects more capacity building with very large number of participants covered.

Name of the event	Status of FY 2014-15		Status of FY 2015-16		Status of FY 2016-17		Status of FY 2017-18		Status of FY 2018-19	
	No.	Participants	No.	Participants	No.	Participants	No.	Participants	No.	Participants
	Training	535	22306	652	30699	926	33677	1596	58769	1257
Workshop	1649	80082	2571	130086	1750	164323	2092	98167	2462	119058
Exposure Visit	111	2440	87	2029	107	2778	101	2269	104	2009

The training and exposure visits have created awareness and enabled farmers to physically witness improved technologies in agriculture, horticulture, livestock and agribusiness and also given them a proven example of success. The level of interest in these exposure visits is high resulting in the high adoption rate of technologies and innovative interventions undertaken, especially in agribusiness can be attributed to the high number of training, exposure and workshops conducted under the project.

The trainings, exposure visits, capacity building and skill up gradation activities have led to a change in the attitude and perceptions of the community considerable. The overall impact of the training programmes was visible in the on-going activities documented through the different case-studies. Another significant impact is also seen in the involvement of women in the activities showing a definite change in gender dynamics.

C. Participation in Planning Process of GPWDP and through AAM Sabha

Increased Participation of Women because of Women Aam Sabha (WAS) has been observed. WAS has brought a significant change among women in the space where they had limited role to play. The suggestions of WAS are getting due importance, there has been open discussions on the suggestions of WAS and are incorporated in the plans.

Table 139: Community response on Inclusion of Women's Suggestion in Plans	
Plans included as per suggestion of Women Aam Sabha	Total (%)
Somewhat changed	46.5
Very much changed	52.3
No change	1.2

In terms of budget also the women centric plans are given due importance but still there is a long way to go. There has been a change but still the allocation is not as per the requirement.

Table 140: Community response on Budget Allocation	
Budget allocated for women centric plans	Total (%)
Somewhat changed	64
Very much changed	33.7
No change	2.3

Women of the community are much aware about the schemes, because of mobility and active participation in governance forums their knowledge about the schemes have increased many folds.

Table 141: Community response on Knowledge Level about Schemes	
Knowledge about development schemes in panchayat	Total (%)
Somewhat changed	48.8
Very much changed	51.2

The women clearly articulated that the Institution of Aam Sabha has been very much beneficial for the overall governance of the Panchayat since it has lent a strong voice to the cause of the Women centric development process

Table 142: Community response on Benefit of Aam Sabha	
Is the Aam Sabha beneficial for the overall governance of the panchayat	Total (%)
Yes	73.30%
No	26.70%

D. Targeted interventions for communities needing greater focus

The project also has a special component focused on transhumant population which has helped in providing day to day items of need to this population helping improve their quality of life. Health camps organized for both the humans as well as their livestock has impacted in improving their health by identifying and addressing the disease and administering curative as well as preventive measures.

Vulnerable groups

The WWMC is also responsible for managing the Vulnerable Group Fund (VGF) supporting livelihood enhancement of vulnerable groups to ensure equity amongst vulnerable households. These Funds are used to finance small income generating activities for vulnerable individuals/groups. IGA proposals are developed by the FNGO in consultation with concerned individual/group and funds are disbursed to the vulnerable individuals/groups, through the GPs after signing of an agreement with GP. Endorsement of each proposal by the MDT to ensure that it is in accordance with the ESMF is mandatory.

In the project, the 'C'- category households were identified through 'Wealth Ranking Exercise' carried out as part of participatory planning for preparation of Gram Panchayat Watershed Development Plans. The features characterizing these 'C' category/ vulnerable group households may vary from one Gram Panchayat to another depending upon the proximity of GP to the connecting road, availability of irrigated area, proximity to market place and other amenities, which are generally characterized by the following features:

- Kuccha House
- Household having fallow /uncultivated land /landless and marginalized farmers having less than 0.1 ha land.
- Reduced Livelihood opportunities
- Less Number / absence of livestock
- Living under debt or overall very less income
- Socially Vulnerable (widow, especially abled, SC/ST, women etc.)

Households fulfilling above 2 to 3 criteria qualify as members of vulnerable group. Similarly, due care was taken to see that Divorcee women, widows and divyang are included as members of groups for income generating activities.

The overall rating of quality and distribution of Individual Assets across the divisions appears too satisfactory. The table above shows that there has been equitable distribution among various categories of project beneficiaries. As can be seen from the table, allocation of assets among 'C' category of beneficiaries is the highest with 45 percent of assets provided to this category, followed by category 'B' (36%) and category 'A' 19%.

Total No. of units (person)	Category 'A'			Category 'B'			Category 'C'		
	No.	%	Female	No.	%	Female	No.	%	Female
15860	2991	19%	745	5741	36%	1515	7128	45%	1943

Till March 2019 the project has provided wage employment to the project beneficiaries to the extent of 7,01,731 man-days with Kumaun region having a wage employment of 3,87,129 man-days and Garhwal with 3,14,602. This shows that the project has been able to generate enough employment to meet the livelihood needs of the community in the project area to quite an extent.

Against an overall grant Rs. 10,01,75,980.00, all the 3770 beneficiaries put together have earned an overall average net income of Rs. 6,26,48,665.00 after putting in 7,01,731 person-days. The average net income of beneficiary works out to Rs. 1661.00. Activities providing maximum net average income had been Food Stall (Rs. 3595.00) and technical and neo activities (Rs. 3572.00) followed by farm-based activities handicraft, tailoring/knitting and traditional activities.

Table 144: Activity wise Status of Vulnerable Individuals

SN	Name of the Activity	No. of Members								Total Members	Grant Allotted (in Rs.)
		Male				Female					
		SC	ST	OB C	Gen	SC	S T	OB C	Gen		
1	Farm based Activities	1	0	0	9	1	0	0	4	15	3,60,000
2	Food Stall	1	0	1	12	0	0	0	3	17	4,75,000
3	Handicraft	20	0	1	6	4	0	0	4	35	5,85,000
4	Livestock Activities	352	120	138	374	296	69	237	474	2,060	5,86,22,900
5	Service	37	7	13	117	3	2	5	18	202	50,55,000
6	Shop	7	1	7	36	7	1	5	19	83	21,05,000
7	Tailoring/ Knitting	79	6	10	50	66	15	38	109	373	90,97,130
8	Traditional	518	20	48	182	20	1	4	17	810	1,95,09,600
9	Technical/ Neo	38	4	16	109	2	2	3	1	175	43,66,350
	Total	1,053	158	234	895	399	90	292	649	3,770	10,01,75,980

Table 145: Financial details of VGA group activities

SN	Name of the Activity	No. of Beneficiaries	Grant Allotted	No. of Months	Total Income Earned	Total Operating Cost	Net Income Earned	Avg. Monthly Income	No. of Live Stocks
1	2	3	4	5	6	7	8 (6-7)	9 (8/5)	10
1	Food Stall	17	4,75,000	177	8,06,597	1,70,320	6,36,277	3,595	0
2	Handicraft	35	5,85,000	492	13,13,820	2,00,885	11,12,935	2,262	0
3	Service	202	50,55,000	1,664	40,43,313	8,16,135	32,27,178	1,939	0
4	Shop	83	21,05,000	648	17,13,268	5,24,230	11,89,038	1,835	0
5	Tailoring/ Knitting	373	90,97,130	4,237	1,09,83,415	19,83,260	90,00,155	2,124	0
6	Traditional	810	1,95,09,600	10,540	2,53,64,705	30,95,615	2,22,69,090	2,113	20
7	Farm based Activities	15	3,60,000	102	3,14,569	78,632	2,35,937	2,313	
8	Livestock Activities	2,060	5,86,22,900	18,327	2,32,13,729	37,25,283	1,94,88,446	1,063	9,721
9	Technical/ Neo	175	43,66,350	1,537	72,54,355	17,64,746	54,89,609	3,572	0
	Total	3,770*	10,01,75,980	37,724	7,50,07,771	1,23,59,106	6,26,48,665	1,661	9,457

*Does not include Uttarkashi

Transhumant Action Plan

Transhumant groups such as Gujjars and Bhotiyas 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. Under Transhumant Action Plan, various utilities items which included tarpaulin/poly sheets, tents, feed tubs, blankets, concentrated feed for the cattle, torches/solar lanterns, daris/cow mats, raincoats, umbrellas, buckets, milk/ water cans, shearing scissors, bells for cattle, shoes, socks, pitthu bags, tripal canvas, cookers, cotton mats, first aid kits, etc. were distributed to the transhumant population in the entire project area at a financial cost of Rs. 159.06 lakhs benefitting 12589 persons during the entire project period.

A majority of transhumant were provided assets such as mats, raincoats, buckets, bells etc. This was followed by provision of torches and solar lanterns for 10% beneficiaries and blankets (9.4%) and feed tubs (9.3%). It is expected that the provision of such benefits would lead to improved health and other indicators of well-being among the transhumant population.

PME

Till date, four rounds of PME exercise have been completed across the Gram Panchayats of all the project divisions. As a practice, PME round is conducted every six months. For the fourth round, 99.1% of the PME has been completed. In some of the Gram Panchayats of the divisions, PME exercise could not be conducted on account of some dispute among the villagers. In case of Dehradun Division of Garhwal Region, there were only 54 GPs during conduction of Round-1 & 2 and GP Mothi was added later on during Round 3 & 4.

88% of the people agreed that transparency as regards sharing of information on project fund is maintained and people are aware about project funds allocation in respect of their GP. 91 percent PME participants agreed that they are aware on question of display of project related information at conspicuous locations in the Gram Panchayats.

Perception of PME participants was further sought on community awareness on display of information relating to expenditure of project funds in the Gram Panchayat. For this, 85% participants accepted that information regarding spending of project funds is displayed at the Gram Panchayat level. 90 percent of the PME participants replied in affirmative as regards their awareness on the place of display of information. Similarly, 91 percent of the participants of PME agreed that transparency regarding sharing of project related information is maintained by WWMC/RVC/MDT.

Timely payment of works conducted under GPWDP is the key issue which needs to be addressed in any project as it directly relates to the payment of wages of the community people engaged in project activities. On this question a significant 92% PME participants replied in affirmative and agreed that timely payments with regard to RVC, User Groups and Vulnerable Group Fund are released well in time. This is a testimony to the fact that payment mechanism across the project area is well in place and timely payment are released to project beneficiaries.

Thus, it can be clearly stated that implementation of works through Gramya II has a very positive impact on the community.

E) Impact on Equity and Cohesion

Equity

The greatest impact of Gramya II in the project region is on building gender responsive strategies and encouraging women leadership and their representation in governance. The WAS formation has enabled women to voice their opinions and given a platform to present their issues. Community women reported that the concerns of women were given priority after the WAS formation. There has been a change in terms of understanding the women issues and problems at the panchayat level. The issues and problems are being discussed in details and efforts are made to address them. The positive change in the community due to WAS and its work has also encouraged women to take up leadership positions and there is a supportive

environment, the family members and the community at large. The suggestions of WAS are getting due importance, there has been open discussions on the suggestions of WAS and are incorporated in the plans. Women of the community are much aware about the schemes because of mobility and active participation in governance forums their knowledge about the schemes have increased many folds.

Social Capital and Women empowerment

Social Capital remains a contested concept till this time as there is no standard definition. The World Bank defines Social Capital as ‘Institutions, relationships, and norms that shape the quality and quantity of a society’s social interactions. Social capital is not just the sum of the institutions which underpin a society – it is the glue that holds them together’ (Hans). It is an important impact indicator to capture as it broadly defines the capacity of the community to co-operate, resolve conflicts, ease transactions and dealings and facilitate upliftment and inclusion. The project has taken various steps for institutional building and for inclusion of the different groups through focused interventions. The impact of these interventions is bound to change the fabric of the society towards the positive as benefits are being reaped by all. The Social Capital score was calculated for all the households covered under treatment and control separately both in baseline and MTR. A total of 9 parameters were considered under dimensions of ‘Togetherness and Trust’ and ‘Social Cohesion’. The perceptions of households are reflected in the social capital score



Figure 25: Social Capital Dimensions and Parameters

Scores are divided into four quartiles where Quartile I represent percentage of households that have scored Excellent, Quartile II represents households scoring Good, Quartile III represents percentage of households scoring Adequate and Quartile IV represents households that have scored poorly on the social capital front. It can be seen from the chart below that the score in the highest quadrant has slightly increased during the MTR study as compared to that of the Baseline Results.

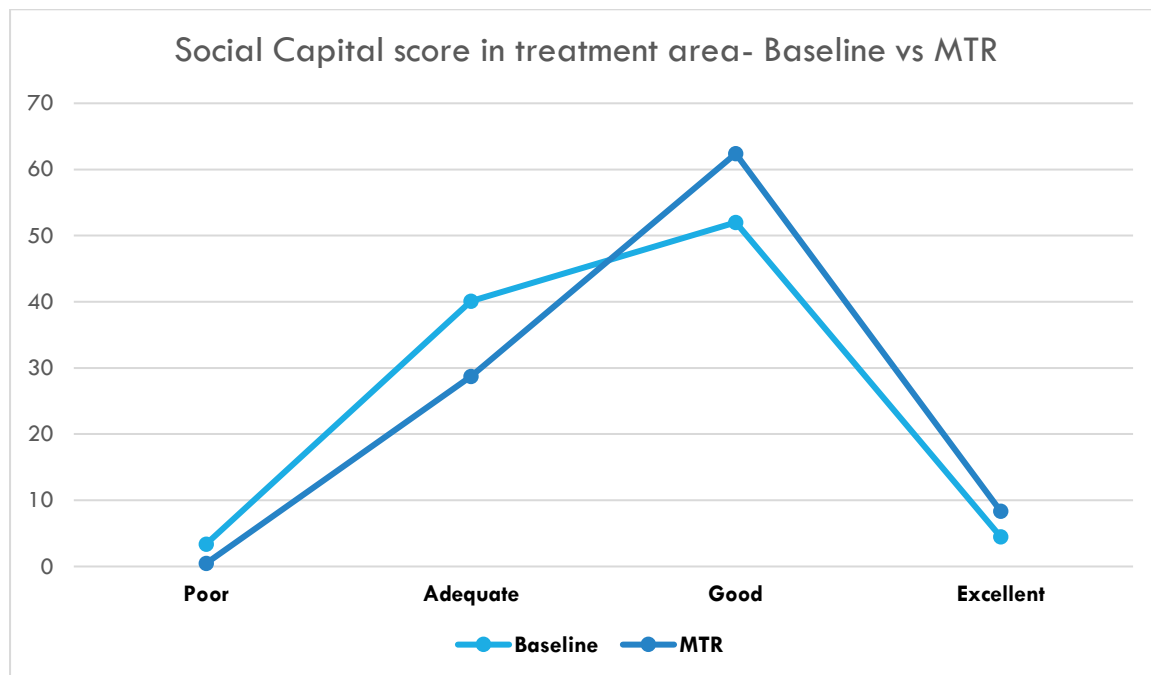


Figure 26: Social Capital score in treatment area

Gramya II has inbuilt inclusive strategies for gender inclusion and in providing opportunities at various stages of GPWDP implementation to empower women. Women’s opinions were captured to calculate the women empowerment score. The Women Empowerment score was calculated for all the households covered under treatment and control separately both during baseline and MTR study based on various parameters grouped under multiple dimensions. A total of 24 parameters were considered under dimensions of ‘Mobility’, ‘Women’s role in agriculture’, ‘Decision making’, ‘Access to services’ and ‘Safety’ as shown in the figure below.

Decision making	Access to services	Safety	Role in agriculture
<input type="checkbox"/> Money spending	<input type="checkbox"/> Involved in paying bills	<input type="checkbox"/> Trust and honesty	<input type="checkbox"/> Managing Labour payments
<input type="checkbox"/> Share of Income as saving	<input type="checkbox"/> Involved in bank transactions	<input type="checkbox"/> Community Welfare	<input type="checkbox"/> Managing timely inputs in agriculture
<input type="checkbox"/> Share of Income as expenditure	<input type="checkbox"/> Travels to health care centres	<input type="checkbox"/> Trust on community	<input type="checkbox"/> Managing share of production - Self consumption and Selling
<input type="checkbox"/> Major investments	<input type="checkbox"/> Travels to seek for livestock management	<input type="checkbox"/> Willingness to help	<input type="checkbox"/> Involvement in deciding type of crop to cultivate
<input type="checkbox"/> Spending on food	<input type="checkbox"/> Approaches panchayat	<input type="checkbox"/> Associate with community	<input type="checkbox"/> Attending training
<input type="checkbox"/> Quality of food	<input type="checkbox"/> Participating in school level meetings		<input type="checkbox"/> Attending crop demonstrations

Figure 27: Women’s role in agriculture

Perceptions of women are reflected in the Women Empowerment Score. The graph below shows that women in treatment areas feel more empowered post project interventions and over 16 % change is seen in the highest (excellent) quadrant.

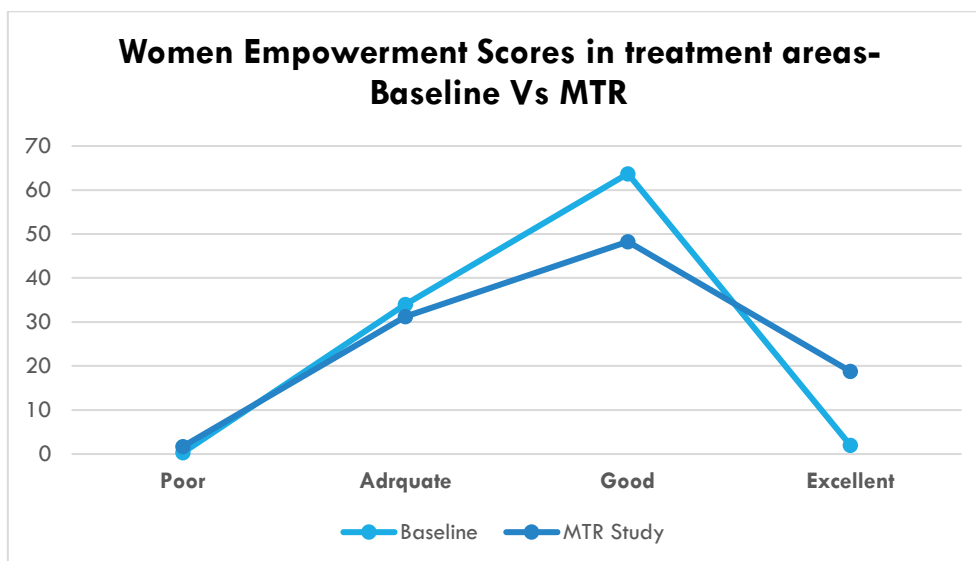


Figure 28: Women Empowerment Scores in treatment areas- Baseline Vs MTR

F) Improved Gender dynamics

UDWDP- II has believed in collective growth and hence reached out to women in villages by giving it a form of institution. The most prominent being FIGs and Women Aam Sabhas where substantial increase in participation of women in decision making is seen. It is not only linked to production linked decisions but also market linked decisions. Crop demonstrations are attended by women farmers and they have also shown great deal of interest. The mobility made available due to the presence of WAS and the conducive environment where opinions of women are given equal importance has helped in improving the gender dynamics.

Women from the community reported that the concerns of women were given priority after the WAS formulation. There has been a change in terms of understanding the women issues and problems at the panchayat level. The issues and problems are discussed in details and efforts are made to an extent to address them.

Table 146: Response on Women Concerns	
Women concerns were given priority	Total (%)
Somewhat changed	69.8
Very much changed	26.7
No change	3.5

Women are encouraged to take up leadership positions and there is a supportive environment, the family members and the community at large are supporting women.

Table 147: Response on Women Leadership	
Encouraged to take leadership position in institution	Total (%)
Somewhat changed	39.5
Very much changed	57
No change	3.5

Mobility is one of the important aspects to reflect on the changed perspective. Women are reported to be mobile to participate in governance forums. That clearly shows their interest and conducive environment which has been created because of the support from the family and the community.

Table 148: Response on Mobility of Women	
Increased mobility of women to participate in governance forums	Total (%)
Somewhat changed	18.6
Very much changed	77.9
No change	3.5

The MTR study also assessed the change in gender dynamics and women’s perception. The comparison of this data with control areas shows that there is a significant change brought about by project activities on the social capital and women’s empowerment in the region.

Women’s ease of mobility in visiting markets and other areas outside the village is significantly better than control area and also women’s role in making household decisions has increased.

Women's Ease of mobility and role in household decision making

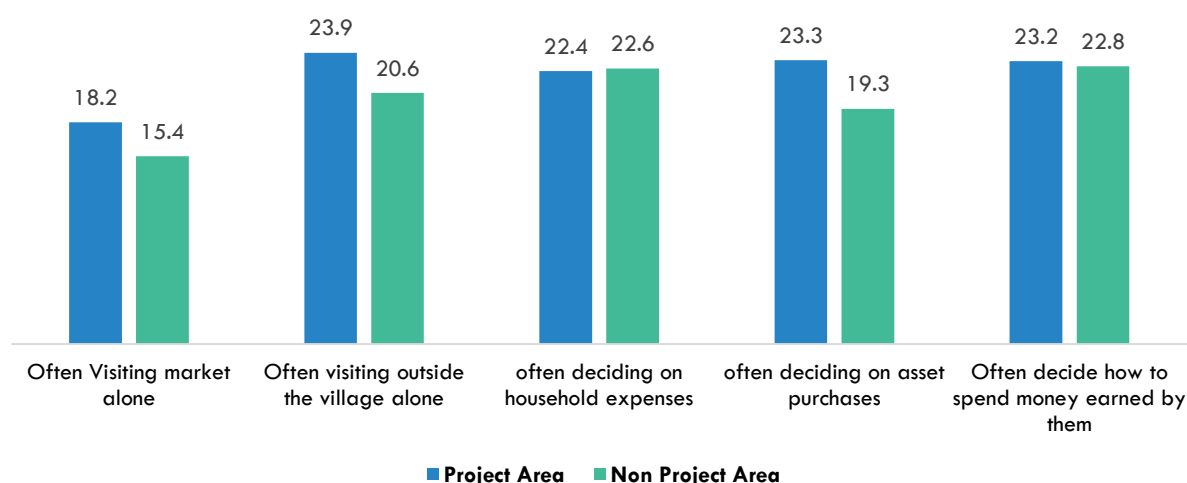


Figure 29: Women’s Ease of mobility and role in household decision-making

Women’s role in agriculture and economic decisions at home is also more often than that in the control areas and the change can be attributed to project activities which encourage participation of women in through different interventions.

Women's role in agriculture and economic decision making

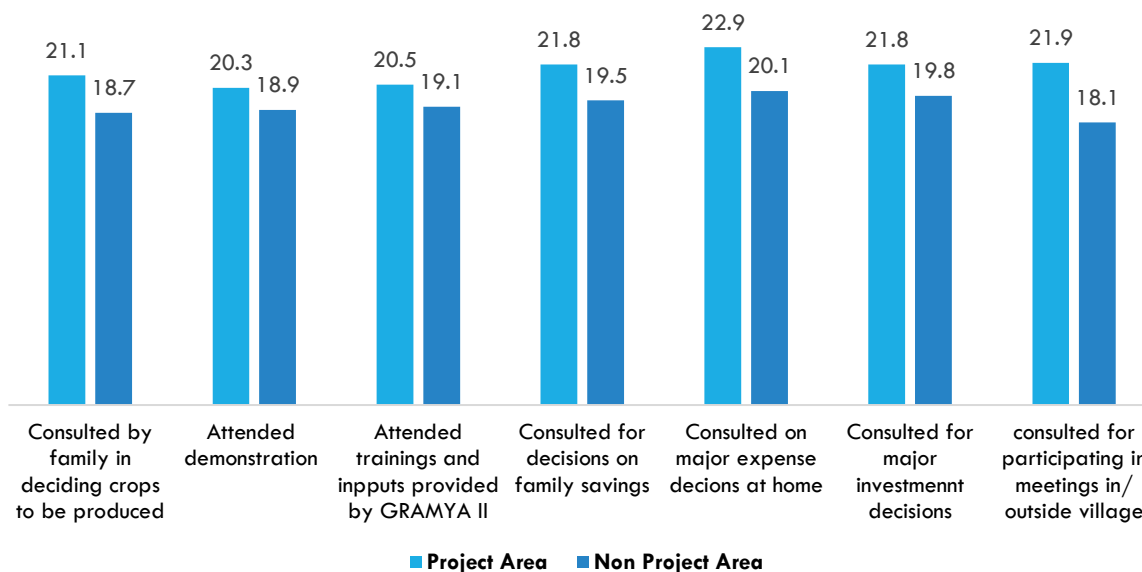


Figure 30: Women’s Role in agriculture and economic decision-making

Women’s perception on ease in accessing the different services as well as safety while participating in the different community forums is good to fairly good showing that the women regard the interventions undertaken in the project important in changing the gender dynamics.

Women's Perception on ease in access to services

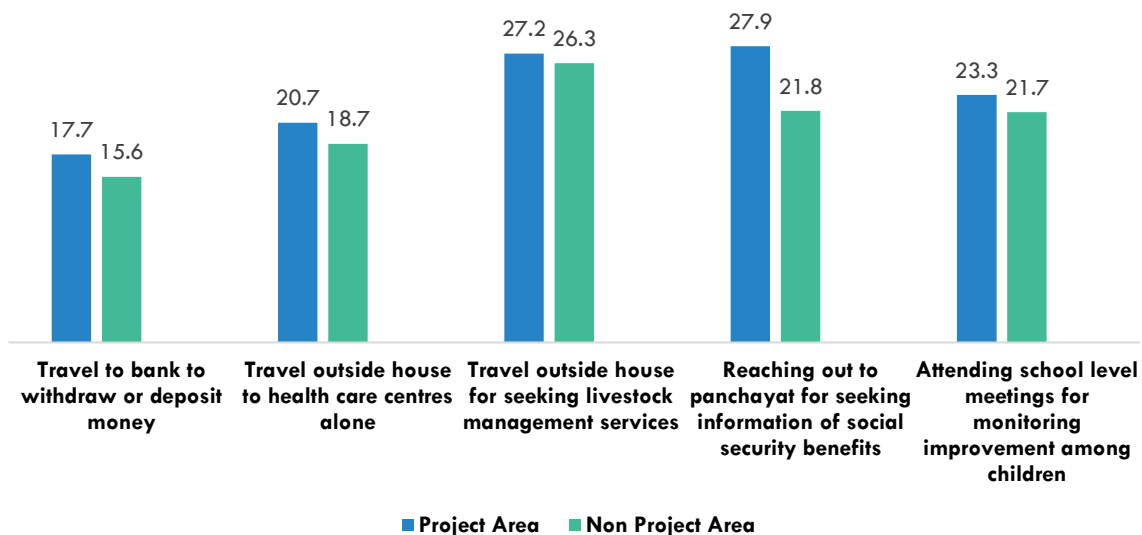


Figure 31: Women’s Perception on ease in access to services

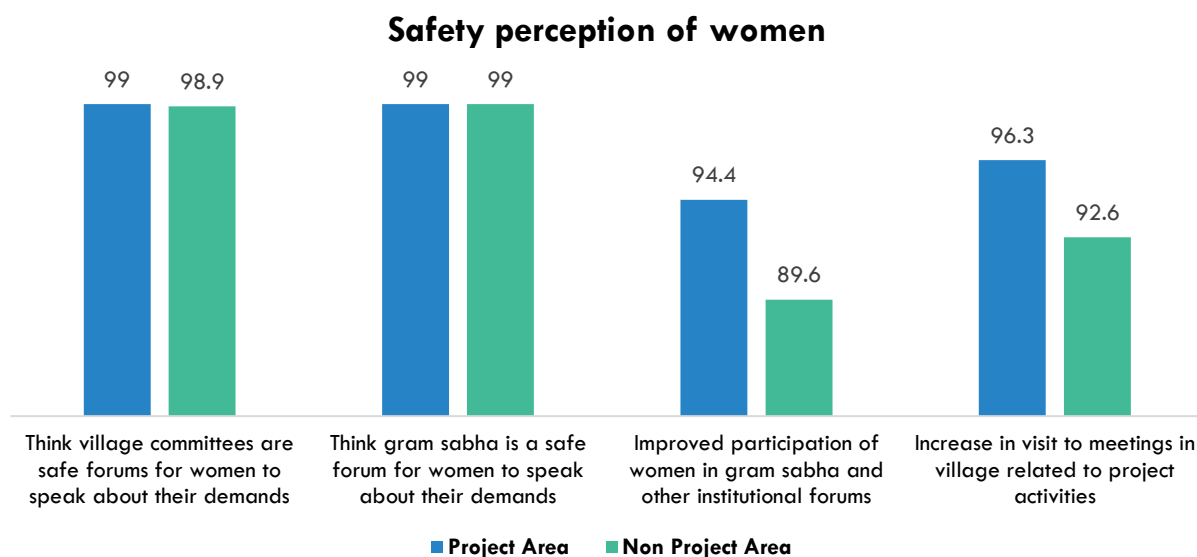


Figure 32: Safety Perception of women

G) Impact on Well-being

Reduction in drudgery of women

Farm mechanization and distribution of farm tools have also helped in reducing the drudgery of women in farm labor and allowed ease of work. Distribution of animal husbandry input has considerably helped reduce the work especially for women who are the primary carer of livestock in rural homes. Fodder cultivation has ensured availability of feed for livestock around the year. The problems associated with fodder collection such as availability, carrying distance and time and effort are no more an issue. Energy conservation interventions like providing solar cookers/pressure cookers and bio gas has provided the rural women with a smokeless cooking tool that utilizes renewable energy. The time and effort spent in gathering fuelwood from the forest for cooking, and the respiratory ailments associated with cooking on an open Chulha have significantly reduced.

Time saved due to lower frequency of fodder collection: Prior to project an average 2.5 hours was spent in collection of fodder daily and often involved 2 or 3 members of the household. Presently after project interventions of fodder plantation, the time has reduced to 2 hours and also number of members involved in fodder collection are 1 or 2.

Time saved due to Stall feeding of animals: The stall-feeding initiative has been received very well and 87% of the women farmers have said that they find it convenient now to provide fodder and take care of animals as there is less effort and time involved. Over 74% of the beneficiaries have said that the stall-feeding program has had a positive impact and made it easier for them to feed the animals.

Time saved due water availability: Water availability interventions have been undertaken throughout the project area and number of traditional as well as new water sources have been made available and their water discharge increased significantly. Beneficiaries, mainly women, have corroborated the fact as 55% said that do not spend any time in bringing drinking water to their household as water is available at or near their house. In contrast, only 6% of the respondents in control areas said they have to spend no time in bringing drinking water and over 90% spend up to 1 hour in bringing drinking water to their dwellings.

Dietary improvements

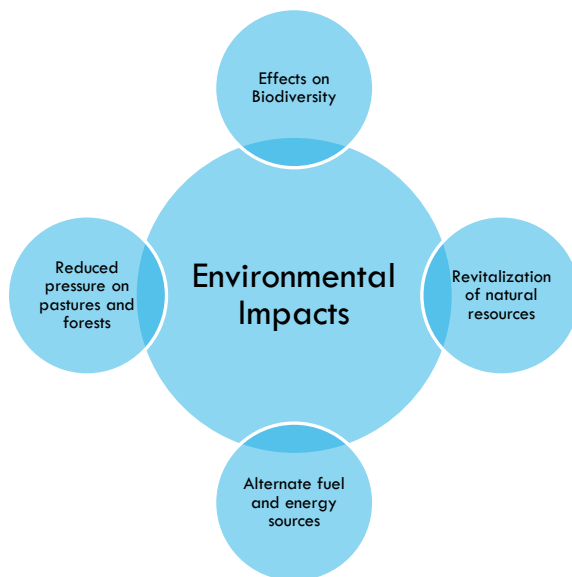
Almost all farmers involved in high yielding agricultural crops (cereals, pulses, and millets etc.) in study villages have decided to dedicate certain portion of their land holding under organic farming practices to produce the crops that are being used for self-consumption. These farmers plan to increase the area under organic farming after realizing the cost-benefit of organic farm produce based on conventional market price. Bio composting technique has thus facilitated the spread of health-consciousness among the farming community. Organic farming is also contributing to a nutrient rich diet for the farmers thus allowing a healthier lifestyle. The project has made the FIG members more health conscious, as they perceive that bio-composting techniques, organic farming practices, vegetable cultivation and hygienic milk production would help in improvement of family health. Homestead plantations have allowed farmer families to include diverse nutrients in their diet with availability of various vegetables and cereals.

The data from MTR study has shown that carbohydrate intake of farmer families in project area is 14.1% (for once a day) and 8.3% (for thrice a day) more than control areas. Similarly, protein intake of farmer families in project area is 7.1% (for once a day) and almost equal (for thrice a day) more than control areas.

Table 149: Nutrient intake of beneficiaries in project area			
Nutrient	Project (%)	Control (%)	Difference
Carbohydrate	32.2	18.1	14.1
Once a Day	16.1	7.8	8.3
Thrice a Day			
Protein			
Once a Day	32.6	25.5	7.1
Thrice a Day	31	31.7	-0.7

6.2 Environmental Impacts

Because of the extraction of natural resources by the inhabitants for subsistence living far beyond their capacity to regenerate, many areas of the state are facing degradation of natural resources. For example, against the requirement of 18 ha of forests land including 5- 12 ha of well-stocked forests, per ha of cultivated land, the ratio of forest to agriculture is only 1.33:1 and the ratio of well-stocked forests to agricultural land is only 0.84:1. Further, soil erosion from the different land use systems in the watersheds has increased many-fold and land productivity has been declining. The water retention capacity of the fragile watersheds has reduced and people are now facing acute shortage of water. Grazing intensity is high; each ha supports about 7.99 units of livestock against the appropriate 2 livestock units. The green fodder requirement has been estimated as 259 lakh mt per annum, but present production is only 52 lakhs mt. both from the forests and agriculture.



To reverse the trend of environmental degradation and ensure sustainable livelihood to the people, the Uttarakhand Decentralized Watershed Development II Project (GRAMYA II) has been introduced with a view to developing Micro Water Sheds in the remote hilly areas of the regions. An important thrust area under the project is the active and effective participation of community as a major stakeholder in conservation, regeneration and the judicious use of all the natural resources - land, water, plants and

animals within a particular watershed. The project has undertaken a range of interventions under the different components such as afforestation, fuel wood plantation, agricultural diversification, introduction of high yielding varieties and social mobilization to name a few. Several of these interventions are having an impact on the environmental and social setting in the areas of influence.

To ensure that Project is based on various environmentally sustainable and energy efficient approaches, practices such as organic farming, use of various alternate fuel-based devices, initiatives towards fuel switch, various soil, and moisture conservation activities to improve the moisture regime for agriculture are being demonstrated and promoted along with encouraging and partly financing the adoption of environment-friendly energy sources such as biogas plants, solar power, and pine briquetting. Such alternate energy sources mean less exploitation of the forest resources and reduced drudgery for women.

The ESMF developed and adopted during the first phase of the project (UDWDP I) was reviewed and based on the experiences gathered an Environmental and Social Code of Practices (ESCP) was developed for UDWDP II. The environmental and social guidelines were made an integral part of the project planning process. A number of plans are being developed as part of the project including the Revenue Village Committee (RVC) Plans, the Gram Panchayat Watershed Development Plans (GPWDP) and the Transhumant Action Plans (TAP). Capacities of stakeholders responsible for development of these plans including community members were developed on environmental and social guidelines so as to ensure that the plans that they developed met the basic requirements.

The section delves into understanding the impacts of the project, especially ESMF inclusion, on preventing further degradation of environment and restoring the biotic components for short as well as for a long-term goal.

a) Reduced pressure on pastures and forests:

The cultivation of fodder and Napier grasses in the fields as a standalone crop and/or border plantation has provided the farmers with around the year feed for livestock reducing the reliance on forests or pastures. The fodder cultivation has reduced the effort of collection of fodder and grasses from the forest. The forests and pasture lands are protected from over exploitation and now have the opportunity to recover from the over

utilization done in the past. Similarly, need for fuelwood has also considerably reduced due to solar cookers/pressure cookers and pine briquettes that are utilizing renewable resources i.e. sun and pines fallen from the trees.

b) Promotion of low impact and traditional energy sources:

Promotion of renewable energy sources such as solar, pine briquettes, solar powered water lifting, biogas, etc. as well as the traditional ones such as the Gharat (hydro powered mill) has contributed to a reduced requirement of electric power. Local communities can now access faster and more efficient crop processing as against either manual crop processing or of hours or days of walking to electric or diesel machines for availing the same services. Biogas has not only helped in utilizing the cow dung and other organic material for energy generation but is also providing nutrients for farming through the output slurry. With increased acceptance of renewable sources of energy local communities stand to benefit from faster and more efficient agro-processing services and a wider range of mechanized crop-processing machinery, plus electrical services via an add-on generator, such as evening lighting, or water-heating, battery-charging, crop-drying, or irrigation pumping at night in the future.

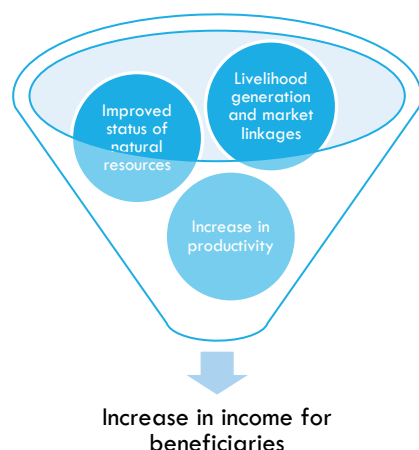
c) Revitalization of natural resources- forests, land, water, and soil:

Adoption of climate resilient agricultural practices under UDWDP II has helped achieve the natural resource conservation, especially soil and water. Almost all farmers engaged in IPM at demonstration in the study villages are convinced to follow the use of organic insecticides, bioagents and the sticky and/or light traps to control pests/insects after the project completion. Demonstrations of Bio-compost, Vermi-compost and INM are received well by the farmers and over 30% of farmers have adopted the organic nutrient management practices along with soil testing based fertilizer application. This has reduced the usage of inorganic measures of nutrition, and disease and pest management, curbing the degradation of soil. Inorganic measures are also less expensive, thus increasing the net profit of the farmers. Uncultivable wasteland brought under fruit orchards has helped reclaim the barren lands and improve its soil quality. Making livestock feed available through fodder plantation and woodless cooking units has reduced the pressure on forests for natural resources.

Improved irrigation facilities have resulted in various plantation activities including afforestation, assisted natural regeneration of Oak tree and Fodder and orchard plantation in approximately 0.024 lakh Ha in project area which has effectively resulted in reduction of 4.7 percent of blank / barren land in project area (0.51 lakh Ha blank land in project area at the beginning of the project)

6.3 Economic Impacts

The Gramya II project has supported the Government of Uttarakhand (GoUK) in improving agricultural productivity and rural livelihoods in the hill areas by enhancing natural resource management and strengthening the administrative capacity of the targeted GPs. With strong community participation and adoption of improved water conservation techniques, has helped increase water availability for irrigation as well as domestic use in a sustainable manner. Moreover, investments in rainwater conservation and harvesting has shown a major impact on agricultural production and productivity in the project area. The project introduced high-value vegetable crops as well as improved crop production techniques in irrigated areas through demonstrations and achieved increased productivity. Additionally, agribusiness component has helped enhance forward linkages and better prices for the produce locally as well as on out of state markets.



The economic impacts of the project include benefits from agriculture, livestock, horticulture, forestry, soil conservation, domestic water and employment. 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.

a) Impact on asset ownership:

Increase in yield of major crops, cropping intensity and inclination towards diversification has strengthened the agriculture-based economy. Farmers in study villages are now are conscious of profitability of various crops and there is a distinct attempt to shift to crops that are more profitable. Increased productivity and better crop management is directly proportional to the increased income for the farmers and better livelihood security. Increase in income from Agriculture/Horticulture crops has also provided surplus income which was absent previously and enabled the farmers to take risks for new crops of high commercial value thereby boosting the overall household income of FIG members. Fallow land has also been brought under cultivation thus increasing the available area for cultivation for the farmers and increasing the value of their asset land.

Interventions in livestock and animal husbandry such as improved livestock breeds for Natural breeding as well as Artificial Insemination and health camps for livestock has contributed to better birthing rates in livestock and healthy progeny. According to the MTR study, livestock ownership in the project region has increased from 2 in the baseline study to 4.

Table 150: Average number of cattle owned				
Overall	Baseline		Mid Term	
	Project	Control	Project	Control
Improved Variety	2	1	4	1
Indigenous Variety	4	4	5	4

b) Increase in income:

The increased crop and livestock productivity as mentioned in Section 4.3 is an important measure of farmer’s income as increased productivity means increased marketable produce. The improved crop technologies, use of climate resilient crop varieties, availability of irrigation has helped to reduce the risk of crop failure and farmers are able to cultivate a larger area as compared to before project. Farmers are also diversifying into nutri-crops, oilseed, pulses, and vegetables. The increased productivity as well as increase in area has led to incremental income for the farmers. Similarly, with livestock, the improved and health and nutrition management and improved progeny has helped in increasing the milk production by 50-100% in the indigenous breeds of cattle. Also, introduction of high yielding improved breeds of cattle and goat is giving milk up to twice that produced by indigenous breeds. The increased production of milk is contributing to improved diet and also to increased income from milk sale.

Moreover, formation of FIGs and subsequently their culmination to form Farmer Federations has enabled farmers to get improved farmgate prices due to collective sale of produce. The Federations are also instrumental in helping farmers decide the crops to cultivate as per market demand, bridge the gap between farmers and corporations by eliminating intermediaries and to get a fair price for their produce as per market situations. The increase in Household Income of the target beneficiaries has increased from an average of 140616 to Rs 160334 annually post project in the project area, whereas in the control areas the increase is from Rs 141132 annual/HH to Rs 148415 annual/HH only. The increase is about 14% for project area whereas only 5 % for control showing that Income Generation Activities undertaken in the project have positive results. Detailed analysis of average household income by economic activity and social class is given in Annexure Table 33 and 34 respectively.

c) Income enhancement through poly-houses, vermi-compost, and bio-compost:

Demonstration of cropping technologies such as poly house, vermicompost and bio compost has been received very well by the farmers in the target area. The Polyhouse structures promoted by the project has largely enabled the beneficiary farmers to cultivate the high value horticulture crops like vegetables, both native as well as exotic under protected cultivation situations. Many farmers are benefitting from the poly house by cultivation off-season vegetables, flowers and other exotic vegetables for commercial markets and have increased income of up to Rs 10,000 per month from the sale of vegetables.

Table 151: Income enhancement through Crop demonstration

	Almora	Bageshwar	Dehradun	Pauri	Pithoragarh	Rudraprayag	Thatyur	Uttarkashi	Average
Number of months vegetables are available	6	6	6	6	6	5	6	6	6
Income earned through Interim sale of vegetables (per month)	15000	13000	10500	8000	10000	6000	13000	4500	10000

Vermi-compost is also being looked at as an income generating activity and farmers have started producing surplus vermicompost for sale and not just for self-consumption.

6.4 Institutional Impacts

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. The project is built to develop greater ownership, planning and management by community through participatory approach.

Institution building for creating various community-based groups for collective working and smooth functioning of the activities had also been the focus area of the project. For this purpose, the FNGO and PNGO field staff formed various institutions and groups, such as Water and Watershed Management Committee, Revenue Village Committee and Farmers' Interest Groups across the divisions.

The institutions and the stakeholders whose capacities were built were entrusted with certain roles and responsibilities. The existing institutions were strengthened and the newly formed institutions were capacitated. The institutions at the level of community include the officials working at Gram Panchayat and Village level including the ABSOs and FNGOs. The institutions at the level of state include the officials and the committees formed for implementation of the project

Capacity building measures particularly at Gram Panchayat level were aimed at building the capacity of the institutions in project management and social accountability, and in particular preparing and implementing GP Watershed Development Plans (GPWDPs). The institutional structure also points towards a high degree of transparency in various project processes.

a) Increased representation of need-based proposal due to Aam Sabha:

Women play a pivotal role in natural resource management and have been given a key role in planning, implementation, and monitoring processes. WAS are ensuring that women raise their proposals and those viable are discussed and incorporated in respective Revenue Village Committee (RVC) plans and undertaken by the Gram Panchayat Watershed Development Plans of their respective GPs. Out of the proposals incorporated, 6485 were addressed through GPWDP, 1209 through convergence with other government schemes and 826 through other sources. Presently, there are 4266 proposals remaining to be addressed, of which 3146 are proposed to be completed through GPWDP and remaining be accomplished through other sources. Overall, 66.6% of proposals were incorporated in the GPWDP Plan against the total proposal raised by Women Aam Sabha. Due to WAS women are getting a platform to discuss and formulate need based proposals which is then placed in Gram Sabha for approval.

WAS has brought about a big change, on the plans where women were having limited role to play has changed. The suggestions of WAS are getting due importance, there has been open discussions on the suggestions of WAS and are incorporated in the plans.

Table 152: Inclusion of Women's Suggestion in Plans	
Plans included as per suggestion of Women Aam Sabha	Total (%)
Somewhat changed	46.5
Very much changed	52.3
No change	1.2

In terms of budget also the women centric plans are given due importance but still there is a long way to go. There has been a change but still the allocation is not as per the requirement.

Table 153: Budget Allocation	
Budget allocated for women centric plans	Total (%)
Somewhat changed	64
Very much changed	33.7
No change	2.3

Women of the community are much aware about the schemes, because of mobility and active participation in governance forums their knowledge about the schemes have increased many folds.

Table 154: Knowledge Level about Schemes	
Knowledge about development schemes in panchayat	Total (%)
Somewhat changed	48.8
Very much changed	51.2

The women clearly articulated that the Institution of Aam Sabha has been very much beneficial for the overall governance of the Panchayat since it has lent a strong voice to the cause of the Women centric development process

Table 155: Benefit of Aam Sabha	
Is the Aam Sabha beneficial for the overall governance of the panchayat	Total (%)
Yes	73.3
No	26.7

During the field verification process, the M&E Team made a detailed analysis of the type of proposal, numbers received and numbers incorporated in the GPWDP plan on a sample basis for Thatyur, Pauri and Dehradun Division, results of which are attached in the Annexure. A matrix of type of Proposals is elucidated in the following table

NRM Proposals	Other Proposals
<p>NRM proposals included –</p> <ul style="list-style-type: none"> • Fodder development • Water resource rejuvenation • Plantation work • Orchard Development • Pipelines • Construction of Irrigation Channels • Irrigation tank • Roof water harvesting tank s • Biogas plants • Construction of Check Dams • Solar water lifting pumps • Terrace repair • Crate wire and Vegetative check dams • Protection walls • Bio composting pits • Poly houses 	<p>Other proposals raised by women included -</p> <ul style="list-style-type: none"> • IGA for Vulnerable households • Training and exposure visits • Mushroom cultivation • Exposure visits for IGA activities • flour/ spice mills, • Goatry, Poultry, dairy units • Improved variety of seeds • Agricultural tools • Construction of animal shelters, mangers, compost pits and animal chari, etc. • Solar lights

b) Gram Sabha Participation:

Gram Sabhas are grass root unit responsible for implementation of the activities under UDWDP II. The role of Gram Sabha comprises is not only in discussing and approving GPWDP activities but also monitoring the working of GP and Implementers to ensure inclusion of all groups and distribution of benefits irrespective of caste, gender, or status. Therefore, participation of members in the Gram Sabha is of utmost importance and owing to the format of the project implementation, participation in Gram Sabha meetings has increased from 62.4 percent to 95.6 percent in treatment areas. Participation of women has also increased from 54 percent to 57 percent from Baseline study to midterm review.

Table 156: Status Of Gram Sabha Participation				
GP participation	Project	Control	Project	Control
Gram Sabha Participation (by any family member)	62.4	58.0	95.6	94.6
Gram Sabha Participation by Female member of family	54.3	67.2	57.0	54.6

c) GP Audits and strengthening:

Financial audit as per requirement of the PRI Act and the State Accountant General and a Social audit through Participatory Monitoring & Evaluation of Gram Panchayats is an integral part of the UDWDP II. It is mandatory for all GPs to submit their monthly and annual financial audit reports to WMD in accordance to statutory norms. The audit has aided to review/audit operations in the Gram Panchayats to ensure that the internal control systems are operating satisfactorily across the programs. The timely auditing has ensured transparency in financial transactions and expenditure done on project activities by the GP. Transparent operations increase trust of the village members in the institution and strengthen participatory governance.

Out of the total targeted Gram panchayat for financial audit, the Project has been able to achieve a completion rate of 100% by March 2019. The no of GP's with satisfactory" financial audit too stands at 100%.

Out of 525 GP's, social audit was targeted in all GP's. Against a planned target of 525 social audits, the Project has been able to achieve 100% completion rate i.e. 525 GP's have completed the audit process. Over 85% of the GPs have satisfactorily completed the Social Audit using PME in the 1st, 2nd, 3rd and 4th rounds of assessment. The results of the 5th are awaited presently

SECTION 7

ECONOMIC ANALYSIS & PROJECTIONS



7. Economic Analysis and Projection

Gramya II targets comprehensive development of watershed-based natural resources spread over 263,837 ha covering 525 GPs in 82 micro watersheds in eight mid Himalayan districts located between 700 m and 2700 m above mean sea level. The project focus is to sustainably increase efficiency and income of about 55,600 rural families in 1,066 project villages.

As in most developmental projects, the key parameters that help the decision maker to take informed choices are a) Technical feasibility, b) Economic viability, c) Environmental Sustainability and d) Social Responsibility. While the last two may precede the Technical feasibility process, it is ultimately the Economic viability that decides the acceptance and implementation of any project.

Economic viability is established through robust Economic analysis as a tool to conclude if the project will be a worthwhile investment. Completing an economic analysis allows for fair comparisons to be made between alternatives and demonstrates why a proposed project can be considered the best solution to meet a given objective.

Albeit Financial and Economic analysis have similar features like estimating the net-benefits of a project investment based on the difference between the with-project and the without-project situations. The basic difference between them is that; the financial analysis compares benefits and costs to the enterprise, while the economic analysis compares the benefits and costs to the whole economy.

In line with the above principle, this document tries to do the financial analysis of the enterprises (Vulnerable Group Activities) being supported through Gramya II and a preliminary economic analysis of the project in its entirety.

It may kindly be noted that as the project activities are still being carried out, the economic analysis may only be seen as a tool which is depicting the direction that the project should take in subsequent years of implementation. The findings of the analysis should not be construed as a comment on project performance.

7.1 Economic Analysis of Gramya II

The complex issue of watershed degradation and management has been the subject of wide attention in the economic and water management literature. In general, the focus has been on the economic costs and benefits of watershed conservation measures and the valuation of the benefits of specific 'watershed services' such as drought mitigation, flood control, water quality maintenance and water yield.

Ultimately, water and land users and the environmental (and other) services provided by the watershed are inexorably interconnected by the hydrological characteristics of the watershed. Consequently, the impact of water or land use on another is determined by the nature of the hydrological cycle. Therefore, the issues of land and water resource management and allocation arise directly from the nature of the watershed and are thus sensibly analysed and approached from this perspective.

7.2 Overall Approach to Economic and Financial Analyses

Economic Analysis is generally carried out *ex-ante* to appraise the project and to take an investment decision, and *ex-post* after the completion of project to know whether the intended objectives have accrued. An economic analysis is carried out during various stages of the project to quantify the economic benefits and costs based on interventions to provide insight on the direction and to know if the intended interventions produce the intended results as envisaged in the results framework.

As the project is in the final phase of implementation, there are many interventions and have been grouped into categories that have immediate, intermediate and long term benefit. During each half year, a set of project interventions is identified along with the project authorities for conducting economic analysis. Data pertaining to cost and benefits is collected from the project beneficiaries through a set out format finalized after piloting. Data sets are collected from beneficiaries through questionnaire or interview schedules on before (without project) and after (with project) to capture the influence of the project intervention on the beneficiaries. Individual case studies supported by BC ratios shall be done for IGA and Vulnerable group support. A full-fledged economic analysis is carried out for major project interventions as and when they are complete and returns are generated.

Economic and Financial Analyses: Cost-benefit analysis is conducted for a project period of 30 years. Costs and benefits is estimated at 2015 prices over 30 years with 12% opportunity cost of capital. Present value of discounted project financial benefits over the project life, due to the project interventions, as estimated during project appraisal are estimated at Rs 15.2 billion, shared by watershed services (14%), forest plantations (39%), agriculture (28%), animal husbandry (6%), agribusiness (11%) and IGA (2%).

Economic analysis is conducted after making appropriate adjustments to financial benefits and costs.

Cost Effectiveness Analysis: The cost effectiveness analysis of the project is ascertained by comparing the decentralized comprehensive watershed development approach adopted by the project. Water harvesting structures and resource conservation investments under Gramya I covering irrigation tanks, drainage line treatment works, irrigation channels, forest plantations, and village ponds had been analysed and compared with publicly-funded similar comparable investments during appraisal stage. The same shall be repeated during the course of the project as well.

7.3 Economic Analysis of the Project

7.3.1 Project Costs

A total investment of \$170 million is envisaged for Gramya II. For the purpose of this economic analysis the exchange rate of Rupee vs Dollar has been taken at the average exchange rate pertaining to the calendar year 2013 which according to Reserve Bank of India was 60.5. Thus in rupee terms total investment planned for the project is Rs. 1028.50 Crore. It may be noted that of the total investment approximately Rs.3 crores would be generated through contribution (in the form of Kind/Wage) from beneficiaries. Given the negligible quantum of beneficiary contribution at this stage, their opportunity cost has not been built into the economic analysis.

This investment is being done towards following components.

- Component 1 - *Social Mobilization and Participatory Watershed Planning* - would ensure community-led participatory watershed planning, implementation and maintenance functions in 509 targeted GPs covering 82 micro watersheds and accounts for 18% of total project costs.

- Component 2 - *Watershed Treatment and Rainfed Area Development* - would integrate arable and non-arable land development with a ridge-to-valley comprehensive approach by the communities to conserve and develop the productive potential of natural resources in the project area. Proposed interventions will cover:
 - watershed treatment and source sustainability investments for 218,787 ha of non-arable lands including inter-GP areas;
 - rainfed agriculture development investments for arable lands (45,050 ha) to conserve soil moisture and enhance rainfed crop productivity in 37,157 ha (net); harvest and recycle rainwater runoff to expand irrigation coverage and enhance productivity of high value crops in 7,893 ha (Net), and
 - Ensure localized fodder production as a part of moisture conservation package to support cross bred cattle and increase milk productivity for 47,440 households, at a projected investment cost of 53% of total project costs.
- Component 3 - *Enhancing Livelihood Opportunities* - would ensure market access and better prices for the high-value vegetable producers (20,816 farm families) in 1,066 project villages and supporting individual and group-based income generating activities for the targeted 13,420 vulnerable households in the project area. The component would account for 11% of the project costs.

7.4 Quantification of Project Benefits

Encouraged with the success of Gramya I implemented from 2004 – 2012, Gramya I, the Uttarakhand Decentralized Watershed Development Project – Phase II, also referred to as Gramya II, is being implemented with the financial assistance of World Bank. This project focusses mainly on development of rainfed agriculture through use of watershed development tools, particularly rainwater conservation and harvesting and natural resource management. Gramya II is built on the successful community-based approach of Gramya I and key learnings from this phase are being incorporated to ensure improved implementation and outcomes.

The project envisages community led participatory watershed development with bottom up approach based on the priorities identified by the beneficiaries in the project area. The Gramya II targets comprehensive development of watershed-based natural resources in eight mid Himalayan districts located between 700 m and 2700 m above mean sea level. The project focus is to sustainably increase efficiency and income of about 55,600 rural families in 1,066 project villages. The farmers, cultivated 45,050 ha of arable lands of which, 77 per cent were rainfed lands, 12 per cent irrigated and the remaining 11 per cent were left fallow. Majority of the farmers are marginal farmers operating less than one ha of land.

The Project Development Objective (PDO) of Gramya II is to *increase the efficiency of natural resource use and productivity of rain-fed agriculture by participating communities in selected micro watersheds of the Uttarakhand state*. The project is being implemented in seven years from 2014 to 2021. The total project cost is 170.0 million US\$ with IDA Credit of 121.2 million US\$ (71.3%), state contribution of 45.8 million US\$ (27.0%) and beneficiary contribution of 3.0 million US\$ (1.7%).

Economic project costs as estimated during project appraisal stands at Rs. 9,178 M after adjusting for transfers, taxes, subsidies, and converting financial prices to economic prices. Economic prices for internationally traded commodities (fertilizer, paddy, and wheat) are derived and used. While deviation between the parity prices and market prices for paddy and wheat is marginal (less than 8%), parity prices for fertilizer nutrient is two and half times that of market prices. This difference in economic and market prices for fertilizers and use of human labour by small farmers in the project area has resulted in economic rate of

return (ERR) marginally lower than financial rate of return. During appraisal, the estimated economic rate of return for the project was 21.6%. Net Present Value at 12% opportunity cost of capital for 30-year project life is Rs. 6.6 billion.

Project has reached its fourth year of implementation. The economic analysis may only be seen as a tool which is depicting the direction that the project should take in subsequent years of implementation. The findings of the analysis and the model used should not be construed as a comment on project performance but rather be used to depict positive performances that the project can upscale at a future.

The project interventions have multi-dimensional impact on farm economy. The intervention have resulted in increase in the irrigated area as well as cropping intensity and changes in cropping pattern too. Farmers in the project area are adopting improved technologies and emphasis is on expanding area under low volume high value horticultural crops.

Improved inter and intra-terrace conservation techniques, promoted through farmer participatory demonstrations, along with the adoption of location-specific efficient crop production packages is projected to enhance crop productivity by 40 to 43 percent and crop income by 42 percent to 55 percent over WOP levels (Table 1). In fact, productivity of major rainfed crops has increased ranging from 14 % in finger millet to 30 % in rapeseed mustered during 2015-16 through 2019-20. Similarly, per hectare income from rain-fed crops experience 80 percent growth during the same period. The per hectare income increased from Rs. 88,820 in 2015-16 to Rs. 1,71,594 by 2018-19 at the current prices.

Table 157: Yield of Rainfed Crops and Income Impacts

Project level	Unit	Base line	Mid Term	% increase over Base line
Crop Yield				
Paddy	t/ha	1.12	1.38	23.21
Ragi	t/ha	1.21	1.38	14.05
Pulses	t/ha	0.77	0.99	28.57
Wheat	t/ha	1.30	1.57	20.77
R/Mustard	t/ha	0.56	0.73	30.36
Financial Income	Rs/ha	13045	23541	80

As envisaged in the PAD, watershed interventions have resulted in substantial increase in the productivity of most of the crops and it varied from a minimum of 19 per cent in irrigated wheat to 30 per cent in paddy yields. The per ha income from irrigated crops (basically vegetables and spices) almost doubled and it increased from Rs. 88,820 in 2015-16 to Rs. 1,71,594 by 2018-19 at the current prices. This may be due to increased productivity as well as hike in prices of vegetables particularly grown during off season.

To promote efficient use of harvested rainwater, improved crop production technologies with emphasis on major vegetables, would be popularized through 18,950 demonstrations, which would be linked to adoption groups covering all irrigated farmers with adoption support. About 15,500 greenhouses and tunnels would be supported in the project villages to ensure quality seedlings of short duration off-season high-value crops for the farmers in project villages. Project interventions in irrigated agriculture would benefit 16,660 irrigated farmers covering 7,893 Ha of irrigated lands to get maximum benefits per unit of water.

As expected, watershed interventions have resulted in substantial increase in the productivity of most of the crops and it varied from a minimum of 12 per cent in irrigated wheat to 30 per cent in paddy yields (Table 2). The per ha income from irrigated crops (basically vegetables and spices) increased from Rs. 1, 03, 916

in 2015-16 (base year) to Rs. 2, 27,608 during 2018-19 (Midterm) at the current prices, registering an improvement of 119 per cent over the base year.

Table 158: Yield of Irrigated Crops and Income Impacts				
Project level	Unit	Base line	Mid Term	% increase over Base line
Paddy	t/ha	1.17	1.52	30
Wheat	t/ha	1.40	1.57	12
Potato	t/ha	9.01	10.67	18
Vegetables	t/ha	8.08	9.84	22
Financial Income	Rs/ha	1,03,916	2,27,608	119

7.5 Overall Approach to Economic and Financial Analyses

Economic Analysis is generally carried out *ex-ante* to appraise the project and to take an investment decision, and *ex-post* after the completion of project to know whether the intended objectives have accrued. An economic analysis is carried out during various stages of the project to quantify the economic benefits and costs based on interventions to provide insight on the direction and to know if the intended interventions produce the intended results as envisaged in the results framework and to initiate midterm correction required if any.

The economic analysis follows the approach provided in the PAD. Beyond that, the standard methodology for economic analysis, based on computation of the discounted net benefits has been used. 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 four years in each GP. Since the benefits are captured over a four-year period, attribution of benefits on a yearly basis has not been attempted.

For the purpose of current economic analysis all the costs (direct as well as indirect) and benefits (direct as well as indirect) are quantified to the extent possible. Cost-benefit analysis is conducted for a project period of 30 years. Costs and benefits are estimated at 2016 prices over 30 years. Considering the long gestation period and paucity of funds, opportunity cost of capital is considered at 12 per cent. Three measures are considered to arrive at the economic benefit derived from the projects. These are:

1. Economic Rate of Return
2. Net Present Value
3. Benefit to Cost Ratio

Required data on physical and financial progress for the economic and financial analyses are compiled from the annual GPWDP & MWS Plan progress reports of UKDWD project.

7.6 Impact of Interventions and Valuation of Benefits

7.6.1 Agriculture and Horticulture

The benefits for agriculture are comprised of the increased area under crops and the increased productivity of the crops. The pre (2015-16) and present (2018-19) project values for the area under major crops (annexure 1) and base year and current year project values for the productivity of these crops have been taken into consideration while determining the increase in the value of these crops ((annexure 2). The incremental values have been multiplied by the crop price to obtain an estimate of the benefit. Farm gate prices based on field data has been used. However, Minimum Support Prices (as specified in the Ministry of Agriculture website)¹⁹ for respective years are considered wherever farm gate prices were not available. Similarly, input costs for major crops were collected from the project area and are supplemented from Ministry of Agriculture web site and a few cost details for vegetable crops are borrowed from ‘An Economic Analysis of Cost and Return of Off-Season Vegetables with Focus on Poly House Effect in Uttarakhand, AERC, New Delhi Report²⁰. Input costs have been deducted from the total benefit to obtain the net benefit.

Input costs for crops grown under the project intervention were not available, data for Himachal Pradesh /or Uttar Pradesh was used and adjusted to suit low input agriculture in Uttarakhand.

Fruit orchards are planted under horticulture components. Key fruit trees planted under the project include pomegranate, citrus fruits, and pear, etc. 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. However, in this case 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.

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 growth in crop income from agriculture (cereals, pulses and oilseeds) as well as horticultural crops is assumed to grow by 2.5 per cent per annum in the absence of watershed interventions.

Domestic water: The measure of benefit in this case is the amount of time saved in obtaining water in the dry season. However, this has not been attempted due to lack of sufficient data in the current analysis.

Plantation of Fodder Crops: The average production of Napier grass was valued at the prevailing market prices. The valuation of time saved on collection of fodder from nearby forest area has not been attempted here.

Biomass Value: As a part of watershed treatment and source sustainability, about 23624 ha of forest plantations with local plant species has been taken up in addition to 210 ha covered under assisted regeneration of Oak, 1312 ha of fruit, fodder and fuel trees under homestead plantation and orchard plantation on 2444 ha during 2015-16 through 2018-19. The timber and fuel wood production has been ignored as it may take more than 30 years’ time lag. The value of incremental biomass produced due to

¹⁹ Directorate of Economics and Statistics, Ministry of Agriculture, GoI. www.farmer.gov.in/mspstatements.aspx and <https://agmarknet.gov.in/PriceTrends/>

²⁰ https://eands.dacnet.nic.in/Cost_of_Cultivation.htm and [du.ac.in/du/uploads/Centre/Report Uttarakhand AERC Delhi-2017.pdf](https://du.ac.in/du/uploads/Centre/Report_Uttarakhand_AERC_Delhi-2017.pdf)

increased plantation has been calculated for carbon sequestration and watershed services using data from Chopra Committee Report²¹. The calculations are enclosed in annexure 3

Solar energy: Values of power generated by solar panels used for various interventions is estimated first and then converted into monetary values.

Biogas/ Pine Briquettes: are valued using expenditure saved on fuel wood.

Employment: Total employment generated due to project interventions in various activities as well as the additional employment created due to increased cropping intensity has been considered as project benefits and valued using appropriate wage rates.

7.6.2 Financial and Economic Impact

Note: Values of PVB, PVC and NPV are in INR Crores

Table 159: Financial Analysis (Financial Ratios for Project as a whole)	
PVB	1528.75
PVC	485.18
NPV	1043.57
FRR	21.30%
BCR	3.15

Table 160: Economic Analysis (Economic Ratios for Project as a whole)	
PVB	1355.79
PVC	485.18
NPV	870.61
ERR	20.1%
BCR	2.79

Table 161: Financial Analysis (Financial Ratios for Project for Watershed and Rainfed Area)	
PVB	1344.37
PVC	432.30
NPV	912.07
FRR	19.94%
BCR	3.11

²¹ Report of the Expert Committee on Net Present Value, constituted by IEG, Delhi as mandated by Supreme Court of India, 2005.

Table 162: Economic Analysis (Economic Ratios for Project for Watershed and Rainfed Area Interventions)

PVB	1188.82
PVC	432.30
NPV	756.52
ERR	18.91%
BCR	2.75

Table 163: Financial Analysis (Financial Ratios for Livelihood Support interventions)

PVB	184.38
PVC	52.88
NPV	131.50
FRR	47.45%
BCR	3.49

Table 164: Economic Analysis (Financial Ratios for Livelihood Support interventions)

PVB	166.97
PVC	52.88
NPV	114.09
FRR	37.37%
BCR	3.16

Annexure

Annexure Table 1: Household Survey Matrix			
Division /Villages	Control	Treatment	Total
Almora	239	645	884
Arasulpur		138	138
Banthok	36		36
Chami	126		126
Chaundungri		74	74
Dungra		167	167
Jhaldungra	77		77
Kaluta		58	58
Khabri		53	53
Nainoli		53	53
Pali		102	102
Bageshwar	76	501	577
Bhadeena		10	10
Dulam		86	86
Jasroli	16		16
Jhopra	38		38
Kiroli	22		22
Loharkhet		14	14
Iweta		13	13
Namtichetabagad		54	54
Seli sama		38	38
Sooding		53	53
Soopi		232	232
Dehradun	102	302	404
Dakra		1	1
Dilau		12	12
Kanbua	35		35
Kandad		41	41
Khamroli	37		37
Kota tarli	30		30
Mohana		61	61
Punapokhari		66	66
Sainj		18	18
Vyasbood		102	102
Dehradun-II(PMU-model)	42	49	91
Dharkot		49	49
Ladawakote	42		42
Pauri	87	421	508
Chopra		62	62

Annexure Table 1: Household Survey Matrix			
Era malla		21	21
Gadri		257	257
Halai malli		38	38
Ira talla		7	7
Nawgaon	30		30
Simar		36	36
Srikot	57		57
Pithoragarh	76	290	366
Bhainskhet		39	39
Chankot		4	4
Dyokli		49	49
Hokra		126	126
Nyaligaon		3	3
Raespata	14		14
Ranikhet		68	68
Sirmola	13		13
Tarakot	7		7
Vinayak	42		42
Rudraprayag	75	659	734
Chaka		193	193
Dadoli		102	102
Dungar	33		33
Kurchola		128	128
Silgaon	42		42
Sillabamangaon		198	198
Sunna		37	37
Thatyur (tehri)	11	284	295
Chilamu		12	12
Fafrog		6	6
Kaudi		25	25
Khera malla		19	19
Lalotna		54	54
Maind	11		11
Masrar		45	45
Matholi		10	10
Pirogi		19	19
Siya kempty		16	16
Tator		60	60
Tuneti		16	16
Uttarkashi	280	186	466
Gadoli		65	65
Kotibanal		69	69

Annexure Table 1: Household Survey Matrix			
Nanai	187		187
Nooranu	35		35
Pokhari		53	53
Upradi	58		58
Grand Total	988	3336	4324

Annexure Table 2: District wise progress of plantation activities						
S. N.	Division	Afforestation (Ha)	Oak ANR (Ha)	Horticulture Development (Ha)	Fodder Development (Ha)	Total Plantation (Ha)
1	Almora	421.2	0	936.3	778	2135.0
2	Bageshwar	745.0	0	472.5	676	1893.9
3	Pithoragarh	531.0	85	706.4	278	1600.4
4	Dehradun	556.0	0	589.6	369	1514.8
5	Pauri	319.5	85	220.7	313	938.2
6	Tehri	451.0	40	388.2	275	1154.2
7	Rudraprayag	266.0	0	131	195	592.0
8	Uttarkashi	270.5	0	184	150	604.5
9	MMWS (PMU)	37.0	0	127.1	112	276.1
	Total	3597.2	210.0	3755.8	3146.0	10709.1

Annexure Table 3: Vendors/Buyers registered in Gramyashree App	
Division	Vendors
Bageshwar	59
Vikasnagar	19
Almora	26
PMU	18
Pithoragarh	42
Uttarkashi	0
Rudraprayag	30
Pauri	12
Thatyur	32
Total	238

Annexure Table 4: Farmers registered in Gramyashree mobile app			
S. no.	Division	FIG	Members
1	Pithoragarh	102	984
2	Almora	110	1542
3	Rudraprayag	164	1358
4	Uttarkashi	210	2325
5	Bageshwar	181	2096
6	Vikasnagar	114	1699
7	PMU	28	219
8	Thatyur	160	1930
9	Pauri	190	1662
		1259	13815

Annexure Table 5: Production detail

S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
2		Chilli	Kharif	-	100	79.57	57.78	57.54	-	2018
	PMU (Model-WS)	Ginger	Kharif	-	685	436.91	342.9	318.8	-	2018
		Maize	Kharif	-	103	80.5	37.5	43	-	2018
		Turmeric	Kharif	-	553	429.55	331.2	321	-	2018
		Onion	Rabi	-	317.5	206.45	99.6	106.85	-	-
		Onion	Rabi	2018	511	0	0	0	-	0
		Potato	Rabi	2018	69	0	0	0	-	0

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
3		Bean	Kharif	-	1604	1116.7	1080.7	1079.7	-	2018
	Vikasnagar	Ginger	Kharif	-	560	461	334	334	-	2018
		Tomato	Kharif	-	5760	5440	5393	5393	-	2018
		Turmeric	Kharif	-	900	68	38	17	-	2018
		Onion	Rabi	-	878	680	549	549	-	2018
		Potato	Rabi	-	1000	1028	1007	1007	-	2018
		Pea	Rabi	2017	1078	700	653.5	653.5	-	2018
		Pea	Rabi	2018	1080	57	55	10	-	0
		Ginger	Kharif	2019	141	0	0	0	-	0
		Tomato	Kharif	2019	12600	0	0	0	-	0
		Turmeric	Kharif	2019	672	0	0	0	-	0
		Onion	Rabi	2019	497	469	351	351	-	2019

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
4		Bean	Kharif	2017	15.12	0	0	0	-	0
	Thatyur	Cabbage	Kharif	2017	80	32.7	27.8	27.8	-	2017
		Capsicum	Kharif	2017	22.5	15.04	12.79	12.79	-	2018
		Chilli	Kharif	2017	7.5	4.91	4.17	4.17	-	2018
		Cucumber	Kharif	2017	28	18.31	15.57	15.57	-	2018
		Garlic	Kharif	2017	56	18.31	15.57	15.57	-	2018
		Pea	Kharif	2017	157.5	47.09	40.02	40.02	-	2017
		Tomato	Kharif	2017	217.8	85.84	72.96	72.96	-	2018
		Cabbage	Rabi	2017	962.8	454.53	386.42	386.42	-	2017
		Carrot	Rabi	2017	609	265.51	225.68	225.68	-	2017
		Chilli	Rabi	2017	7.5	4.91	4.17	4.17	-	2018
		Coriander	Rabi	2017	250	163.57	139	166.8	-	2018

Annexure Table 5: Production detail											
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production/(Qt.)									
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year		
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018	
		Ginger	Kharif	-	410	350.4	224	229	-	2018	
		Ginger	Rabi	-	12	11	5	5	-	2018	
		Potato	Rabi	-	481.5	453	196	322	-	2018	
		Garlic	Rabi	2019	292.152	0	0	0	-	0	
		Pea	Rabi	2019	172	0	0	0	-	0	
		Potato	Rabi	2019	886	0	0	0	-	0	
		Tomato	Rabi	2019	30	0	0	0	-	0	
			Garlic	Rabi	2017	823.2	18.31	15.57	15.57	-	2017
			Pea	Rabi	2017	1404.2	594.44	505.28	505.28	-	2017
			Radish	Rabi	2017	1218	474.15	403.05	403.05	-	2017
			Bean	Kharif	2018	985.32	537.84	456.88	459.89	-	2018
			Brinjal	Kharif	2018	400	261.6	222.4	222.4	-	2018
			Cabbage	Kharif	2018	45.6	32.7	27.8	27.8	-	2017
			Capsicum	Kharif	2018	397.8	215.93	183.6	183.6	-	2018
			Chilli	Kharif	2018	834.75	409.33	346.92	351.59	-	2018
			Cucumber	Kharif	2018	1161.2	18.31	15.57	15.57	-	2017
			Garlic	Kharif	2018	56	36.62	31.14	31.14	-	2018
			Ginger	Kharif	2018	319	204.03	173.54	173.54	-	2018
			Radish	Kharif	2018	1015	568.98	483.66	483.66	-	2018
			Tomato	Kharif	2018	2939.52	1628.2	1359.96	1361.96	-	2018
		Bean	Rabi	2018	22.2	9.81	8.41	8.41	-	2018	
		Cabbage	Rabi	2018	4010	152.28	129.03	129.03	-	2018	
		Pea	Rabi	2018	1690.5	149.12	126.73	126.73	-	2017	

Annexure Table 5: Production detail

S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production/(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
	Ginger	Kharif	-	410	350.4	224	229	-	2018	
	Ginger	Rabi	-	12	11	5	5	-	2018	
	Potato	Rabi	-	481.5	453	196	322	-	2018	
	Garlic	Rabi	2019	292.152	0	0	0	-	0	
	Pea	Rabi	2019	172	0	0	0	-	0	
	Potato	Rabi	2019	886	0	0	0	-	0	
	Tomato	Rabi	2019	30	0	0	0	-	0	
	Radish	Rabi	2018	508.7	358.63	303.94	303.94	-	2018	
	Bean	Kharif	2019	1197.5	0	0	0	-	0	
	Brinjal	Kharif	2019	665	0	0	0	-	0	
	Cabbage	Kharif	2019	126	0	0	0	-	0	
	Capsicum	Kharif	2019	885.56	0	0	0	-	0	
	Chilli	Kharif	2019	783	0	0	0	-	0	
	Cucumber	Kharif	2019	236.28	0	0	0	-	0	
	Ginger	Kharif	2019	360.92	0	0	0	-	0	
	Radish	Kharif	2019	509	0	0	0	-	0	
	Tomato	Kharif	2019	1797.5	0	0	0	-	0	
	Turmeric	Kharif	2019	147.81	0	0	0	-	0	

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
5		Garlic	Rabi	-	970.1	0	0	0	-	0
	Pauri	Pea	Rabi	-	488.3	0	0	0	-	0
		Potato	Rabi	-	364	0	0	0	-	0
6		Cabbage	Rabi	-	132	126	119	119	-	2018
	Almora	Pea	Rabi	-	946	856	806	806	-	2018
		Bean	Kharif	2018	412.44	132.47	117	117	-	2018
		Cabbage	Kharif	2018	1303.4	238.9	206	208	-	2018

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
		Capsicum	Kharif	2018	1195.34	72.33	66	66	-	2017
		Chilli	Kharif	2018	108.25	18.3	12.5	12.5	-	2018
		Ginger	Kharif	2018	780	223	205	173	-	2018
		Pea	Kharif	2018	961	94	92	30	-	2017
		Radish	Kharif	2018	89.95	17.35	12.7	12.7	-	2018
		Tomato	Kharif	2018	1147.09	296.81	259	259	-	2018
	Turmeric	Kharif	2018	294	74	57	57	-	2018	
	Pea	Rabi	2018	698	615	566	568	-	2018	
7		Bean	Kharif	-	6951.66	3195.9	1751.59	1901.19	-	-
	Bageshwar	Cabbage	Kharif	-	2025.68	1375.38	803.7	803.7	-	-
		Capsicum	Kharif	-	607.98	32.1	19.4	19.4	-	-

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
	Ginger	Kharif	-	410	350.4	224	229	-	2018	
	Ginger	Rabi	-	12	11	5	5	-	2018	
	Potato	Rabi	-	481.5	453	196	322	-	2018	
	Garlic	Rabi	2019	292.152	0	0	0	-	0	
	Pea	Rabi	2019	172	0	0	0	-	0	
	Potato	Rabi	2019	886	0	0	0	-	0	
	Tomato	Rabi	2019	30	0	0	0	-	0	
	Chilli	Kharif	-	16	17.6	12.3	12.3	-	-	
	Ginger	Kharif	-	4383.6	4363.18	2299.25	2299.34	-	2018	
	Tomato	Kharif	-	61.2	44.5	29.1	29.1	-	-	
	Turmeric	Kharif	-	911.84	902.74	446.52	446.52	-	2018	
	Cabbage	Rabi	-	935.2	843.43	487.73	509.13	-	-	
	Garlic	Rabi	-	902.2	897.55	500.75	585.15	-	-	
	Pea	Rabi	-	543.15	614.34	370.3	391.7	-	-	
	Potato	Rabi	-	2233.73	1688.48	998.75	1032.75	-	-	
	Ginger	Kharif	2018	33.28	34.22	18.85	18.85	-	2018	
	Cabbage	Rabi	2018	939.8	0	0	0	-	0	
	Garlic	Rabi	2018	506.6	0	0	0	-	0	
	Pea	Rabi	2018	1112.99	0	0	0	-	0	
Potato	Rabi	2019	1109.6	0	0	0	-	0		
8		Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production	Surplus Production Sold(QT)	Remaining Production(QT)	Year

Annexure Table 5: Production detail										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production/(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
						to be sold(QT)				
		Tomato	Kharif	-	766.9	425	327	327	-	2018
	Pithoragarh	Brinjal	Rabi	-	12.3	7.8	5.8	5.8	-	2018
		Cabbage	Rabi	-	528.677	304	233	233	-	2018
		Capsicum	Rabi	-	706.25	396.6	299.3	299.3	-	2018
		Chilli	Rabi	-	1.06	0.9	0.6	0.6	-	2018
		Coriander	Rabi	-	481.7	280.2	219.7	219.7	-	2018
		Cucumber	Rabi	-	8.85799	9.3	6.55	7.3	-	2018
		Garlic	Rabi	-	380.29	203.5	158.4	158.4	-	2018
		Onion	Rabi	-	842.8	505	369	360	-	2018
		Pea	Rabi	-	412.723	237.4	182.5	182.5	-	2018
		Radish	Rabi	-	173.51	107.5	81.1	81.1	-	2018
		Tomato	Rabi	-	3054.84	2	1	1	-	2017
		Ginger	Kharif	2018	1680	727.5	629.5	620.5	-	2018
		Turmeric	Kharif	2018	1143.36	43	35	35	-	2018

Annexure Table 5: Production detail											
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production(Qt.)									
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remaining Production(QT)	Year		
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018	
		Ginger	Kharif	-	410	350.4	224	229	-	2018	
		Ginger	Rabi	-	12	11	5	5	-	2018	
		Potato	Rabi	-	481.5	453	196	322	-	2018	
		Garlic	Rabi	2019	292.152	0	0	0	-	0	
		Pea	Rabi	2019	172	0	0	0	-	0	
		Potato	Rabi	2019	886	0	0	0	-	0	
		Tomato	Rabi	2019	30	0	0	0	-	0	
			Garlic	Rabi	2018	290.9	22.8	16.7	16.7	-	2019
			Ginger	Rabi	2018	613	0	0	0	-	0
			Onion	Rabi	2018	1029.75	0	0	0	-	0
			Pea	Rabi	2018	214.83	16.45	13.1	13.1	-	2018

Annexure Table 6: Micro Finance details	
Micro Finance Details	
Division Name	Micro Fin(Rs)
Rudraprayag	784334
PMU (Model WS)	359562
Dehradun	28546971
Tehri	1364509
Pauri	252138
Almora	337160
Bageshwar	488071
Pithoragarh	40000
	32172745

Annexure Table 7: Crop-wise Production data		
Values		
Row Labels	Count of Individual Crop Cultivated Area(Ha)	Sum of Estimate Production (Qtls)
Almora	396	8067.47
Bean	58	412.44
Cabbage	48	1435.4
Capsicum	57	1195.34
Chilli	24	108.25
Ginger	20	780
Pea	49	2605
Radish	65	89.95
Tomato	55	1147.09
Turmeric	20	294
Bageshwar	801	23274.51
Bean	106	6951.66
Cabbage	134	3900.68
Capsicum	42	607.98
Chilli	2	16
Garlic	130	1408.8
Ginger	90	4416.88
Pea	145	1656.14
Potato	127	3343.33
Tomato	5	61.2
Turmeric	20	911.84
Dehradun	254	26770
Bean	47	1604
Ginger	18	701
Onion	20	1375
Pea	38	2158
Potato	6	1000
Tomato	66	18360
Turmeric	59	1572
Pauri	153	1822.4
Garlic	72	970.1
Pea	38	488.3

Annexure Table 7: Crop-wise Production data		
Values		
Row Labels	Count of Individual Crop Cultivated Area(Ha)	Sum of Estimate Production (Qtls)
Potato	43	364
Pithoragarh	565	12341.74799
Brinjal	5	12.3
Cabbage	10	528.677
Capsicum	45	706.25
Chilli	2	1.06
Coriander	20	481.7
Cucumber	9	8.85799
Garlic	78	671.19
Ginger	99	2293
Onion	78	1872.55
Pea	77	627.553
Radish	16	173.51
Tomato	66	3821.74
Turmeric	60	1143.36
PMU (Model WS)	106	2338.5
Chilli	9	100
Ginger	12	685
Maize	8	103
Onion	49	828.5
Potato	12	69
Turmeric	16	553
Rudraprayag	242	2418.902
Barnyard millet	90	135.25
Garlic	36	292.152
Ginger	42	422
Pea	15	172
Potato	58	1367.5
Tomato	1	30
Tehri	704	26953.28
Bean	83	2220.14
Brinjal	31	1065
Cabbage	47	5224.4
Capsicum	50	1305.86
Carrot	9	609
Chilli	113	1632.75
Coriander	17	250
Cucumber	114	1425.48
Garlic	35	935.2
Ginger	39	679.92
Pea	46	3252.2
Radish	34	3250.7
Tomato	69	4954.82
Turmeric	17	147.81
Total	3221	103986.81

Annexure Table 8: Awareness on Organization of PRA for GPWDP Preparation

Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4562	97%	7129	6870	96%	11826	11432	97%
Kumaun	7333	6426	88%	5561	4874	88%	12894	11300	89%
Rudraprayag	1755	1344	77%	4761	3955	83%	6516	5299	81%
Total	13785	12332	89%	17451	15699	90%	31236	28031	90%

Annexure Table 9: Awareness on Participation in PRA Exercise for GPWDP Preparation

Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4534	97%	7129	6828	96%	11826	11362	96%
Kumaun	7333	6560	89%	5561	4860	87%	12894	11420	89%
Rudraprayag	1755	1298	74%	4761	3899	82%	6516	5197	80%
Total	13785	12392	90%	17451	15587	89%	31236	27979	90%

Annexure Table 10: Awareness on Beneficiary Selection and Various GPWDP Activities

Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4570	97%	7129	6897	97%	11826	11467	97%
Kumaun	7333	6612	90%	5561	4873	88%	12894	11485	89%
Rudraprayag	1755	1302	74%	4761	3944	83%	6516	5246	81%
Total	13785	12484	91%	17451	15714	90%	31236	28198	90%

Annexure Table 11: Awareness about GPWDP activities screened through ESMF									
Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4538	97%	7129	6806	95%	11826	11344	96%
Kumaun	7333	6317	86%	5561	4565	82%	12894	10882	84%
Rudraprayag	1755	1311	75%	4761	3899	82%	6516	5210	80%
Total	13785	12166	88%	17451	15270	88%	31236	27436	88%

Annexure Table 12: Justification of Beneficiary Selection during GPWDP Preparation									
Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4607	98%	7129	6960	98%	11826	11567	98%
Kumaun	7333	6861	94%	5561	5028	90%	12894	11889	92%
Rudraprayag	1755	1305	74%	4761	3944	83%	6516	5249	81%
Total	13785	12773	93%	17451	15932	91%	31236	28705	92%

Annexure Table 13: Organization of WAS Prior to GPWDP Preparation									
Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4537	97%	7129	6998	98%	11826	11535	98%
Kumaun	7333	6692	91%	5561	5484	99%	12894	12176	94%
Rudraprayag	1755	1244	71%	4761	3744	79%	6516	4988	77%
Total	13785	12473	90%	17451	16226	93%	31236	28699	92%

Annexure Table 14: Ensuring Selection of SC/ST/Widow/Divyang as Project Beneficiaries									
Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Garhwal	4697	4609	98%	7129	7017	98%	11826	11626	98%
Kumaun	7333	6831	93%	5561	5076	91%	12894	11907	92%
Rudraprayag	1755	1310	75%	4761	3844	81%	6516	5154	79%

Annexure Table 14: Ensuring Selection of SC/ST/Widow/Divyang as Project Beneficiaries									
Region	Male Participants			Female Participants			Total		
	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age	Total	No. of Participants saying Yes	%age
Total	13785	12750	92%	17451	15937	91%	31236	28687	92%

Annexure Table 15: Employment Generation through Project Activities	
Region	Total No of Man-days generated up to 31st March 2019
Garhwal	2,79,158
Kumaun	3,87,129
Rudraprayag	3,54,44
Total	7,01,731

Annexure Table 16: Information Sharing on Project Funds				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11124	94%
2	Kumaun	12894	11131	86%
3	Rudraprayag	6516	5244	80%
	Total	31236	27499	88%

Annexure Table 17: Awareness on Display of Information				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11346	96%
2	Kumaun	12894	11765	91%
3	Rudraprayag	6516	5188	80%
	Total	31236	28299	91%

Annexure Table 18: Awareness on Display of Information on Status of Expenditure in GP				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	10887	92%
2	Kumaun	12894	10496	81%
3	Rudraprayag	6516	5310	81%
Total		31236	26693	85%

Annexure Table 19: Awareness on Place of Displayed Information				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11330	96%
2	Kumaun	12894	11633	90%
3	Rudraprayag	6516	5277	81%
Total		31236	28240	90%

Annexure Table 20: Maintenance of Transparency by WVMC/RVC/MDT				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11506	97%
2	Kumaun	12894	11823	92%
3	Rudraprayag	6516	5188	80%
Total		31236	28517	91%

Annexure Table 21: Timely payment of works under GPWDP								
S.No.	Region	Total (Participants)	No. of Participants saying Yes					
			RVC		USER Group		Vulnerable Group	
			No.	%age	No.	%age	No.	%age
1	Garhwal	11826	11710	99%	10105	85%	11730	99%
2	Kumaun	12894	11782	91%	10723	83%	11709	91%
3	Rudraprayag	6516	5311	82%	5388	83%	5311	82%
Total		31236	28803	92%	26216	84%	28750	92%

Annexure Table 22: Scrutiny of Documents

SN Division	Total (n)	Response in Affirmative															
		R1		R2		Sanction Register		Stock Register		Integrated Activity Register		Cash Book		VGF/ VIG Expenditure		Beneficiary Register	
		No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
1 Garhwal	2815	2671	95%	2661	95%	2627	93%	2578	92%	2623	93%	2663	95%	2672	95%	2615	93%
2 Kumaun	2696	2666	99%	2655	98%	2641	98%	2645	98%	2640	98%	2696	100%	2696	100%	2696	100%
3 Rudraprayag	6516	5250	81%	5199	80%	5362	82%	5257	81%	5244	80%	5088	78%	5144	79%	4998	77%
Total	12027	10587	88%	10515	87%	10630	88%	10480	87%	10507	87%	10447	87%	10512	87%	10309	86%

Annexure Table 23: Technological Improvement in Traditional Occupations of Vulnerable Individuals and Groups

S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11641	98%
2	Kumaun	12894	11624	90%
3	Rudraprayag	6516	5322	82%
	Total	31236	28587	92%

Annexure Table 24: Income enhancement due to technological advancement of Vulnerable Individuals and Groups

S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11592	98%
2	Kumaun	12894	11491	89%
3	Rudraprayag	6516	5410	83%
	Total	31236	28493	91%

Annexure Table 25: Conversion of Abandoned Agriculture land in UDWDP-II

Division	Cultivable waste land	Number of RV	Horticultural intervention (Orchards) Area (Ha)	Agricultural crop		Total intervention Area (ha)
				Area (Ha)	Fodder crop area (Ha)	
Pithoragarh	9918.4	117	185.3	9.75	87.3	282.35
Bageshwar	416.8	41	119.4	54.3	23.2	196.9

Annexure Table 25: Conversion of Abandoned Agriculture land in UDWDP-II						
Division	Cultivable waste land	Number of RV	Horticultural intervention (Orchards)	Agricultural crop		Total intervention Area (ha)
			Area (Ha)	Area (Ha)	Fodder crop area (Ha)	
Almora	3349.696	77	450.10	0.00	381.10	831.2
Tehri	1366.8	13	48	3	0.00	51
Rudraprayag	5.7	4	25	0.00	0.00	25
Pauri	794.3	141	104.5	120.75	83.6	308.85
PMU	16.5	23	36.3	18.63	5.1	60.05
Vikasnagar	3598.41	63	74.45	0.00	24.56	99.01
Uttarkashi	0.00	0.00	0.00	0.00	0.00	0.00
Total	19466.61	479	1043.05	206.43	604.86	1854.36

Annexure Table 26: Increase in productivity due to Technical Training on Agri/Horti/Animal Husbandry & Exposure Tours				
S. No.	Region	Total (Participants)	No of Participants saying Yes	
			No.	%age
1	Garhwal	11826	11503	97%
2	Kumaun	12894	10439	81%
3	Rudraprayag	6516	5377	83%
	Total	31236	27319	87%

Annexure Table 27: Technical Assistance by Village-In-charge								
S.No.	Region	Total (n)	Always		Sometime		Never	
			No.	%age	No.	%age	No.	%age
1	Garhwal	11826	11665	99%	161	1%	0	0%
2	Kumaun	12894	11779	91%	1037	8%	78	1%
3	Rudraprayag	6516	2872	44%	2455	38%	1189	18%
	Total	31236	26316	84%	3653	12%	1267	4%

Annexure Table 28: Assistance by Motivators/Facilitators/Coordinators

S.No.	Region	Total (n)	Always		Sometime		Never	
			No.	%age	No.	%age	No.	%age
1	Garhwal	11826	11709	99%	117	1%	0	0%
2	Kumaun	12894	12321	96%	444	3%	0	0%
3	Rudraprayag	6516	2511	39%	2455	38%	1600	25%
Total		31236	26541	85%	3016	10%	1600	5%

Annexure Table 29: Technical Assistance by Unit In-Charge

S.No.	Region	Total (n)	Always		Sometime		Never	
			No.	%age	No.	%age	No.	%age
1	Garhwal	11826	10602	90%	1224	10%	0	0%
2	Kumaun	12894	11418	89%	1356	11%	120	1%
3	Rudraprayag	6516	3357	52%	2455	38%	704	11%
Total		31236	25377	81%	5035	16%	824	3%

Annexure Table 30: FIG & Farmer Details

Registered Farmers		
Division	FIG	Members
Pithoragarh	102	984
Almora	110	1542
Rudraprayag	164	1358
Uttarkashi	210	2325
Bageshwar	181	2096
Vikasnagar	114	1699
PMU	28	219
Thatyur	160	1930
Pauri	190	1662
Total	1259	13815

Annexure Table 31: Distribution of Individual Assets

Individual Assets created under GPWDP	Total No. of units (person)	Category 'A'			Category 'B'			Category 'C'		
		No.	%	Female	No.	%	Female	No.	%	Female
Poly House (No)	412	157	38%	41	125	30%	24	130	32%	5
Poly Tunnel (No)	408	200	49%	72	163	40%	83	45	11%	4
Animal Shelter/ Sheds	3156	359	11%	66	988	31%	288	1809	57%	502
Mangers	3412	560	16%	51	1029	30%	184	1823	53%	168
Chaff Cutter	145	16	11%	0	75	52%	6	54	37%	9
Nursery establishment	0	0	-	0	0	-	0	0	-	0

Annexure Table 31: Distribution of Individual Assets											
Individual Assets created under GPWDP	Total No. of units (person)	Category 'A'			Category 'B'			Category 'C'			
		No.	%	Female	No.	%	Female	No.	%	Female	
(Farmer nursery)											
Bio Gas Plant	43	3	7%	2	20	47%	9	20	47%	9	
Renovation of Water Mills (Gharat)	0	0	-	0	0	-	0	0	-	0	
Solar lantern	3772	686	18%	217	1500	40%	458	1586	42%	741	
Pine briquette stove	2	1	50%	0	0	0%	0	1	50%	0	
Roof Water Harvesting Tank	3928	867	22%	241	1579	40%	366	1482	38%	453	
LDP Tank	98	22	22%	0	48	49%	10	28	29%	2	
Water lifting solar pump	1	0	0%	0	1	100%	1	0	0%	0	
Bio Compost Pit	483	120	25%	55	213	44%	86	150	31%	50	
TOTAL	15860	2991	19%	745	5741	36%	1515	7128	45%	1943	

Annexure Table 32: FIG Production Details										
S.No	Division	Crop Name/Crop Estimate Production/Actual Production/Available Production/(Qt.)								
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(Q T)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remining Production(QT)	Year	
1	Rudraprayag	Barnyard millet	Kharif	-	135.25	46.5	18	18	-	2018
		Ginger	Kharif	-	410	350.4	224	229	-	2018
		Ginger	Rabi	-	12	11	5	5	-	2018
		Potato	Rabi	-	481.5	453	196	322	-	2018
		Garlic	Rabi	2019	292.152	0	0	0	-	0
		Pea	Rabi	2019	172	0	0	0	-	0
		Potato	Rabi	2019	886	0	0	0	-	0
		Tomato	Rabi	2019	30	0	0	0	-	0
2		Chilli	Kharif	-	100	79.57	57.78	57.54	-	2018
	PMU (Model-WS)	Ginger	Kharif	-	685	436.91	342.9	318.8	-	2018
		Maize	Kharif	-	103	80.5	37.5	43	-	2018
		Turmeric	Kharif	-	553	429.55	331.2	321	-	2018
		Onion	Rabi	-	317.5	206.45	99.6	106.85	-	-
		Onion	Rabi	2018	511	0	0	0	-	0
		Potato	Rabi	2018	69	0	0	0	-	0
3		Bean	Kharif	-	1604	1116.7	1080.7	1079.7	-	2018
	Vikasnagar	Ginger	Kharif	-	560	461	334	334	-	2018
		Tomato	Kharif	-	5760	5440	5393	5393	-	2018
		Turmeric	Kharif	-	900	68	38	17	-	2018
		Onion	Rabi	-	878	680	549	549	-	2018
		Potato	Rabi	-	1000	1028	1007	1007	-	2018
		Pea	Rabi	2017	1078	700	653.5	653.5	-	2018
		Pea	Rabi	2018	1080	57	55	10	-	0
		Ginger	Kharif	2019	141	0	0	0	-	0
		Tomato	Kharif	2019	12600	0	0	0	-	0

Mid Term Assessment Report
Uttarakhand Decentralized Watershed Development Project (Gramya-II)

	Turmeric	Kharif	2019	672	0	0	0	-	0
	Onion	Rabi	2019	497	469	351	351	-	2019
	Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remining Production(QT)	Year
	Bean	Kharif	2017	15.12	0	0	0	-	0
4	Thatyur Cabbage	Kharif	2017	80	32.7	27.8	27.8	-	2017
	Capsicum	Kharif	2017	22.5	15.04	12.79	12.79	-	2018
	Chilli	Kharif	2017	7.5	4.91	4.17	4.17	-	2018
	Cucumber	Kharif	2017	28	18.31	15.57	15.57	-	2018
	Garlic	Kharif	2017	56	18.31	15.57	15.57	-	2018
	Pea	Kharif	2017	157.5	47.09	40.02	40.02	-	2017
	Tomato	Kharif	2017	217.8	85.84	72.96	72.96	-	2018
	Cabbage	Rabi	2017	962.8	454.53	386.42	386.42	-	2017
	Carrot	Rabi	2017	609	265.51	225.68	225.68	-	2017
	Chilli	Rabi	2017	7.5	4.91	4.17	4.17	-	2018
	Coriander	Rabi	2017	250	163.57	139	166.8	-	2018
	Garlic	Rabi	2017	823.2	18.31	15.57	15.57	-	2017
	Pea	Rabi	2017	1404.2	594.44	505.28	505.28	-	2017
	Radish	Rabi	2017	1218	474.15	403.05	403.05	-	2017
	Bean	Kharif	2018	985.32	537.84	456.88	459.89	-	2018
	Brinjal	Kharif	2018	400	261.6	222.4	222.4	-	2018
	Cabbage	Kharif	2018	45.6	32.7	27.8	27.8	-	2017
	Capsicum	Kharif	2018	397.8	215.93	183.6	183.6	-	2018
	Chilli	Kharif	2018	834.75	409.33	346.92	351.59	-	2018
	Cucumber	Kharif	2018	1161.2	18.31	15.57	15.57	-	2017
	Garlic	Kharif	2018	56	36.62	31.14	31.14	-	2018
	Ginger	Kharif	2018	319	204.03	173.54	173.54	-	2018
	Radish	Kharif	2018	1015	568.98	483.66	483.66	-	2018
	Tomato	Kharif	2018	2939.52	1628.2	1359.96	1361.96	-	2018
	Bean	Rabi	2018	22.2	9.81	8.41	8.41	-	2018
	Cabbage	Rabi	2018	4010	152.28	129.03	129.03	-	2018
	Pea	Rabi	2018	1690.5	149.12	126.73	126.73	-	2017
	Radish	Rabi	2018	508.7	358.63	303.94	303.94	-	2018
	Bean	Kharif	2019	1197.5	0	0	0	-	0
	Brinjal	Kharif	2019	665	0	0	0	-	0
Cabbage	Kharif	2019	126	0	0	0	-	0	
Capsicum	Kharif	2019	885.56	0	0	0	-	0	
Chilli	Kharif	2019	783	0	0	0	-	0	

Mid Term Assessment Report
Uttarakhand Decentralized Watershed Development Project (Gramya-II)

		Cucumber	Kharif	2019	236.28	0	0	0	-	0
		Ginger	Kharif	2019	360.92	0	0	0	-	0
		Radish	Kharif	2019	509	0	0	0	-	0
		Tomato	Kharif	2019	1797.5	0	0	0	-	0
		Turmeric	Kharif	2019	147.81	0	0	0	-	0
5		Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remining Production(QT)	Year
		Garlic	Rabi	-	970.1	0	0	0	-	0
	Pauri	Pea	Rabi	-	488.3	0	0	0	-	0
		Potato	Rabi	-	364	0	0	0	-	0
6		Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remining Production(QT)	Year
		Cabbage	Rabi	-	132	126	119	119	-	2018
	Almora	Pea	Rabi	-	946	856	806	806	-	2018
		Bean	Kharif	2018	412.44	132.47	117	117	-	2018
		Cabbage	Kharif	2018	1303.4	238.9	206	208	-	2018
		Capsicum	Kharif	2018	1195.34	72.33	66	66	-	2017
		Chilli	Kharif	2018	108.25	18.3	12.5	12.5	-	2018
		Ginger	Kharif	2018	780	223	205	173	-	2018
		Pea	Kharif	2018	961	94	92	30	-	2017
		Radish	Kharif	2018	89.95	17.35	12.7	12.7	-	2018
		Tomato	Kharif	2018	1147.09	296.81	259	259	-	2018
		Turmeric	Kharif	2018	294	74	57	57	-	2018
		Pea	Rabi	2018	698	615	566	568	-	2018
7		Crop Name	Season	Season Year	Estimate Production (QT)	Actual Production(QT)	Surplus Production to be sold(QT)	Surplus Production Sold(QT)	Remining Production(QT)	Year
		Bean	Kharif	-	6951.66	3195.9	1751.59	1901.19	-	-
	Bageshwar	Cabbage	Kharif	-	2025.68	1375.38	803.7	803.7	-	-
		Capsicum	Kharif	-	607.98	32.1	19.4	19.4	-	-
		Chilli	Kharif	-	16	17.6	12.3	12.3	-	-
		Ginger	Kharif	-	4383.6	4363.18	2299.25	2299.34	-	2018
		Tomato	Kharif	-	61.2	44.5	29.1	29.1	-	-
		Turmeric	Kharif	-	911.84	902.74	446.52	446.52	-	2018
	Cabbage	Rabi	-	935.2	843.43	487.73	509.13	-	-	

Annexure Table 33: FIG Micro Finance	
Micro Finance Details	
Division Name	Micro Fin (Rs)
Rudraprayag	784334
PMU (Model WS)	359562
Dehradun	28546971
Tehri	1364509
Pauri	252138
Almora	337160
Bageshwar	488071
Pithoragarh	40000
TOTAL	32172745

Annexure Table 34 : Vendor Details	
Registered Vendors/Buyers	
Division	Vendors
Bageshwar	59
Vikasnagar	19
Almora	26
PMU	18
Pithoragarh	42
Uttarkashi	0
Rudraprayag	30
Pauri	12
Thatyur	32
TOTAL	238

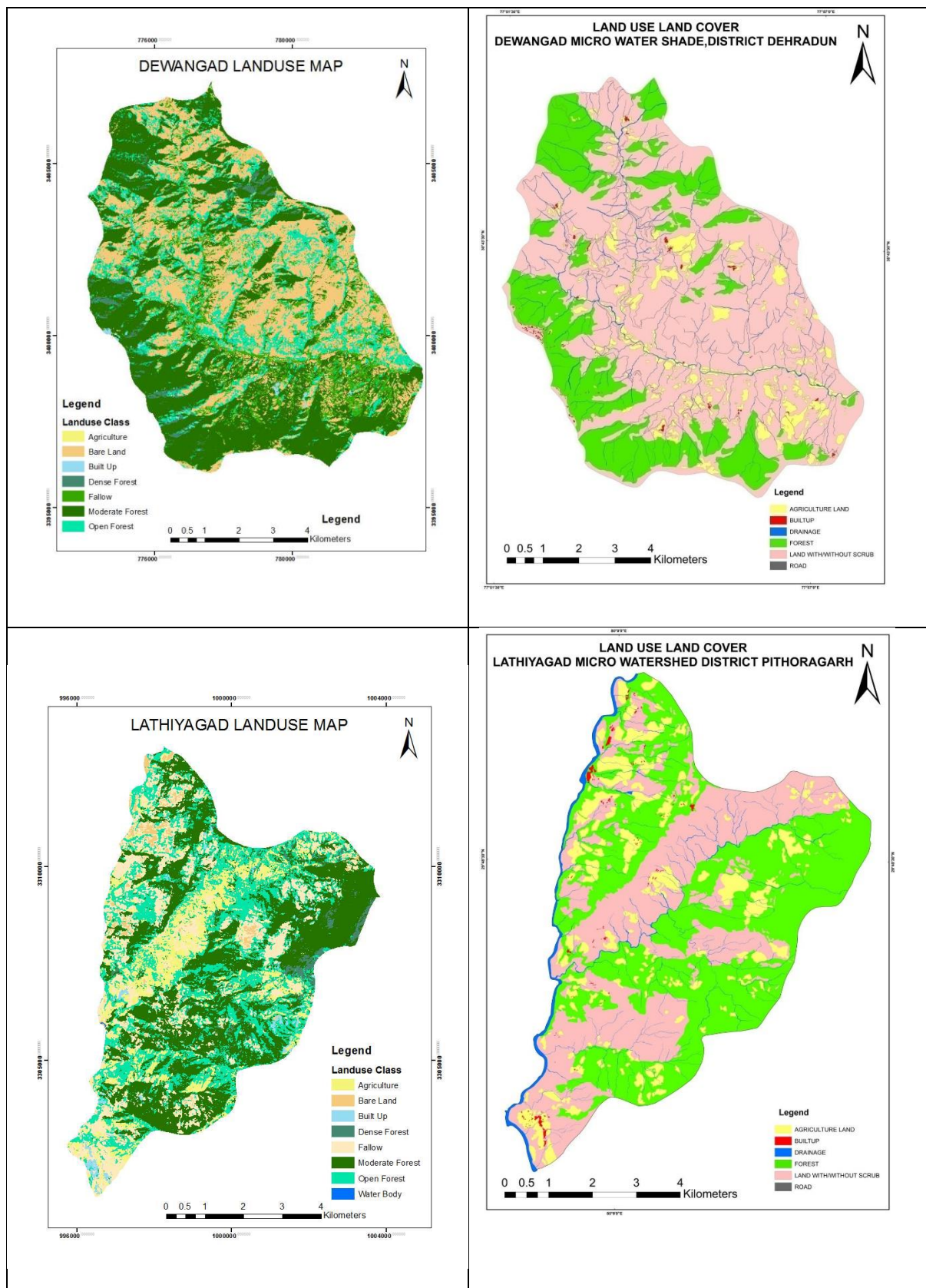
Annexure Table 35: Income: Engagement in Economic Activity (by Farmer Category) Average Income per HH

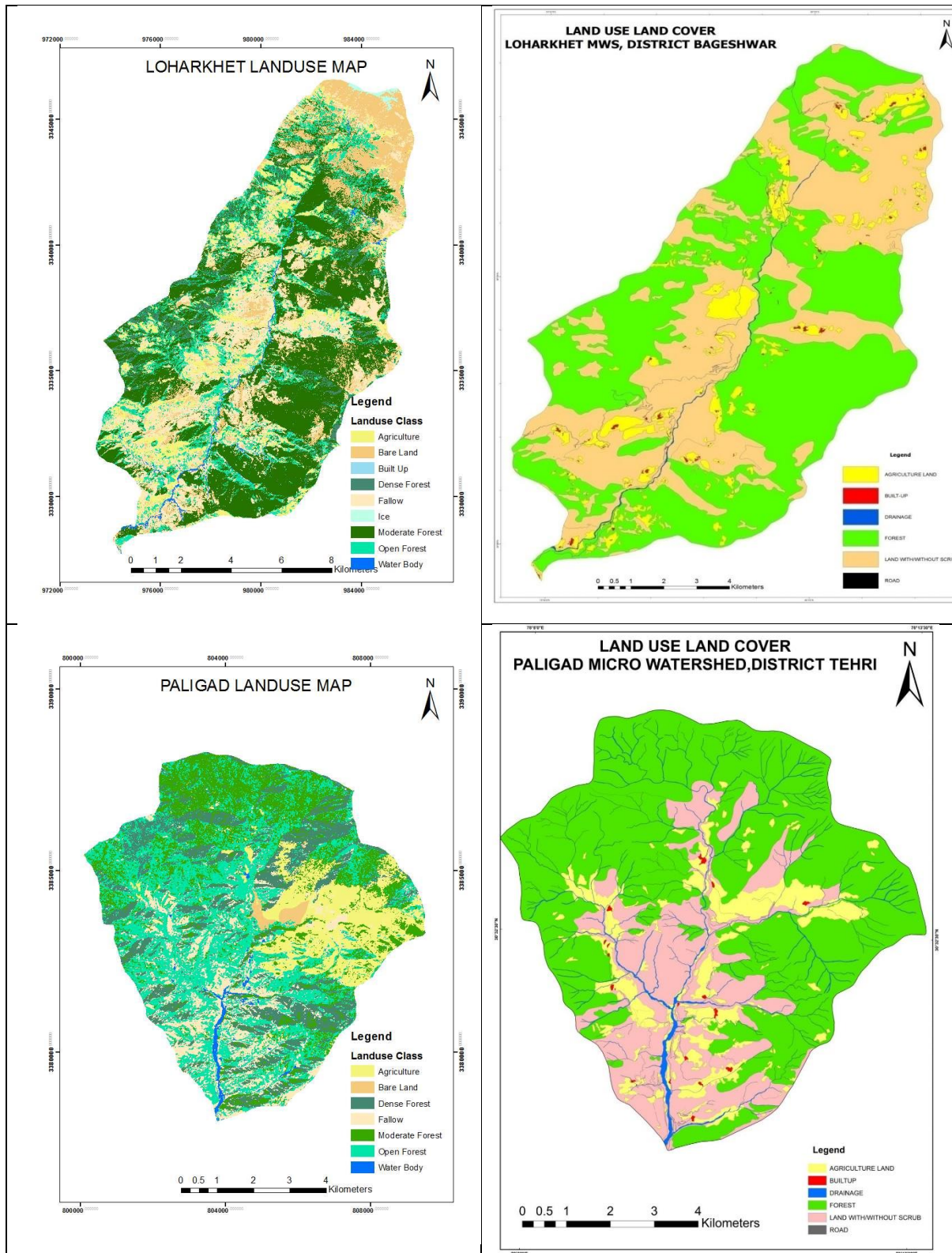
S N o	Farmer Category	Project (Rs/HH)							Control (Rs/HH)								
		Agriculture/ Farming	Livestock Rearing	Fishing	Salaried/ Office	Handloom/ Handicraft	Farm/ Non-Farm Labour	Skilled Labour	Total	Agriculture/ Farming	Livestock Rearing	Fishing	Salaried/ Office	Handloom/Han dicraft	Farm/ Non-Farm Labour	Skilled Labour	Total
1	Marginal	12,715	1,127	29	94,211	653	40,121	10,246	159,102	9,818	783	0	86,367	100	43,520	7,923	148,512
2	Small	98,767	0	0	73,605	0	39,070	0	211,442	76,000	0	0	0	0	85,833	0	161,833
3	Semi Medium	86,778	0	0	216,667	0	58,333	0	361,778	91,000	0	0	0	0	0	0	91,000
4	Landless	0	0	0	93,333	0	76,667	0	170,000	0	0	0	0	0	30,000	0	30,000
	Total	14,014	1,109	28	94,275	642	40,189	10,077	160,334	10,293	776	0	85,668	99	43,720	7,859	148,415

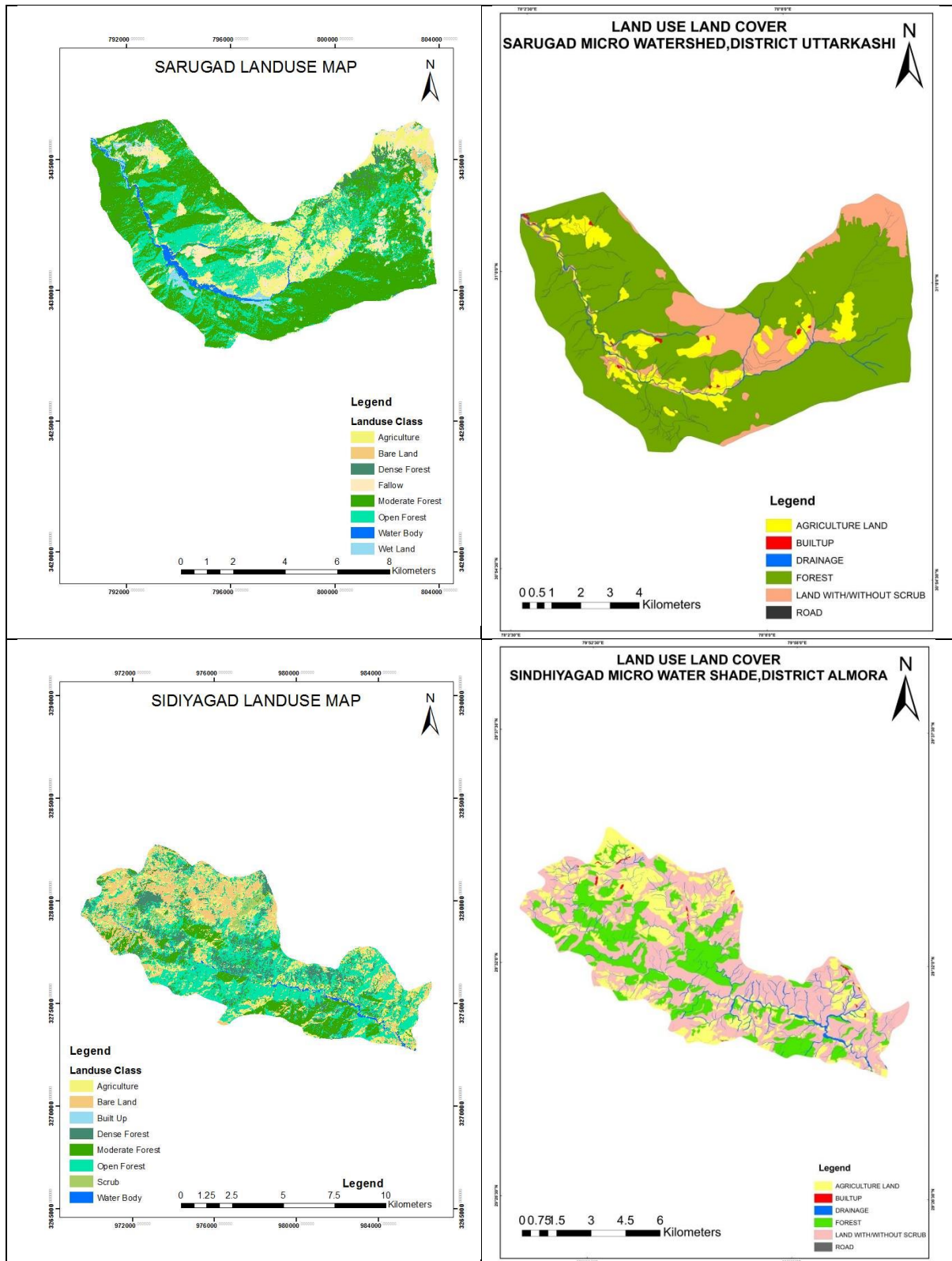
Annexure Table 36: Income: Engagement in Economic Activity (by Social Class) Average Income per HH (A/Sample)

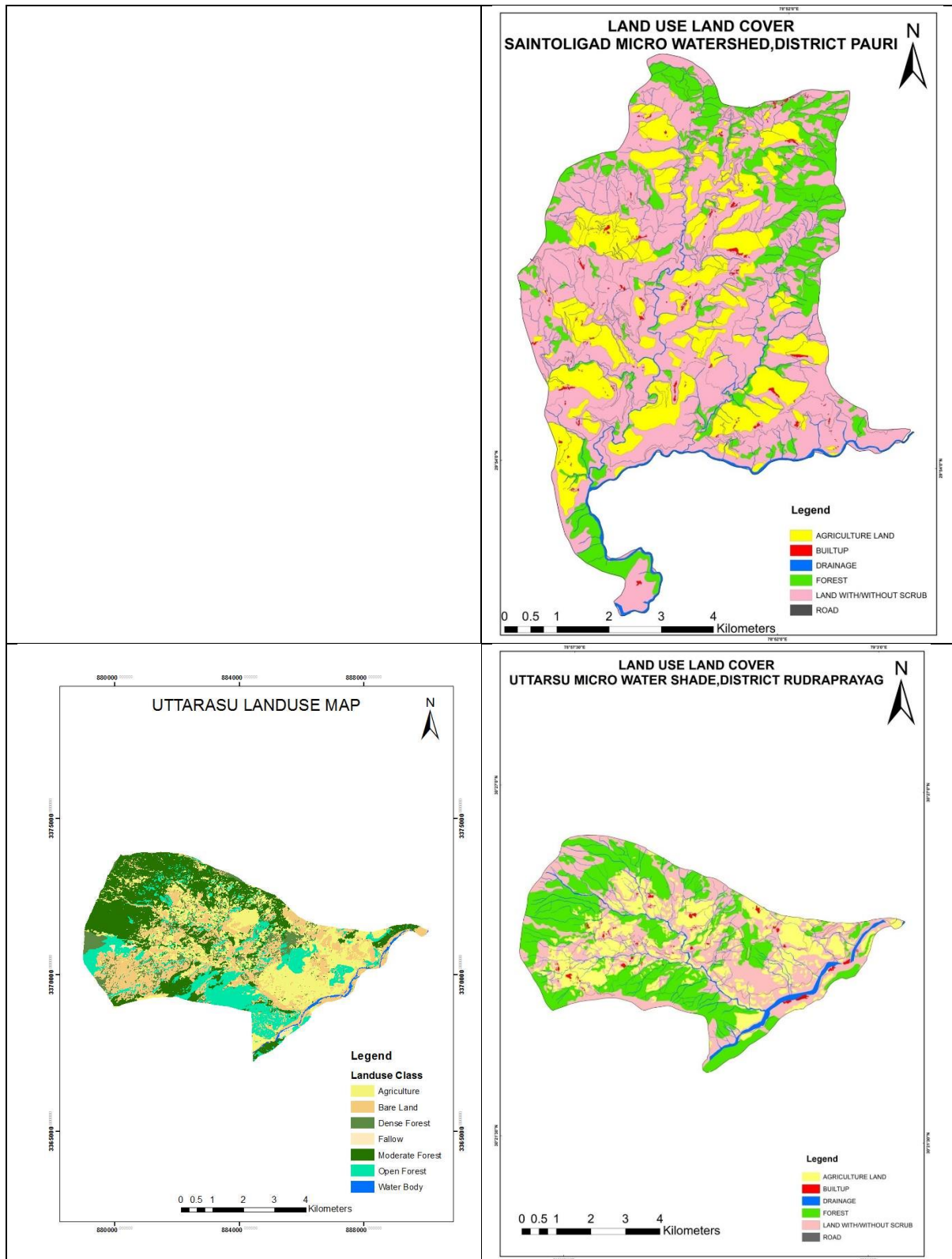
S N o	Social Class	Project (Rs/HH)							Control (Rs/HH)								
		Agriculture/ Farming	Livestock Rearing	Fishing	Salaried/ Office	Handloom/ Handicraft	Farm/No n-Farm Labour	Skilled Labour	Total	Agriculture /Farming	Livestock Rearing	Fishing	Salarie d/Offic e	Handloom/Ha ndicraft	Farm/No n-Farm Labour	Skilled Labour	Total
1	General	13,043	1,313	27	121,491	391	37,969	5,827	180,062	5,155	1,045	0	133,021	0	42,732	1,268	183,221
2	OBC	26,530	948	0	69,415	0	48,060	11,555	156,507	17,892	0	0	34,697	0	47,792	13,810	114,190
3	Others	5,500	0	0	0	0	40,833	83,333	129,667								
4	SC	8,715	606	56	52,852	287	42,428	14,528	119,473	11,190	1,453	0	47,402	547	44,078	8,436	113,106
5	ST	17,896	1,265	0	32,180	5,474	38,270	29,668	124,754	16,484	0	0	38,978	0	38,065	26,344	119,871
	Total	14,014	1,109	28	94,275	642	40,189	10,077	160,334	10,293	776	0	85,668	99	43,720	7,859	148,415

Annexure Table 37: Comparison of Baseline and MidTerm LULC maps for 8 MWS









Annexure Table 38: Land use categories for Dewangad micro watershed			
S.No.	Land use categories	Area (ha)	
		Base line (2015)	Midterm (March 2018)
1	Built up	16.2	18.7
2	Agriculture	454.01	498.4
3	Forest	1808	1825.5
4	Water	163.5	164.1
5	Land with or without scrub	4501	4434.4
6	Road	39.38	41.5
TOTAL		6982.09	6982.6

Annexure Table 39: Land use categories for Lathiyagad micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm(November 2018)
1	Built up	18.3	18.3
2	Agriculture	700.9	700.9
3	Forest	2617.4	2617.4
4	Water	85	85
5	Land with or without scrub	1242	1242
6	Transportation	23	23
TOTAL		4686	4686.6

Annexure Table 40: Land use categories for Loharkhet micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm(December 2018)
1	Built up	14.82	15.2
2	Agriculture	797.85	847.6
3	Forest	7791.8	7826.5
4	Water	376.57	378.8
5	Land with or without scrub	4316	4227.8
6	Transportation	15.92	16.1
TOTAL		13312.96	13312

Annexure Table 41: Land use categories for Paligad micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm(December 2018)
1	Built up	5.98	12.8
2	Agriculture	682.33	691.6
3	Forest	3647.3	3649
4	Water	206.88	207.5
5	Land with or without scrub	1432.8	1414.4
6	Transportation	10.37	10.5
TOTAL		5985.66	5985.8

Annexure Table 42: Land use categories for Saintoligad micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm(December 2018)
1	Built up	21.96	22.9
2	Agriculture	941.43	957.9
3	Forest	682.19	683.1
4	Water	159.56	159.6
5	Land with or without scrub	2262.3	2242.3
6	Transportation	41.41	41.4
TOTAL		4108.85	4107.2

Annexure Table 43: Land use categories for Sarugad micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm (November 2018)
1	Built up	7.68	15.1
2	Agriculture	623.52	678.9
3	Forest	5535.43	5568.2
4	Water	106.28	106.2
5	Land with or without scrub	1100.86	1005.5
6	Transportation	19.7	19.7
TOTAL		7393.47	7393.6

Annexure Table 44: Land use categories for Sindhiyagad micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm(December 2018)
1	Built up	16.8	23.6
2	Agriculture	1815.7	1828
3	Forest	1737.5	1776.5
4	Water	415.09	416.1
5	Land with or without scrub	3837.3	3779.1
6	Transportation	28.38	27.5
TOTAL		7850.77	7850.8

Annexure Table 45: Land use categories for Uttrasu micro watershed			
S.No.	Land use categories	Area (ha)	
		Baseline (2015)	Midterm (December 2018)
1	Built up	16.83	17.2
2	Agriculture	912.1	915.7
3	Forest	1287.4	1310.8
4	Water	205.2	205.2
5	Land with or without scrub	1149.2	1121.4
6	Transportation	20.21	20.2
TOTAL		3590.94	3590.5

Annexure Table 46: Details of the revenue and expense of the farmer federations

Name of Division	Name of FFs constituted	No. of associated FIGs	No. of associated Farmers	Produce marketed in (Qtls)			Value of marketed produce in (Rs)			Year wise total running and operating expenses of FFs (Rs)			Benefit shared to member FIGs (Rs)	Total savings of FFs (Rs)	No. Of meetings held
				Fresh Produce	Graded	Processed	Fresh Produce	Graded	Processed	FY 2016-17	FY 2017-18	FY 2018-19			
Almora	Jagnath Krishi Beej Utpadak Sangh (Certified Seed Production)	18	39			295.28			1721432.00	68692.00	154168.00	53796.00	1300298.40	152277.00	9
Almora	Dhauladevi Gramyashree Self Reliant Cooperative	31	126		108			499500.00				49950.00	438311.30	40939.00	3
Bageshwar	Danpur Kisan Ekta Swayat Sahakarita Sama Gramya-2	44	380	455.03		3	965288.60		30000		3000	11000	674353.50	275000	24
Pithoragarh	Triveni Sangam Swayatta Sahakarita Kisan Sangh, Nachani	64	592	347		69	598000		480000			1078000	658000	420000	12
Pithoragarh	Unnati Swayatta Sahakarita Sangh Thal	52	518	75		16.22	133500		152000			285500	265000	20500	7
Thatyur	Gramya Krishak Swayatta Sahakarita	243	2926	2687.1	56.58	23.85	13470424	520331.4	137731.6		254100	282048	1176022	176355	18
		452	4581												
Dehradun	Jaunsar Phal Sabji Evam Dugdh Utpadak Swayatta Sahakarita	15	274	165	0	0	198000							5000	19
Dehradun	Athgaon Phal Evam Sabji Utpadak Swayat Sahakarita	13	178	230			638190				0	0	0	10000	12

Annexure Table 47: Year wise Afforestation Activity						
Name of Division	Unit	2015-2016	2016-2017	2017-2018	2018-2019	Total
PMU (Model WS)	Ha.	0	37	0	0	37
Rudraprayag	Ha.	0	0	266	0	266
Uttarkashi	Ha.	0	0	270.5	0	270.5
Vikasnagar	Ha.	0	471	65	10	546
Thatyur	Ha.	0	121	330	0	451
Pauri	Ha.	0	83.5	209	15	307.5
Almora	Ha.	0	160.19	241	5	406.2
Bageshwar	Ha.	0	15	416	268.62	699.6
Pithoragarh	Ha.	201	175	100	7	483
Total		201	1062.69	1897.5	305.62	3466.81

Annexure Table 48: Year wise Horticulture Development						
Name of Division	Unit	2015-2016	2016-2017	2017-2018	2018-2019	Total
PMU (Model WS)	Ha.	0	1	16	41.5	58.5
Rudraprayag	Ha.	0	0	0	0	0
Uttarkashi	Ha.	0	0	79	0	79
Vikasnagar	Ha.	0	0	0	0	0
Thatyur	Ha.	1	23	4	23	51
Pauri	Ha.	0	0	0	0	0
Almora	Ha.	0	0	6	63	69
Bageshwar	Ha.	0	26.5	15.5	19	61
Pithoragarh	Ha.	0	0	0	0	0
Total		1	50.5	120.5	146.5	318.5

Annexure Table 49: Year wise intervention Oak ANR						
Name of Division	Unit	2015-2016	2016-2017	2017-2018	2018-2019	Total
PMU (Model WS)	Ha.	0	0	0	0	0
Rudraprayag	Ha.	0	0	0	0	0
Uttarkashi	Ha.	0	0	0	0	0
Vikasnagar	Ha.	0	0	0	0	0
Thatyur	Ha.	0	15	25	0	40

Annexure Table 49: Year wise intervention Oak ANR						
Name of Division	Unit	2015-2016	2016-2017	2017-2018	2018-2019	Total
Pauri	Ha.	0	0	0	0	0
Almora	Ha.	0	0	0	0	0
Bageshwar	Ha.	0	0	0	0	0
Pithoragarh	Ha.	40	10	5	0	55
Total		40	25	30	0	95

Annexure Table 50: Cropped Area and Cropping Intensity (Economic & Financial Analysis)				
Particulars	2015-16	2016-17	2017-18	2018-19
Rain fed	34260	33681	33205	32861
Cropping Intensity	152	154	157	160
GCA - RF	52075	51869	52132	52578
Net irrigated area	5262	6180	7277	8515
Cropping Intensity	171	185	205	225
GCA- IR	8998	11433	14918	19159
Total NSA (RF+IR)	39522	39861	40482	41376
Tot GCA (RF+IR)	61073	63157	66696	71227
Overall Cropping Intensity	154.53	158.44	164.76	172.15

Annexure Table 51: Productivity of Major Agri. Crops (Quintals/ha) (Economic & Financial Analysis)		
Crops	Base (2015-16)	MTR (2018-19)
Paddy	11.23	13.8
Wheat	12.62	15.66
Maize	12.97	15.79
Finger Millet	12.05	13.82
Barnyard Millet	11.65	13.33
Black gram	7.25	9.74
Horse gram	6.84	8.4
Lentil	7.31	9.50
Soybean	8.90	11.9
Mustered	5.61	7.3
Paddy IR	11.65	15.15
Wheat IR	12.62	15.66

Annexure Table 52: Productivity of Major Vegetable Crops (Quintals/ha) (Economic & Financial Analysis)		
Crops	Base (2015-16)	MTR (2018-19)
Potato	90.10	106.74
Tomato	105.38	137.78
Capsicum	58.50	81.90
Turmeric	76.10	88.28
Ginger	84.70	113.92
Garlic	40.20	60.90
Peas	51.81	70.00
Cabbage	86.40	128.70
Cauliflower	99.50	113.20
French Beans	55.60	79.68

Annexure Table 53: Value (Rs. per ha) of Forest Services) (Economic & Financial Analysis)						
	Bilaspur	Chhamba	Dharmashala	Mandi	Nahan	Shimla
Forest Area	37,700	168,900	113,400	125,700	198,500	213,300
Timber	2,074	1,499	3,034	922	765	1,535
Carbon	11,367	18,431	7,947	19,749	6,725	15,079
NTFP	9,789	1,023	7,555	3,426	1,697	1,084
Eco-tourism	14,542	1,658	7,765	339	821	12,791
Fuel-wood	4,150	322	2,028	836	515	304
Fodder	4,145	319	2,025	835	515	304
WS	22,207	22,207	22,207	22,207	22,207	26,952

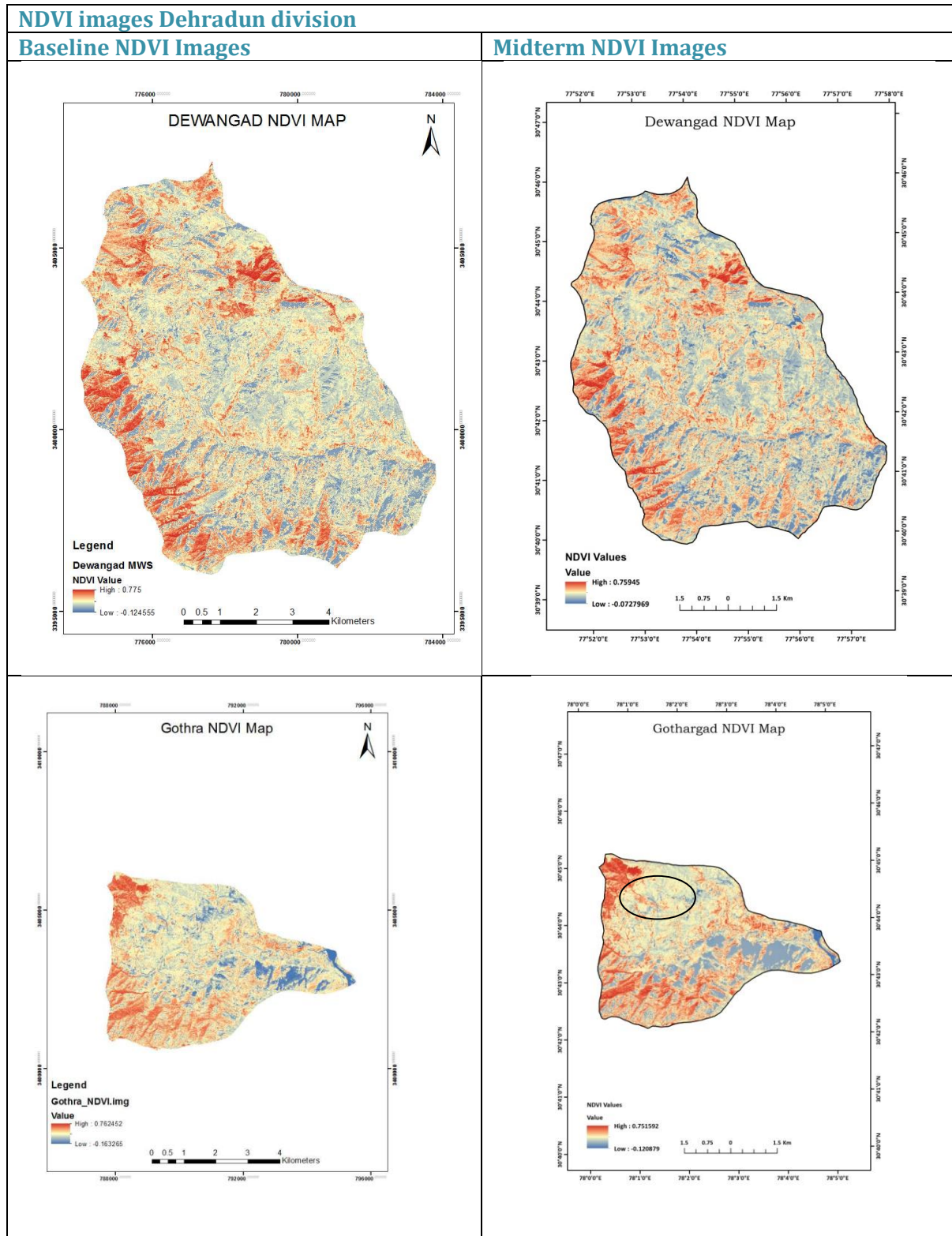
Source: Report of the Expert Committee on Net Present Value, constituted by IEG, Delhi as mandated by Supreme Court of India, 2005.

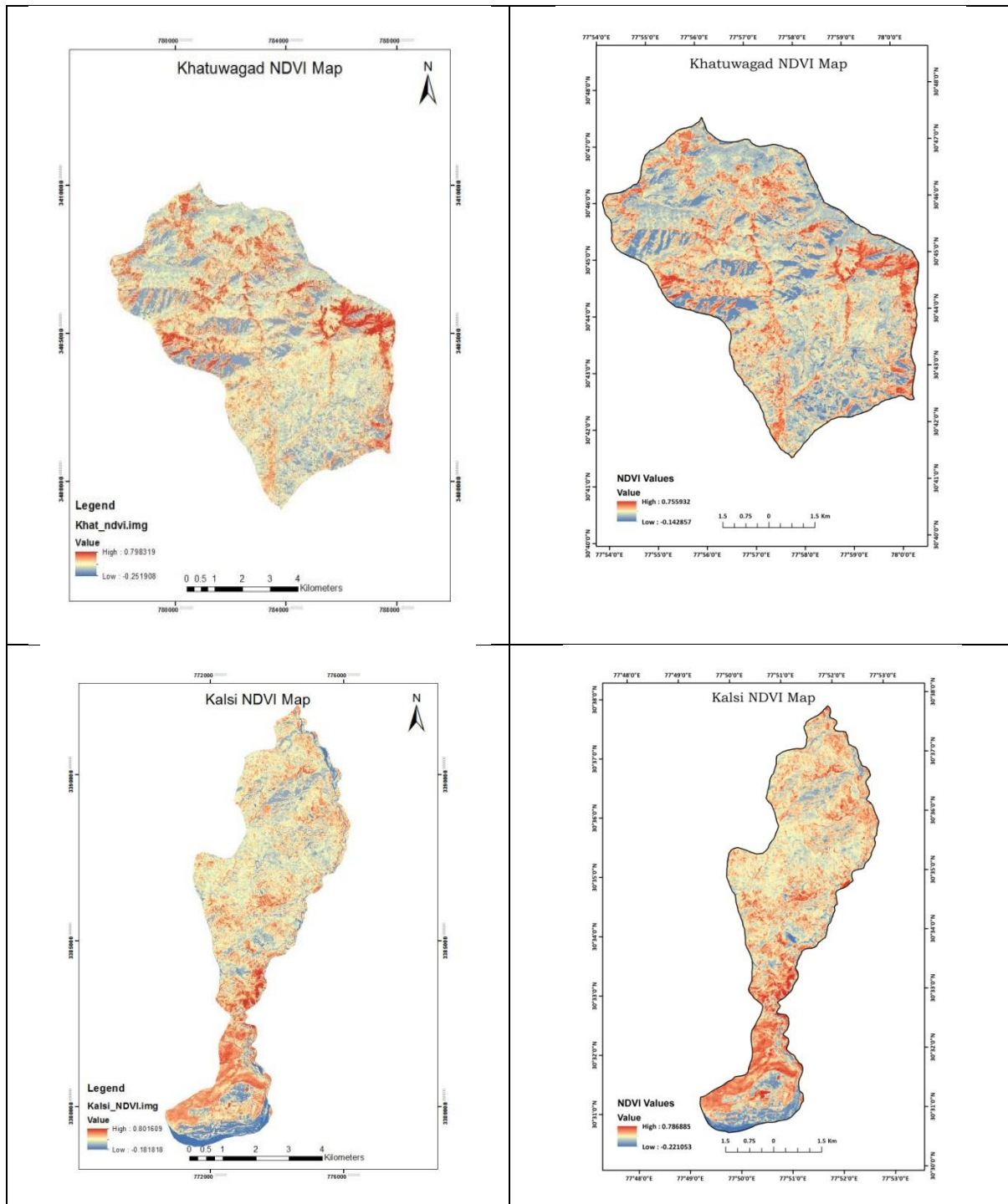
Weighted Average value of carbon sequestration + WS = 36770.90/ha

Assuming Rs 36771 per 27.7 MT of biomass

Value of per MT biomass = Rs. 1327.47

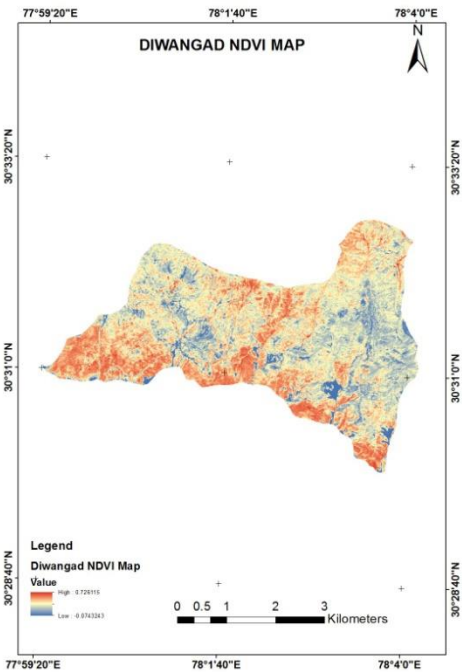
Annexure Table 54: NDVI image of MWS (2019)



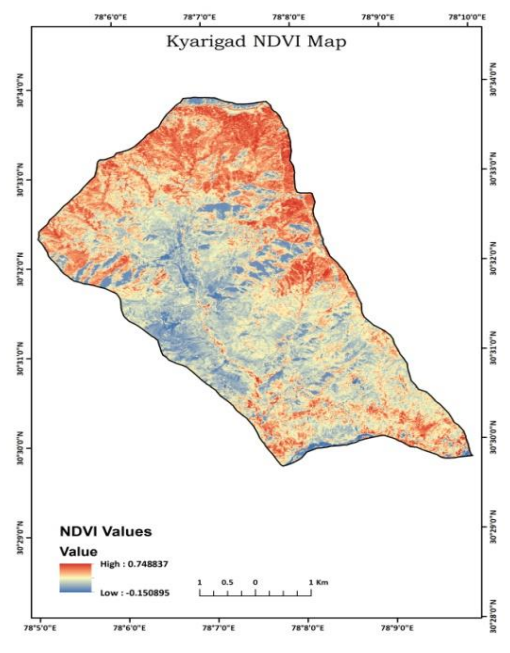
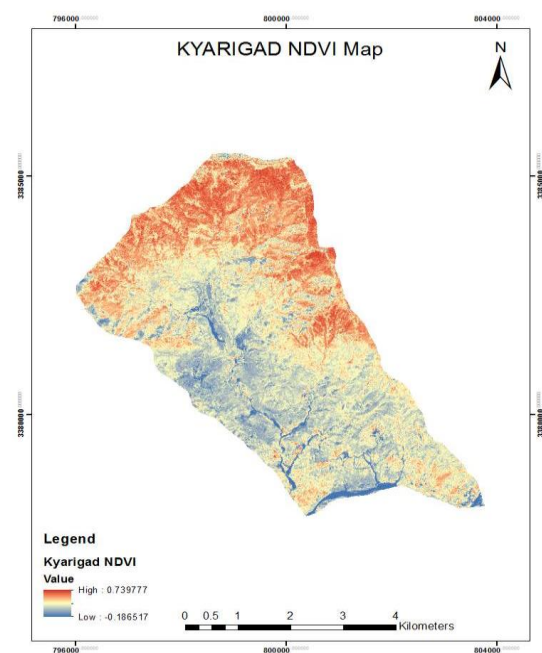
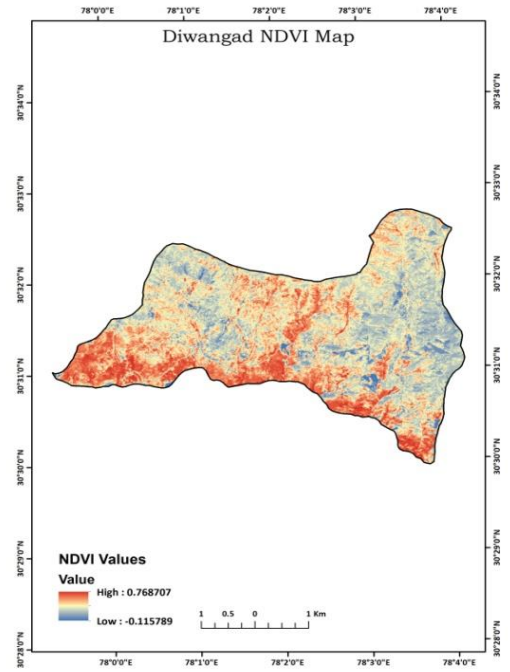


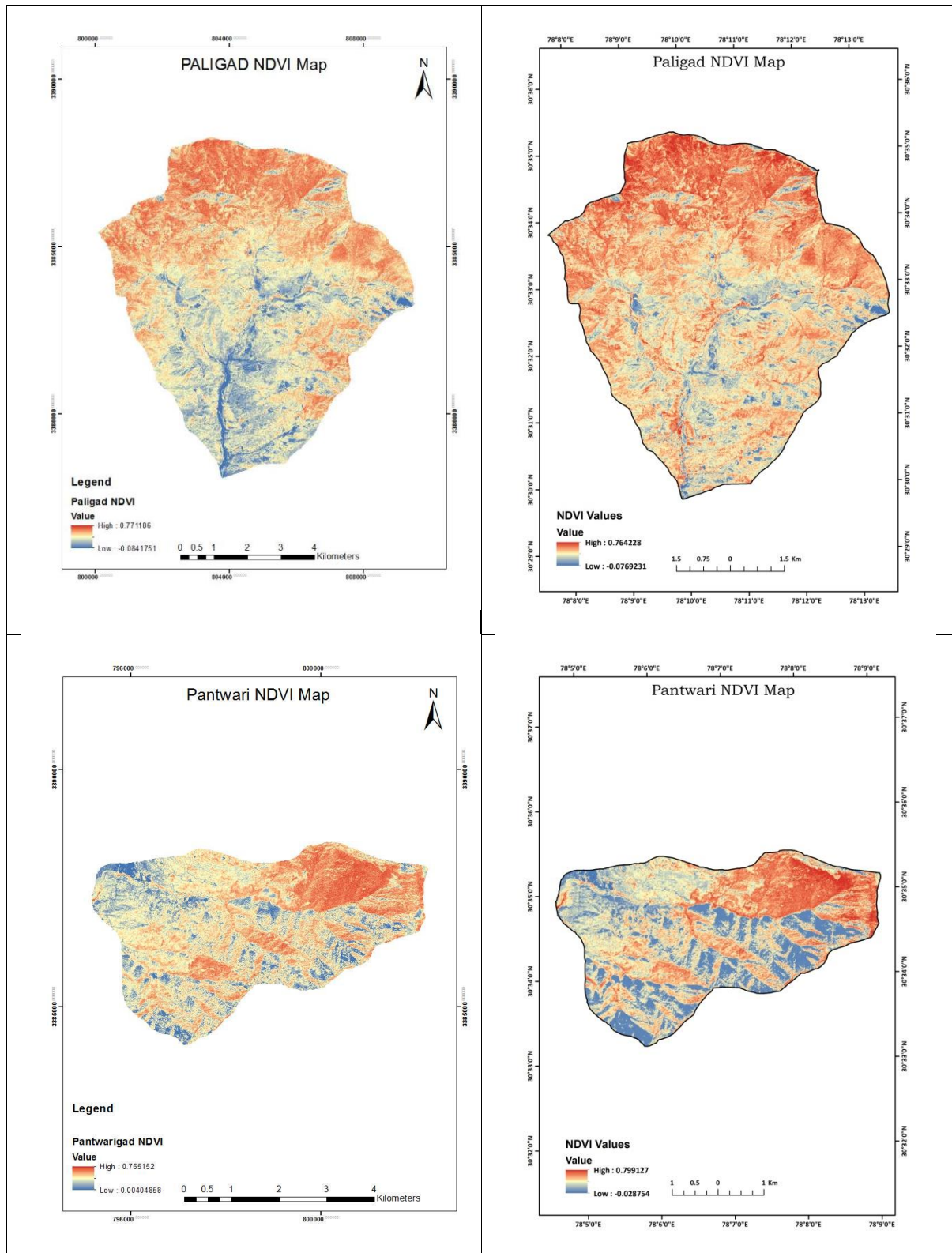
NDVI images Thatyur division

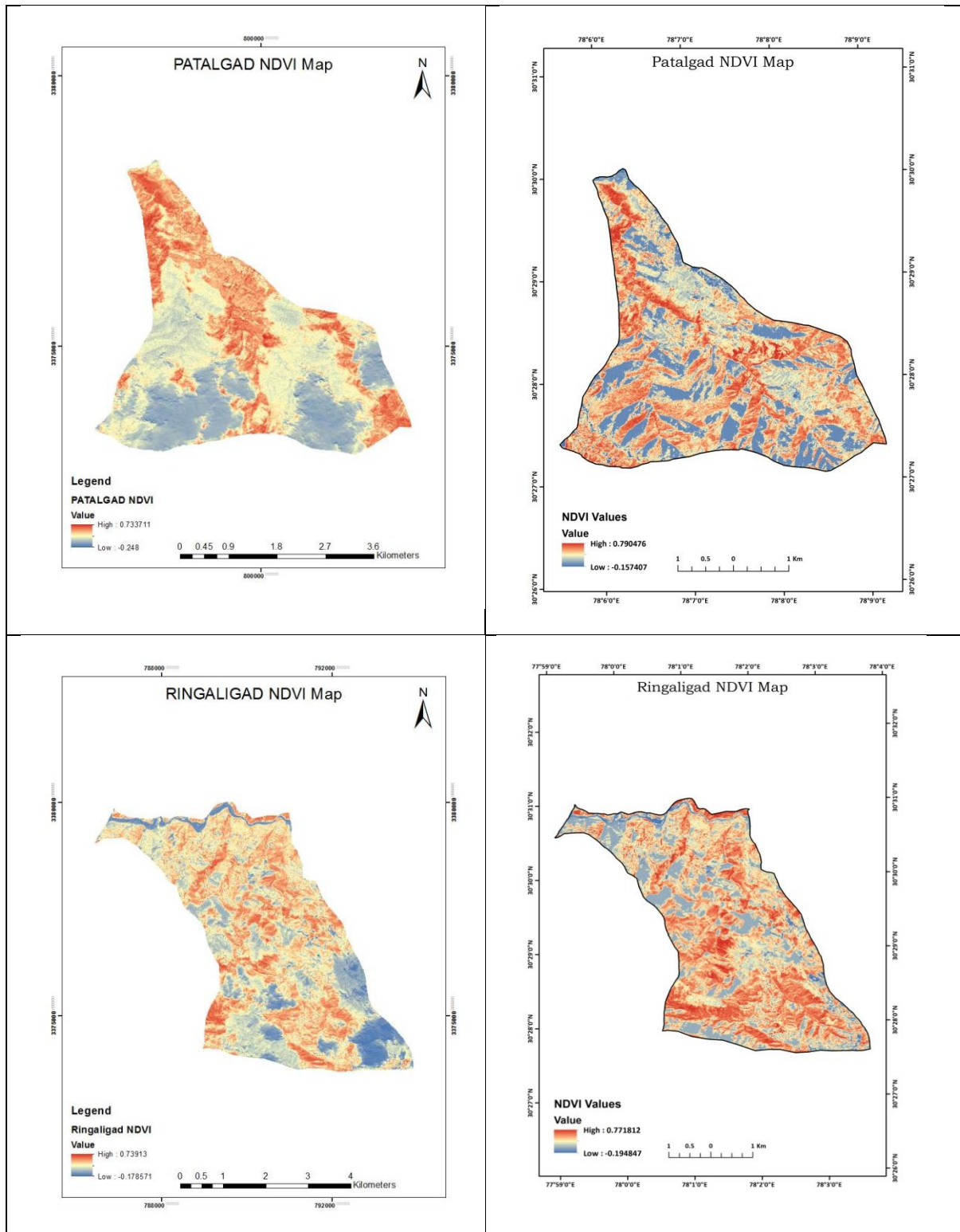
Baseline NDVI Images

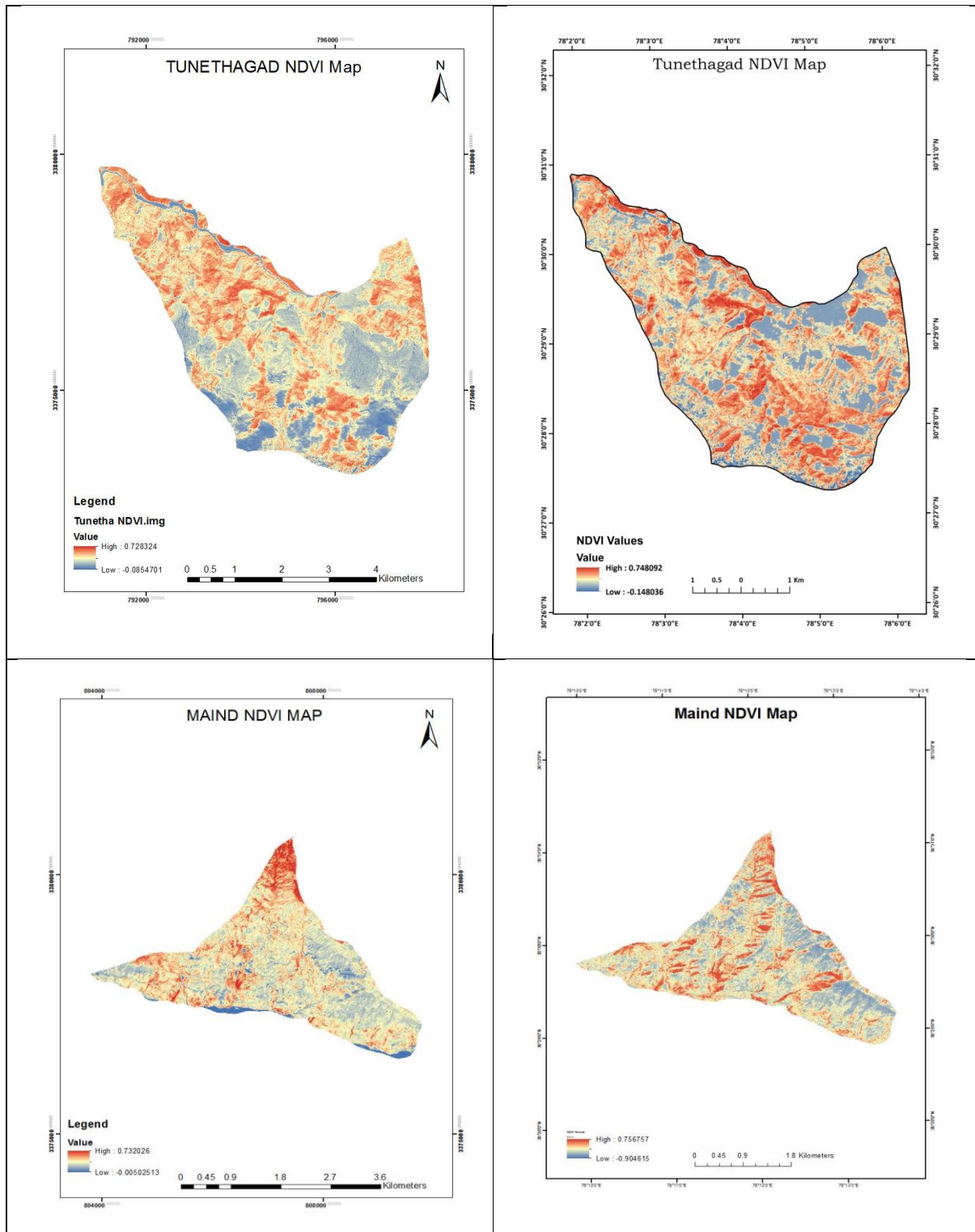


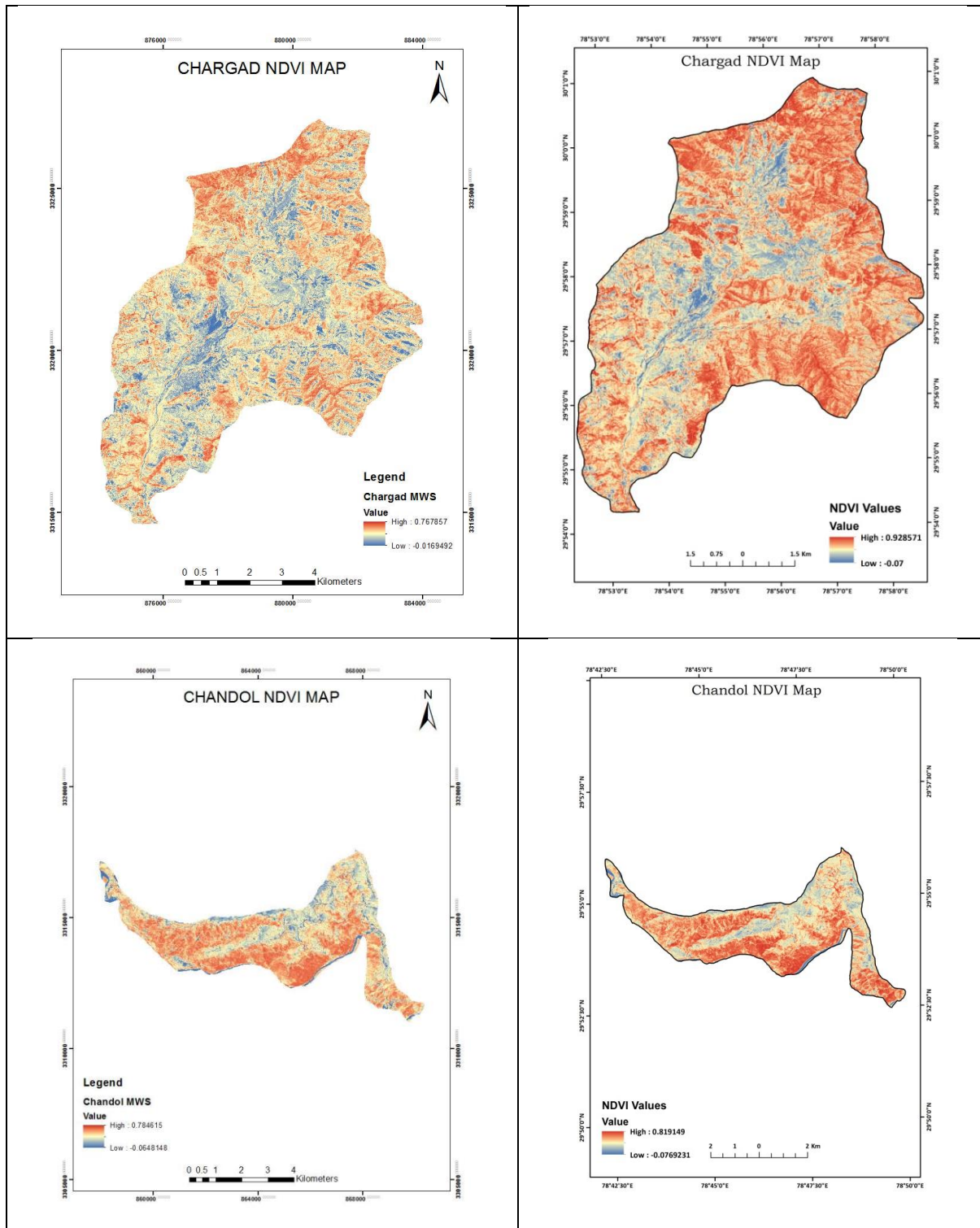
Midterm NDVI Images

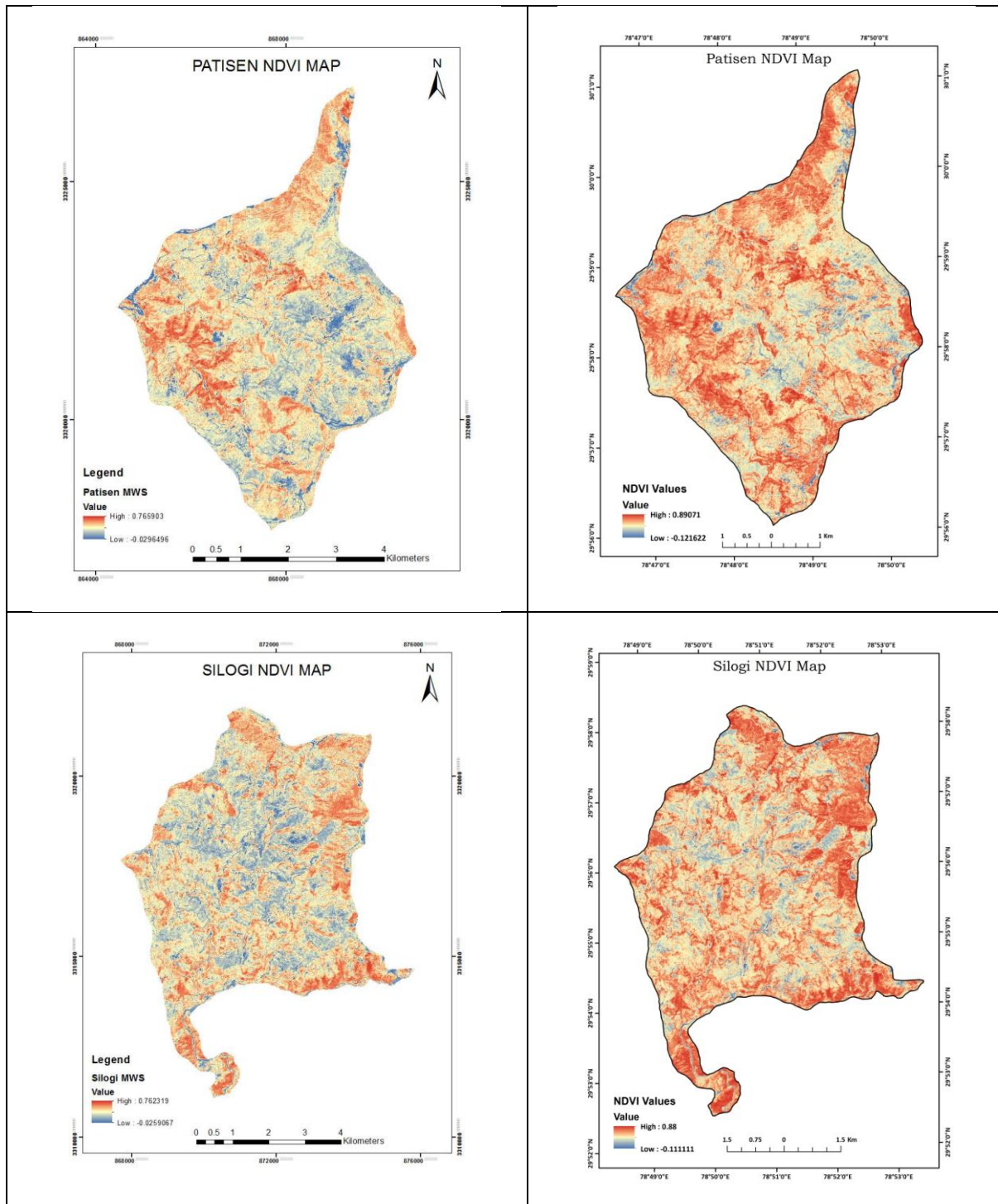






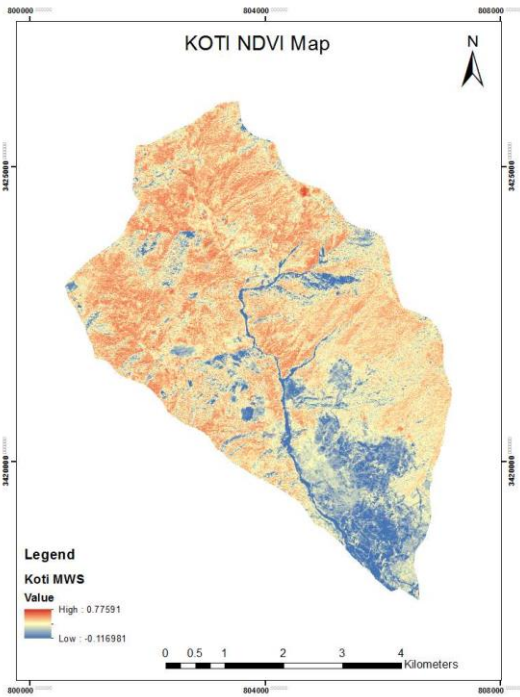




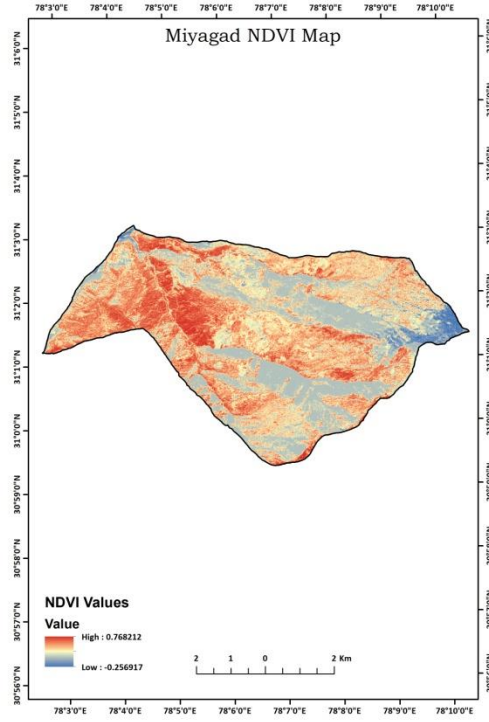
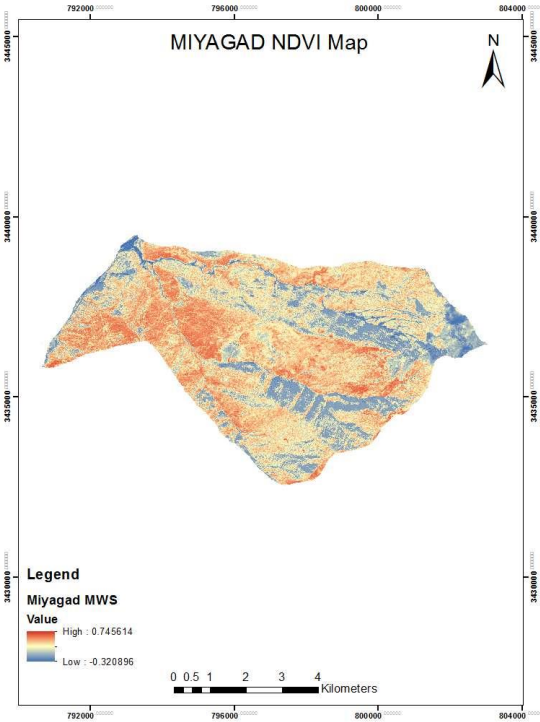
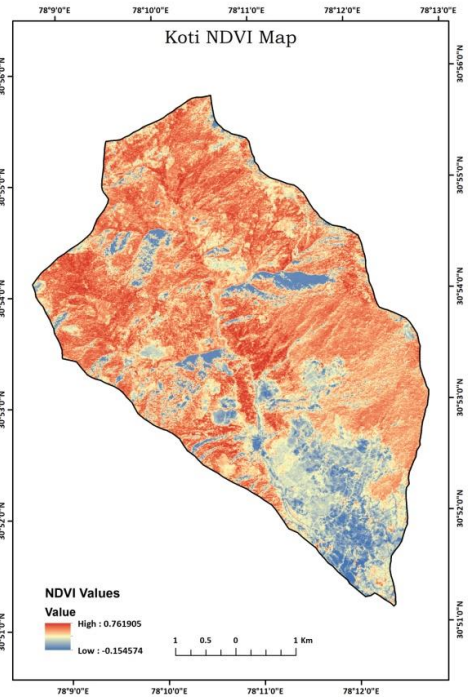


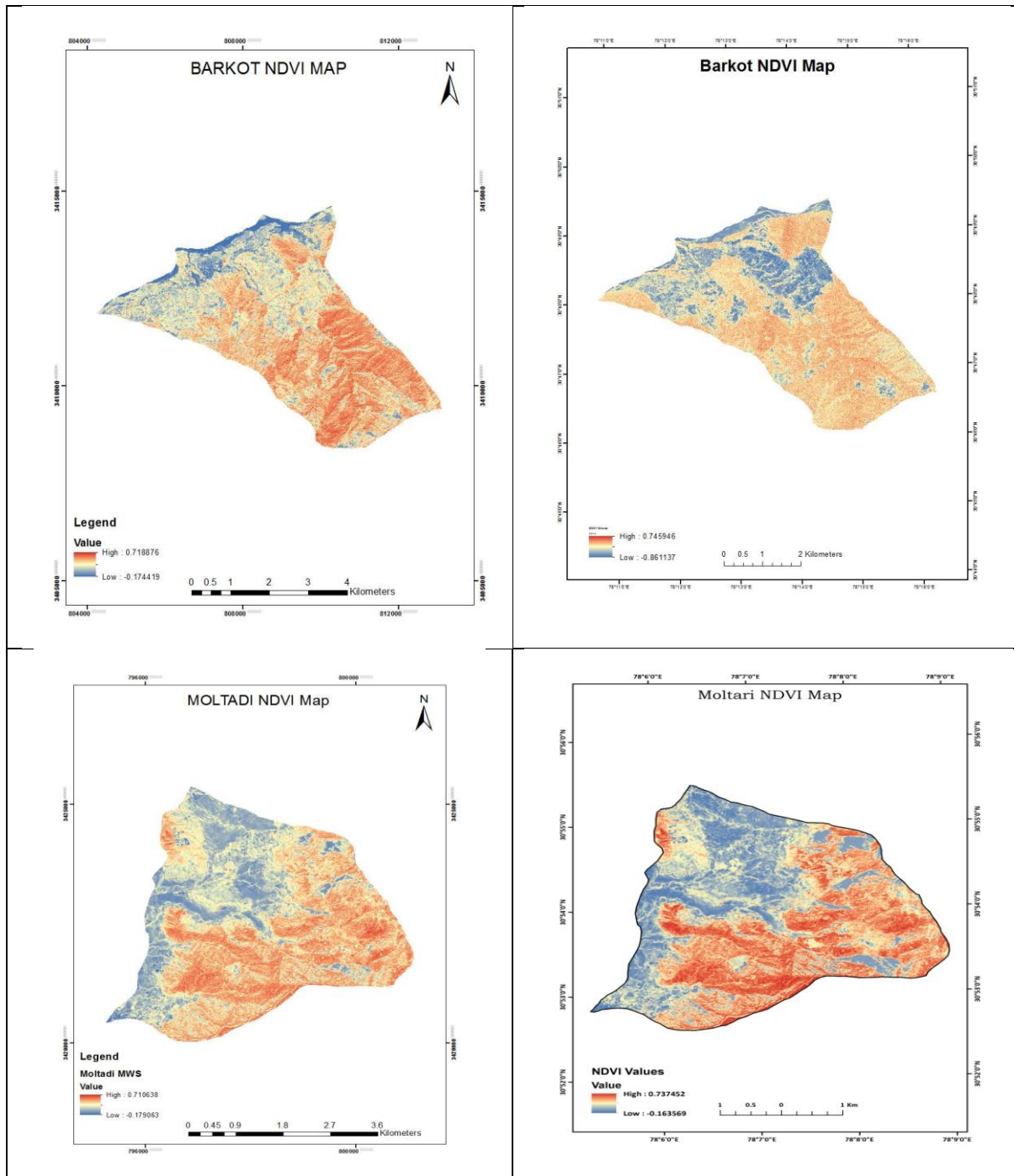
NDVI images Uttarkashi division

Baseline NDVI Images



Midterm NDVI Images

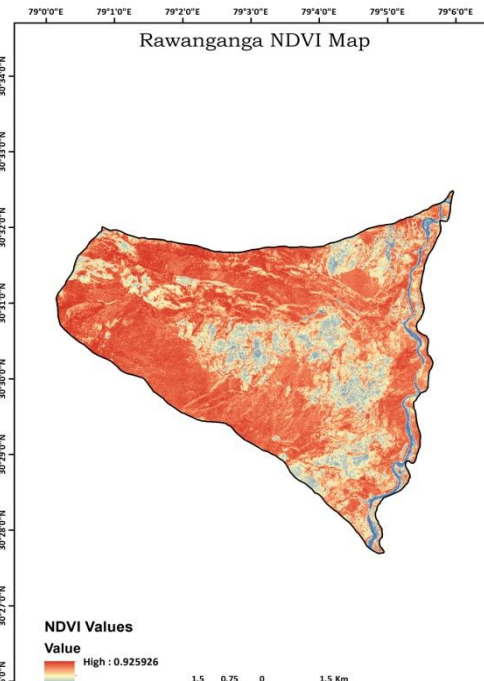
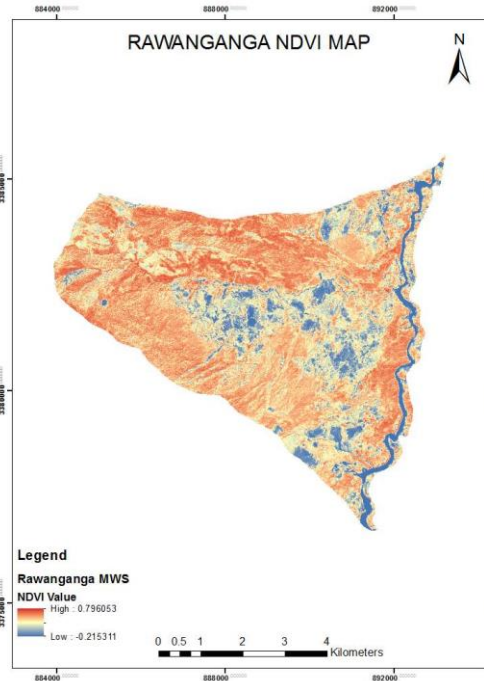
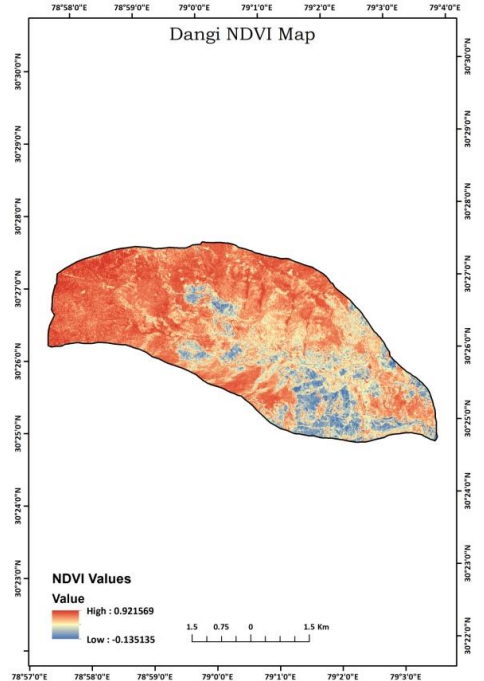
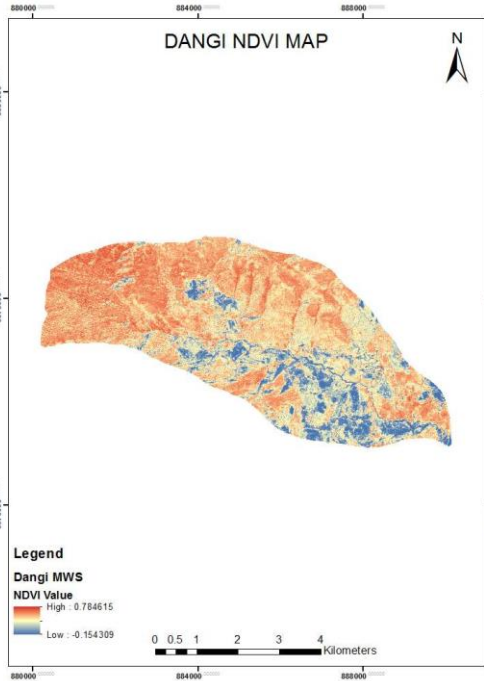


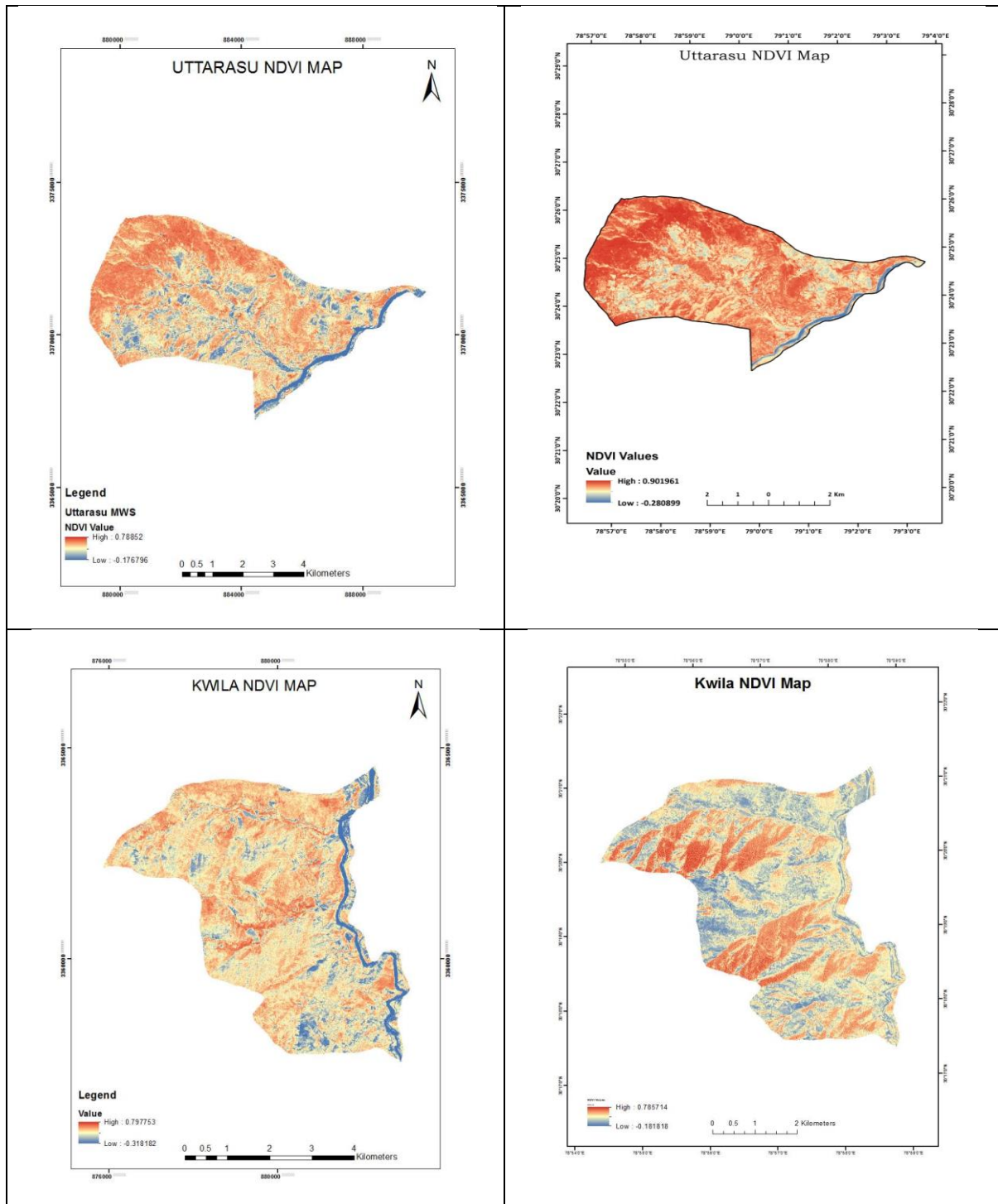


NDVI images Rudraprayag division

Baseline NDVI Images

Midterm NDVI Images

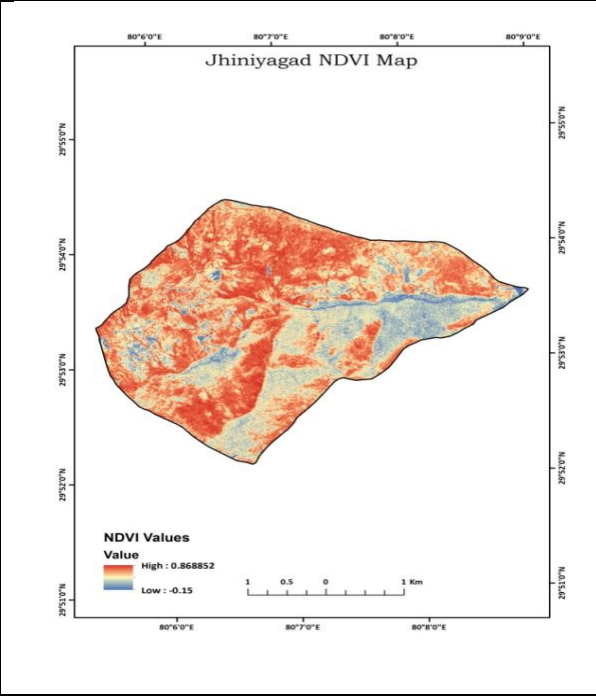
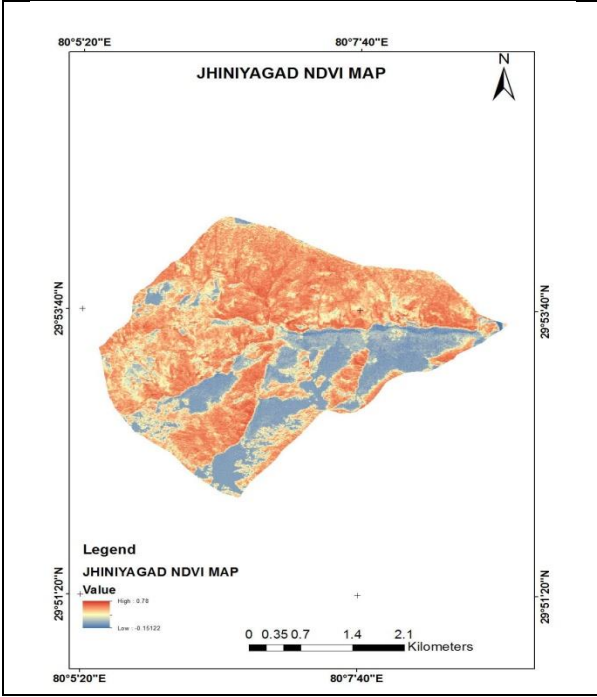
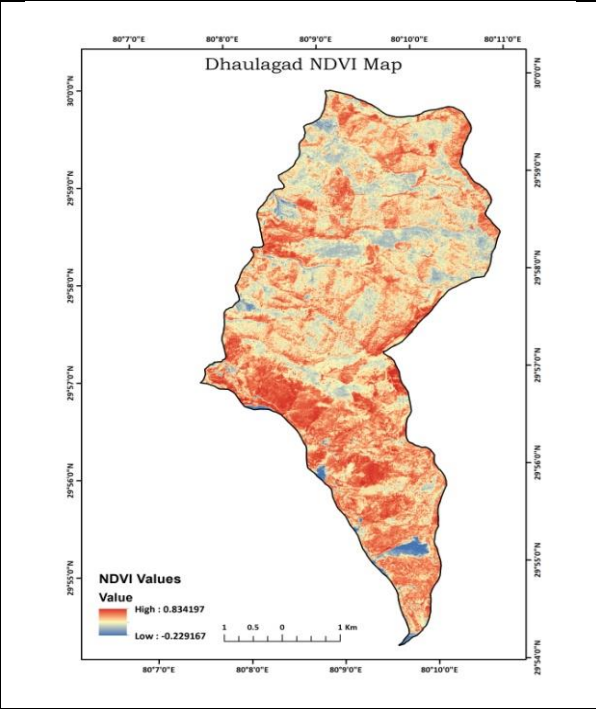
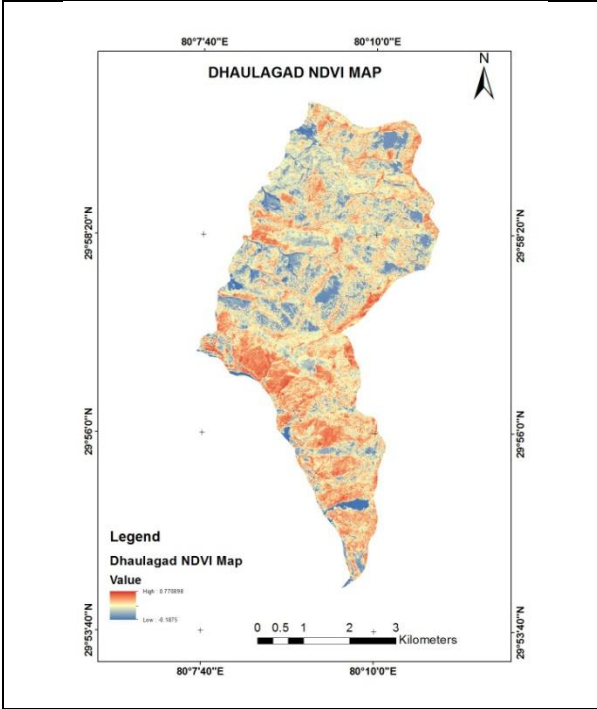


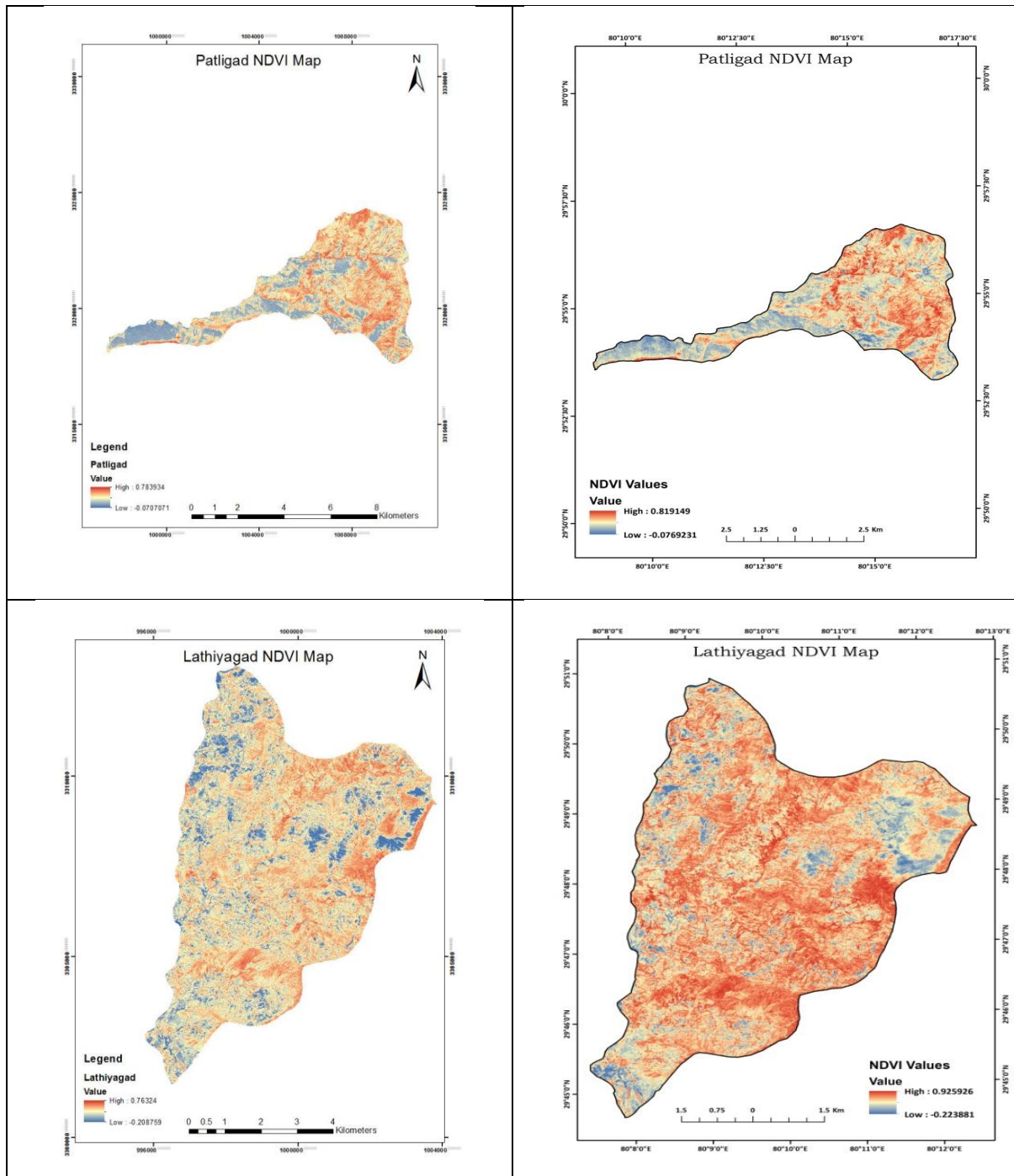


NDVI images Pithoragarh division

Baseline NDVI images

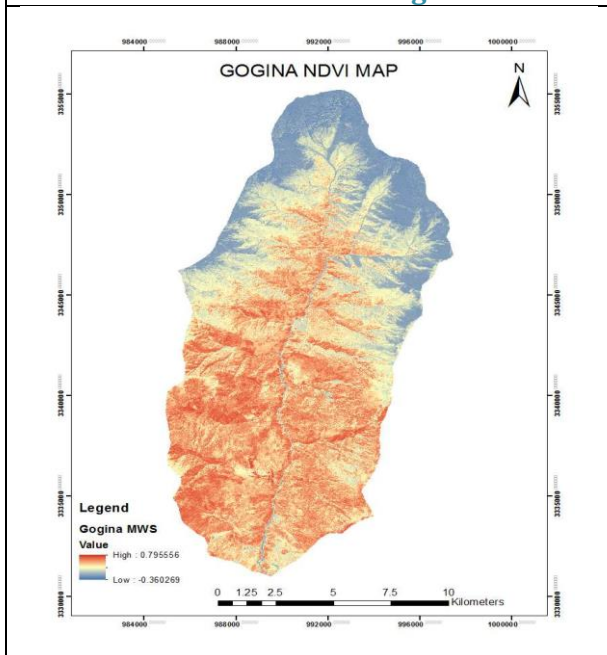
Baseline NDVI images



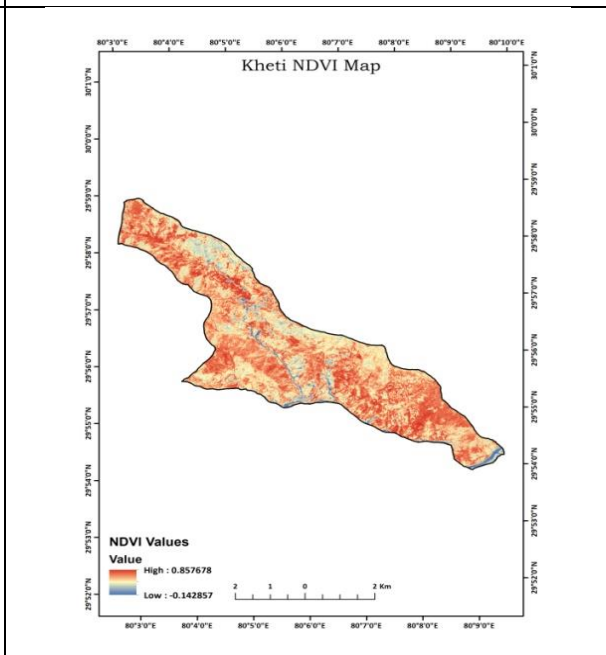
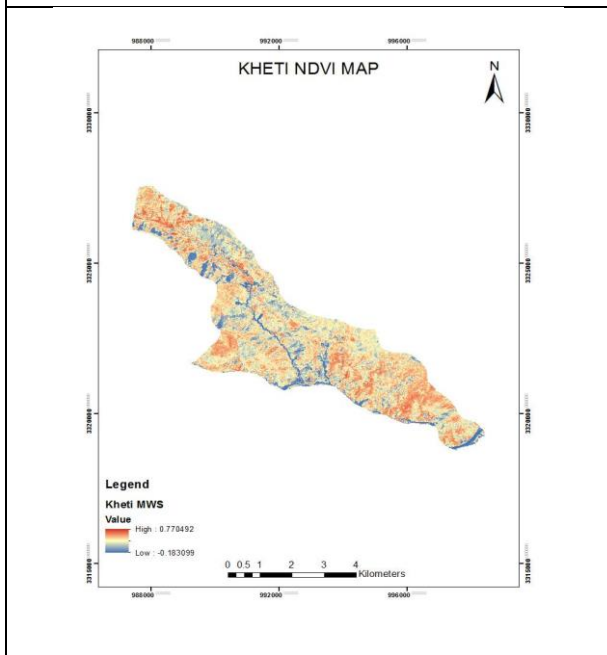
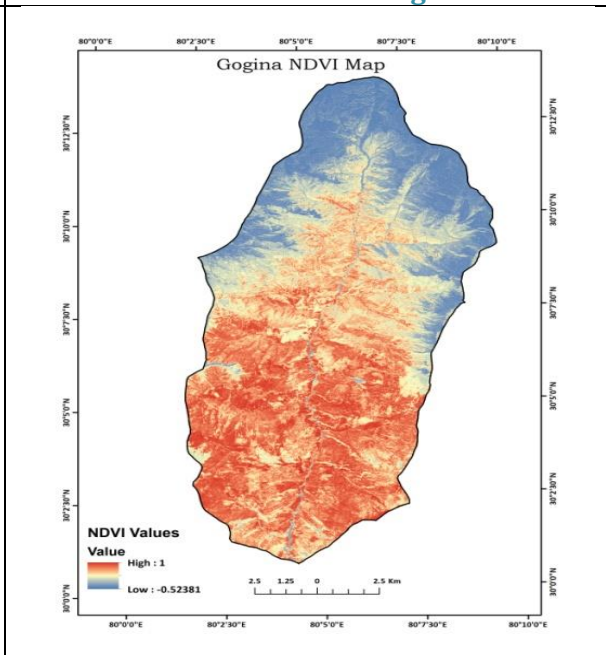


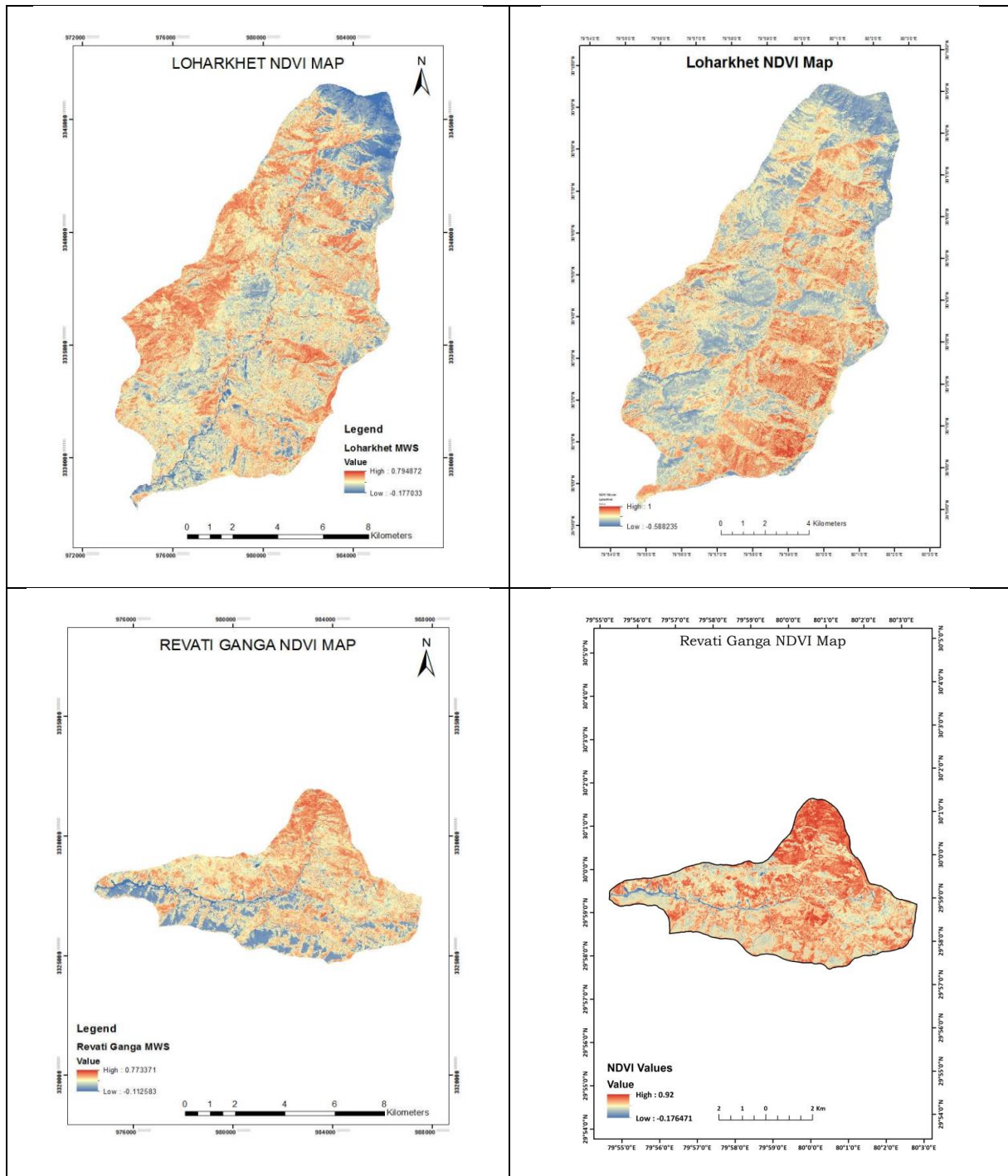
NDVI images Bageshwar division

Baseline NDVI images



Baseline NDVI images





NDVI images Almora division

Baseline NDVI images

Midterm NDVI images

