Sustainable Natural Resource Use in Arctic and High Mountainous Areas

SUNRAISE

Co-funded by the Erasmus+ Programme of the European Union

SUNRAISE Activities and Outcome Dissemination Programme in the Rural Areas of the Middle Himalayan Mountains, Uttarakhand, India [01 – 30 September 2021]

SUNRAISE Platform

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Rationale:

In Himalaya, the nature of terrain imposes severe limitations on level of resource productivity as well as on efficiency of infrastructure. Consequently, the food and livelihood system of rural communities is directly dependent on climate sensitive subsistence farming in the region. During the recent past, a variety of changes have emerged in the traditional agricultural resource use structure mainly in response to growth of population, increasing rural out-migration, improved road connectivity, and rapid urbanization. As a result, critical natural resources, such as land, water, forest and biodiversity have been depleted and degraded steadily and significantly. Moreover, climate change has impacted the mountain farming and food system through increase in temperature, altered precipitation pattern and increasing frequency and severity of climate change induced natural disasters. These changes are undermining the water, food, livelihood and health security of large proportion of rural population and further increasing the trends of rural outmigration across the Himalayan Mountains.

In view of this, rural communities are the key beneficiaries and stakeholders of the sustainable natural resource utilization framework in the Himalayan mountain ecosystem of India. A range of local government agencies as well as non-government organizations are engaged in evolving community based strategies for sustainable resource development and climate change adaptation at local levels involving community based rural institutions. Natural Resource Conservation and Climate Change Awareness Assessment Programmes have been organized in 11 villages located in the densely populated Middle Himalayan Mountain Ranges, in Uttarakhand under the SUNRAISE Project. Attempts have been made to assess the community perception on natural resource conservation and climate change. Besides, the community responses to climate change and natural resource management have also analysed and documented.

These outreach and dissemination activities have been carried by Kumaun University under SUNRAISE Platform.

- The program has been organized for the wider dissemination of the SUNRAISE activities at community and grass-root levels in the Himalayan region of the State of Uttarkhand as without disseminating the outcomes and activities of the project to local people the results of the project cannot be translated on the real ground.
- The outcomes of the project have been discussed and shared with the local rural communities and their level of awareness and perception about the sustainable utilization of natural resources have been analyzed in the context of the project activities.
- The project team also discussed the relevance of the new and devised courses developed and implemented by Kumaun University for addressing the sustainable resource development issues at the local levels

Objectives:

The main objectives of the exercise have been:

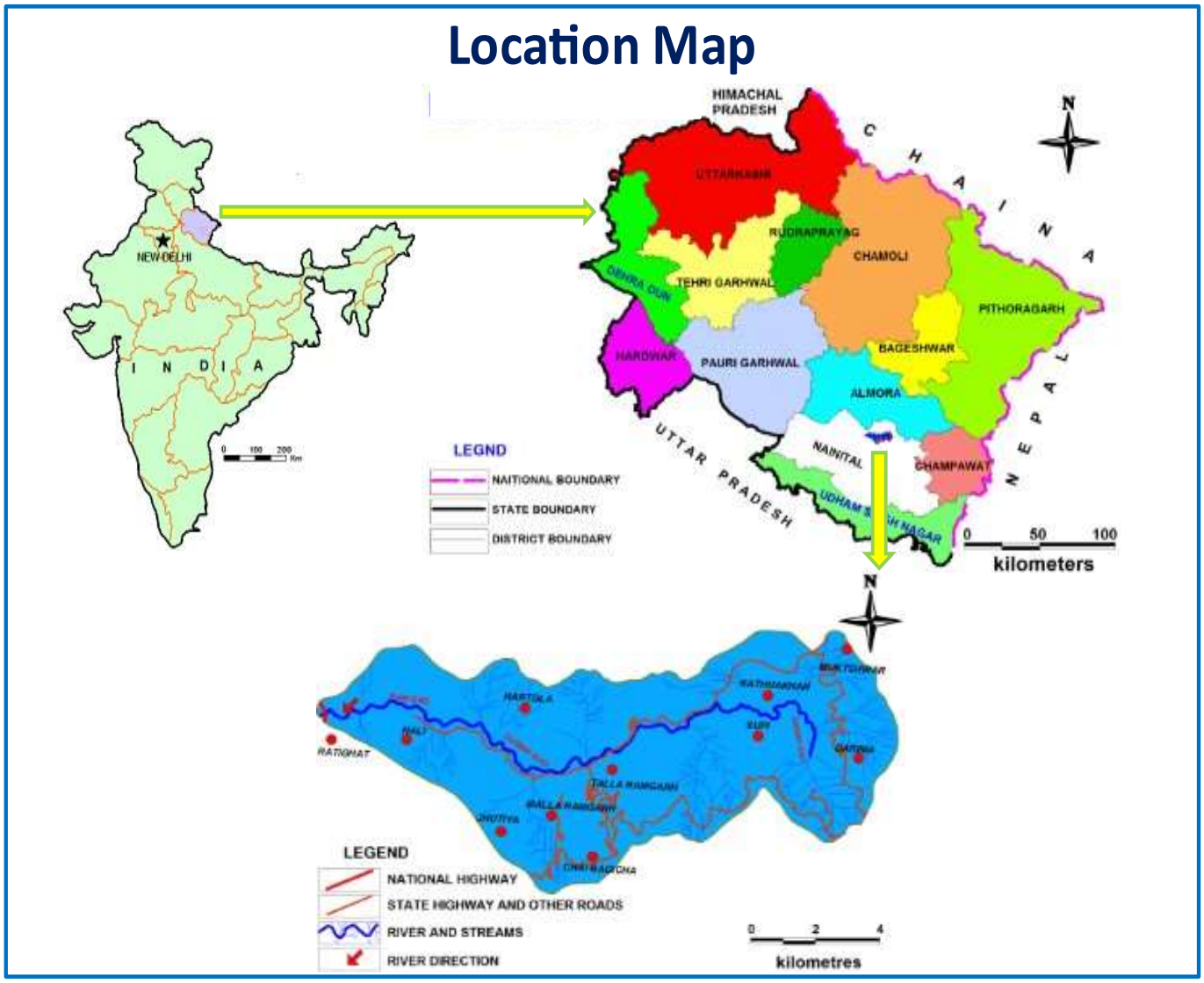
- To disseminate the SUNRAISE activities and outcomes in wider perspective
- To obtain and analyse the feedbacks of rural Himalayan communities on the activities of SUNRAISE
- To examine the relevance of the new and revised courses developed by Kumaun University in the rural context in Himalaya
- To assess the level of awareness among the rural communities about sustainable natural resource development and utilization in the Himalayan mountains
- To examine the role and contribution of local government agencies and non-government organization in sustainable resource management and climate change adaptation

The Study Site:

Ramgad Watershed situated in the Lesser Himalayan ranges of the Himalayan State of Uttarakhand in India has been selected as the area of study for the proposed work. The Watershed encompasses a geographical area of nearly 75.8 km^2 between 1025 and 2346 m altitude. Ramgad is the one of principal tributaries of River Kosi - the important rain-fed rivers of Uttarakhand. The catchment is characterized by diversified geological structure, terrain characteristics and geomorphic landscape which are clearly reflected in varying magnitudes of structure, slopes and their aspects, variety of soils, natural vegetation and hydrological regimes and the climatic complexities.

The total population of the headwater is 31645 persons in 2021, which is inhabited in 35 villages. The Watershed registered almost 50% increase in population during 2001- 2021. Out of the total geographical area (75.8 km^2) of the watershed 57.71% is under forests and 25.75% is under agriculture and horticulture. The activities of cultivation, horticulture, tourism and grazing are extended over large areas leading to exploitation of natural resources and land use intensifications increasing the vulnerability of large population to the emerging risk of climate change and natural disasters in the entire watershed.

The study area was divided up into three altitudinal transects. The three altitudinal transacts of the Ramgad Watershed are (i) Lower Elevation Zone between 1000 - 1500 m; (ii) Middle Elevation Zone between1500 - 2000 m; and (iii) Higher Elevation Zone from 2000 to 2500 m (Figure 3). This exercise was carried out with the help of Survey of India Topographical sheet at scale 1:50000. The Lower Elevation Zone, Middle Elevation Zone and Higher Elevation Zone respectively cover 15.77 Km^2 (21.02%), 37.69 Km^2 (50.25%) and 21.55 Km^2 (28.73); and 10, 07 and 18 villages of the Watershed. Rural awareness programme have been organized in 11 villages selecting respectively 2, 3 and 6 villages from Lower, Middle and Higher Elevation Zone.



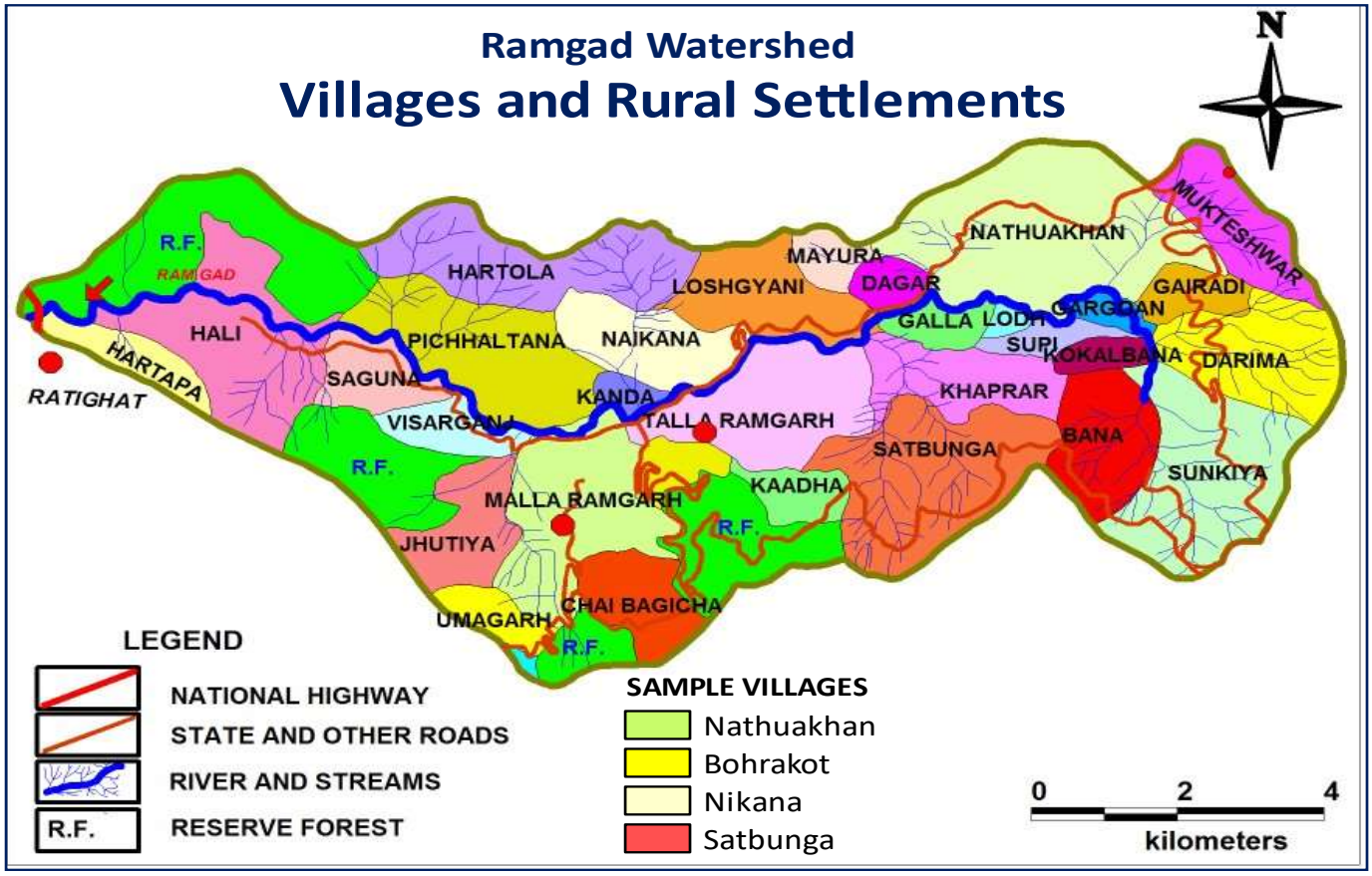
The natural and socio-economic profile of the study area is presented in the following Table:

Natural and Socio-economic Parameters

Natural and Socio-economic Parameters	Current Status
Total Geographical Area	75.8 km^2
Altitude	Between 1025 and 2346
Natural Location	Lesser Himalaya (Middle Himalaya)
Administrative Location	District Nainital, Ramgarh Block, Uttarakhand
Total Length of Master Stream	25.81 km (with a fall of 1025 m)
Villages	35 Villages
Total Population	31645 persons (51% Males and 49% Females)
Population Density	417.48 Persons/Km^2
Farm Land Holding Size	1 ha (more than 90%)
Agricultural Land	32% of Total Geographical Area
Forest Area	53% of Total Geographical Area
Forest Councils	In 22 Villages

Profile of Study Villages:

Name of Village	Altitude from Mean Sea Level [m]	Total Area [Km^2]	Total Population	Main Rural Livelihood
Bohrakote	1655-1967	2.71	1567	Agriculture, Fruits and Vegetable Farming
Satbunga	1698-1905	1.75	1299	Fruits and Vegetable Farming
Hartola	1687-1955	2.11	1750	Fruits and Vegetable Farming, Milk Production
Jhutiya	1590-1845	1.90	1625	Agriculture, Fruits and Vegetable Farming
Darima	1750-1915	1.99	1872	Fruits and Vegetable Farming, Milk Production
Nathuakhan	1759-1877	2.29	2755	Fruits and Vegetable Farming, Milk Production
Talla Ramgarh	1570-1805	2.57	2921	Fruits and Vegetable Farming, Milk Production
Naikana	1679-2021	2.15	1978	Fruits and Vegetable Farming, Milk Production
Mayura	1725-1921	1.77	1797	Fruits and Vegetable Farming, Milk Production
Umagarh	1805-1955	2.19	2156	Fruits and Vegetable Farming, Milk Production
Sunkiya	1850-2029	2.71	2475	Fruits and Vegetable Farming, Milk Production



The area is highly vulnerable environmental changes, particularly the climate change and unsustainable natural resource utilization. At the same time, the watershed represents one of the most densely populated parts of Uttarakhand Himalaya. As a result, the availability of arable land is severely limited, productivity is low and livelihood options are scarce across the region. However, the level of education is high and access to market is easy which could be utilized for sustainable resource development. The vulnerabilities and potentials for building socio-ecological resilience have been presented in the following Table:

Vulnerabilities and Potential for Building Socio -ecological Resilience

Geo-environmental Status	Critical Socio-economic Hot-Spots	Existing and Emerging Potentials
▪ Altitudinal Variations	▪ Densely Populated	▪ High Educational Level
▪ Steep Slopes	▪ Severely Limited Arable Land	▪ Scenic Landscape
▪ Tectonically Alive	▪ Limited Livelihood Options	▪ Access to Markets
▪ High Stream Frequency	▪ Subsistence Economy	▪ Traditional Horticulture
▪ High Stream Density	▪ Increased Out-migration	▪ Improved Infrastructure
▪ High Run-off	▪ Gender Inequality	▪ Rich Traditional Knowledge
▪ Climate Change	▪ Socio-economic Exclusiveness	▪ Multilevel Institutions
	▪ Rapid Urbanization	
	▪ High Food Deficit	

Natural Resource Conservation and Climate Change Awareness Programme have been organized in all the 11 selected villages during May 2020 – September 2021. The meetings were organized in village schools and other such common places where all households of the villages could participate in the meeting. The participants included both men and women and representatives of the local community-based institutions and non-governmental organizations. The community responses and observations have been documented and analyzed.

A Hamlet of Village Bohrakote Where the First Awareness Meeting Organized

Meeting Being Organized in Bohrakote Village

View of Densely Populated Ramgad Watershed

Community Meeting in Satbunga Village

A View of Talla Ramgad Village

Village Meeting in Talla Ramgarh Village

Densely Forested Parts of Ramgad Watershed

Villagers Meeting in Hartola Village

Intensively Cultivated Upslope Land in Hartola Village

Community Programme Being Organized in Jhutiya Village

Depletion of Natural Resources Through Development of Tourist Infrastructure in Jhutiya

Village Programme in Darima

Unplanned Development of Tourist Infrastructure in Darima

Village Programme in Nathuakhan

Community Interaction Programme in Naikana Village

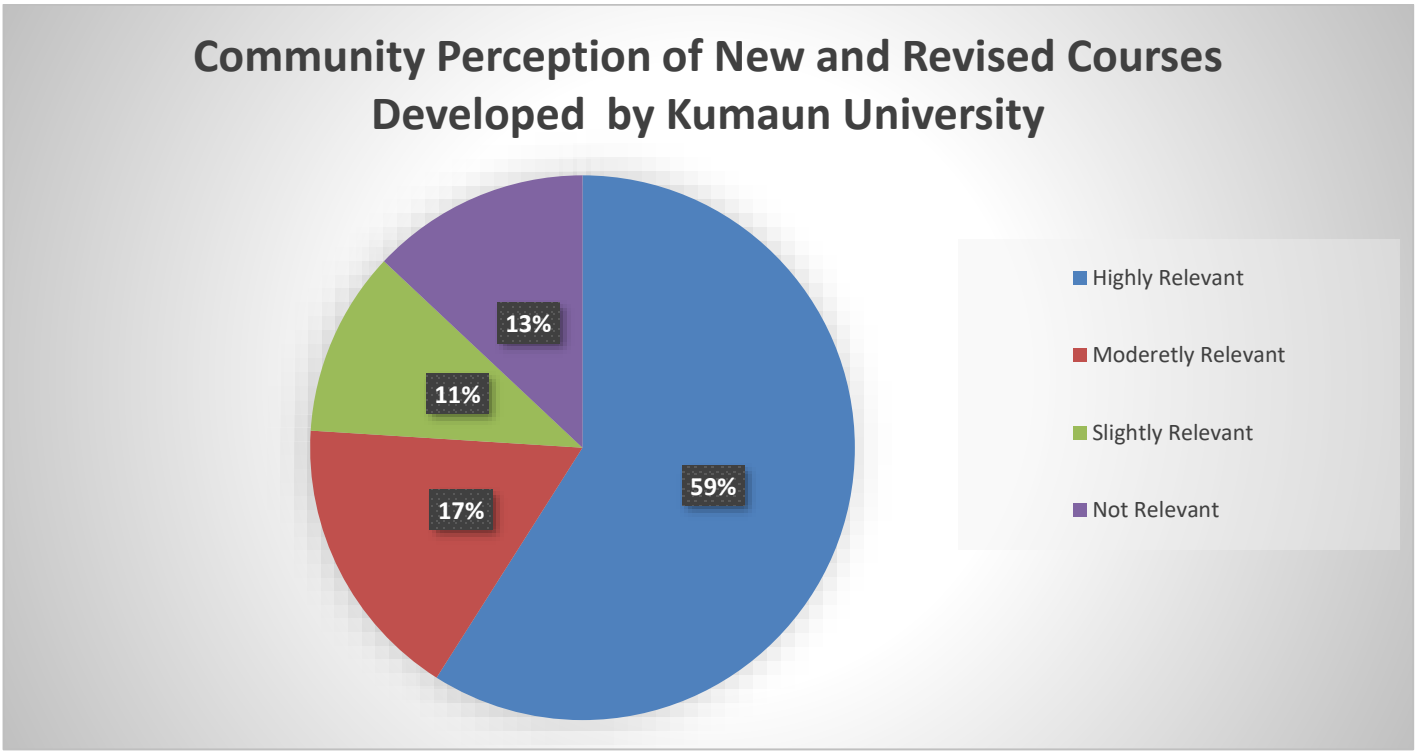
Villagers Meeting in Mayura Village

Village Meeting in Umagarh

Community Meeting in Village Sunkiya

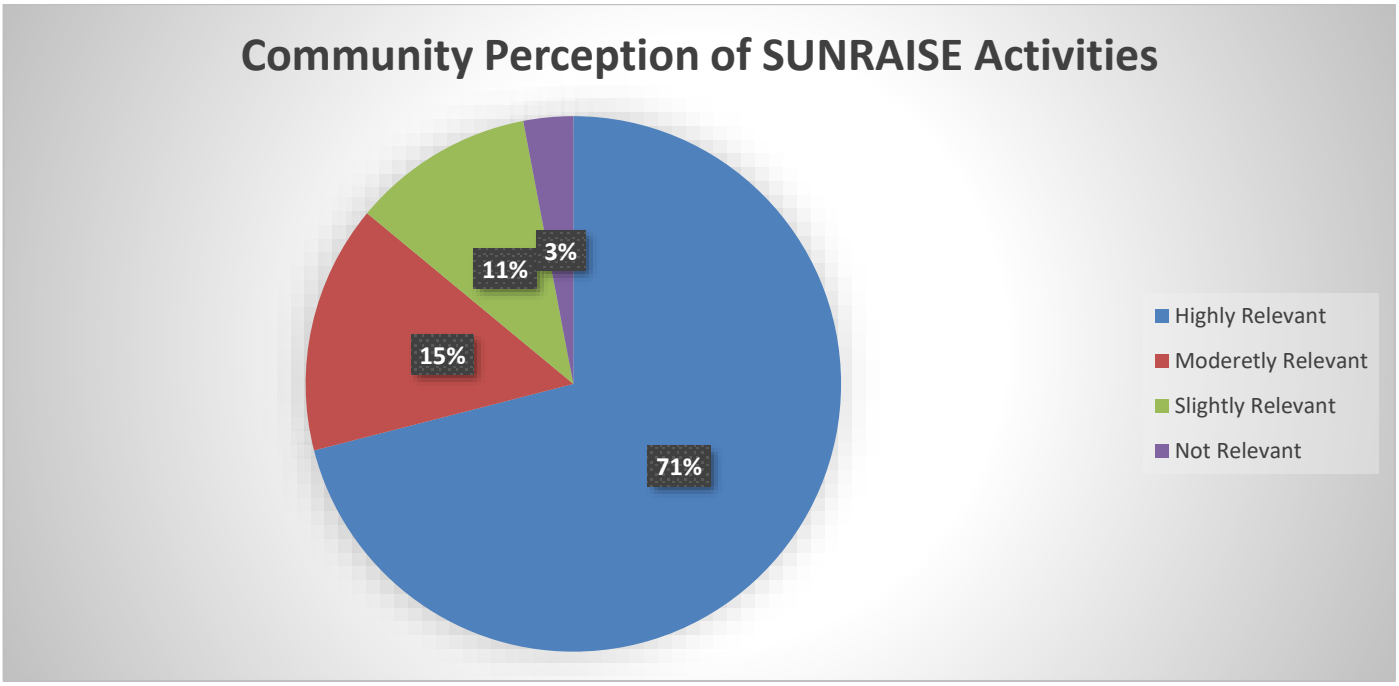
Community Perception of SUNRAISE New and Revised Courses Developed By Kumaun University

During the programme the community perception about the new and revised courses developed by the Kumaun University has been obtained and analyzed.



- As many as 59% rural people found the courses highly relevant in the context of sustainable resource development in Himalaya
- Nearly 19% people perceived the courses as modersately relevant
- Approximately 11% community members realized that the courses are slightly relevant in the present context
- However, 13% people did not find the courses relevant

Community Perception of SUNRAISE Activities



- Nearly 71% rural people found the SUNRAISE activities highly relevant in the context of sustainable resource development in high mountain, specifically in Himalaya
- Nearly 15% people perceived the project activities as modersately relevant in the context of the Himalayan mountains
- Approximately 11% community members obsrved that SUNRAISE activities are slightly relevant in the present context
- Only, 3% people did not find the project activities relevant at all

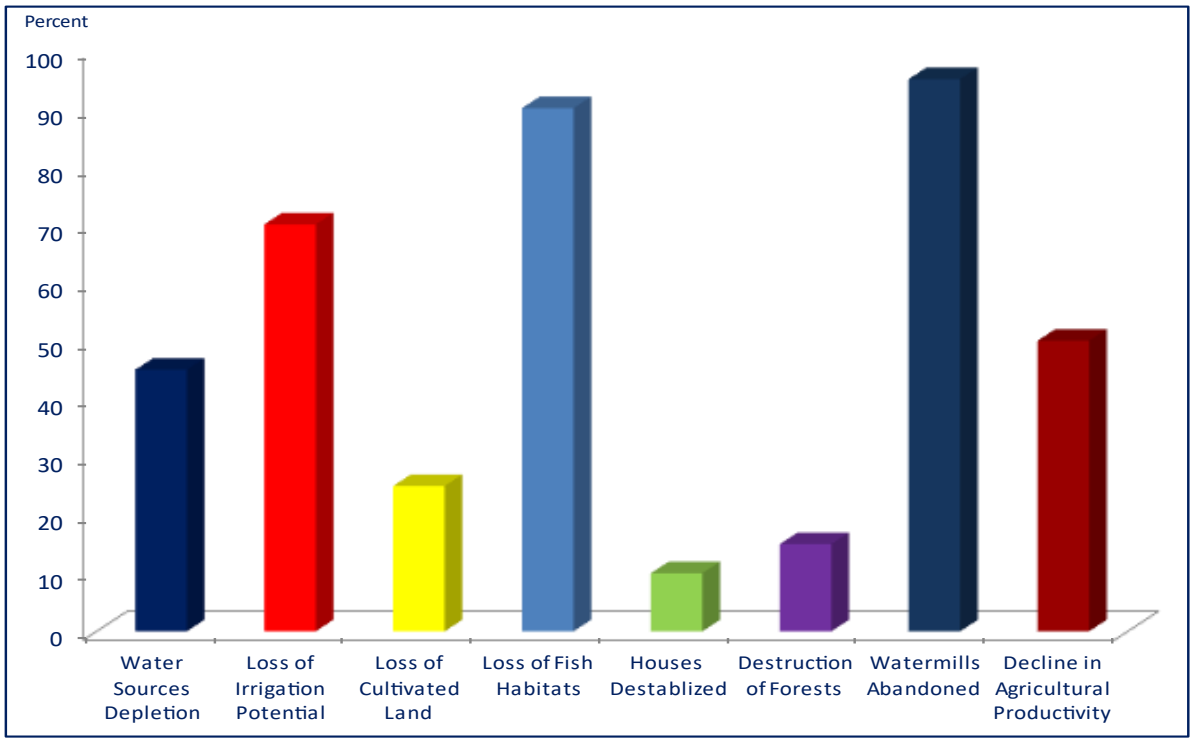
Community Perceptions and Responses:

The documentation, analyses and interpretation of the community perceptions and responses obtained during the programmes organized in all the 11 villages have been synthesized and integrated. The following observations have been made based on the interpretation of community perception and responses about the natural resources management and climate change impact and adaptation:

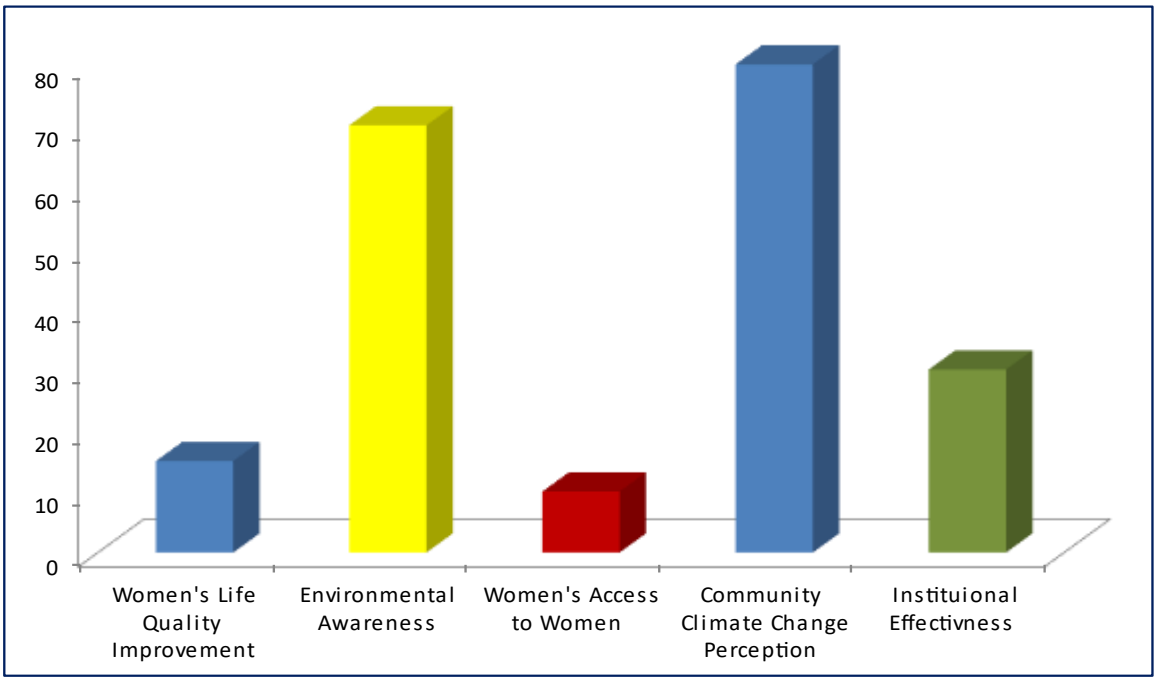
- 50% water sources depleted in all the 10 villages along with the massive degradation of forest and biodiversity mainly due irrational utilization of natural resources
- Availability of water for Drinking, Sanitation, and irrigation declined, fishing activities and water mills impacted by unsustainable natural resource development
- Fisheries and livestock productivity reduced, agro-biodiversity depleted, and irrigation potential declined
- Food productivity declined about 30% and production of other traditional crops decreased 25%
- Trends of rural out-migration increased during last 30 years
- Block Development Office, Irrigation Department Watershed Management Department, Forest Councils, Non-governmental Organizations and Women's Associations are effective institutions
- Work load on women has increased due to depletion of natural resources and livelihood constraints
- Water-borne diseases have increased due not availability of safe and adequate water for drinking and sanitation
- Environmental awareness in women increasing as they have more opportunity of participating in various environmental and developmental programmes
- Fuel-wood and fodder availability decreased in all villages affecting adversely livestock productivity in the region
- Rate of abandonment of cultivated land increased over past 3 decades
- Water Mills abandoned due reduced water flow in streams and rivers
- Agricultural productivity declined increasing vulnerability to food livelihood and insecurity
- Cropping strength, crop-diversity as well as productivity of Paddy has declined, potato is no more important cash crop and some varieties of pulses have completely extinct
- Temperature has been increasing, particularly in winter and spring months [November – April]
- The amount of rainfall as well as annual number of rainy days decreased by almost 25%
- The frequency of the incidences of weather extremes, particularly high intensity rainfall and droughts have increased over the past 30 years in the region

- In order to adapt to climate change rural communities are abandoning agricultural land, changing cropping pattern, conserving water resources employing their traditional knowledge, and out-migrating the villages

Impact on Ecosystem Services

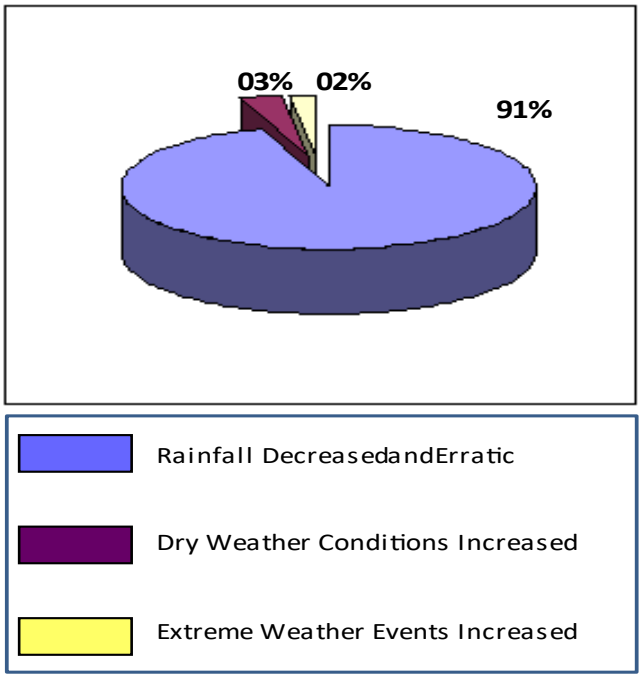


Socio-cultural Transformation



People's Perception of Climate Change and Constraints to Sustained Agricultural Production

Bottlenecks	Community Response (%)
Irratic and Reduced Rainfall	95
Reduced Water for Irrigation	16
Labour Scarcity	03
lack of Improved Seeds	03
Lack of Extension Services	01
Lack of Fertilizer	02



Capacity Building of Rural Women in Climate Change Adaptation:

In order to build the capacity of rural communities, particularly for improving women [who are the primary resource developers in the Himalayan mountains] direct access to climate information we have installed low cost automated and manual weather equipment in the Ramgad Watershed located in the Middle Himalayan Ranges of District, Nainital, Uttarakhand

- The automated weather station are located at two villages, and manual equipment have been installed in 7 villages of the Ramgad Watershed. The women have been trained in the collection and analysis of weather information
- The information is collected after every 24 hours, the climatic trends of month, agricultural season and of the year are presented and discussed in the village meeting every month.
- The students and faculty of the network member institutions of the project are most welcome to visit the weather equipment sites, interact with the community and observe the monitoring process

Location of Community Weather Station in Nathuakhan Village