

**Workshop on best practices of agricultural adaptation in Uttarakhand
15th and 16th February, Dehradun
Organized by Oxfam India and PAIRVI**

Introduction

The workshop aims to understand and document the best practices of adaptation in agriculture. The relevance of the workshop arises from the fact that climate change impacts are severely affecting agriculture in South Africa, South Asia and India. India remains highly vulnerable to climate change impacts due to its high dependence on rain fed agriculture, and high proportion of the population dependant on agriculture (UNEP, 2010). The impacts have been manifested in rising temperature, rising sea level, decreasing precipitation, increasing unpredictability due to changing weather and monsoon patterns, invasion of unknown weeds and pests etc. the FAR predicts huge loss in farm outputs due to climate change in business as usual scenario. The state of Uttarakhand is highly vulnerable to climate change impacts due to melting of glaciers, high runoff of water and top soil, increasing temperature, decrease in ground frost, loss of floral and faunal biodiversity. However, traditional agro-ecological agriculture has huge potential to increase resilience of agriculture and sustain food production despite the impact of climate change. The farmers have demonstrated capacity to adopt a number of adaptation practices which has not only sustained production and farm incomes but has significant environmental, social and economic value. Adaptation practices including crop based adaptation, agricultural practices based adaptation, scientific knowledge and weather forecasting, technology based adaptation, water management based adaptation etc. have brought sufficient resilience in agriculture. However, the knowledge of these innovative, scientific, and cost effective adaptation practices are not shared equally among all the farmers throughout the state and as a result many of them have witnessed crisis in agriculture due to climate change. The workshop aims at sharing and exchanging best practices of agricultural adaptation among the farmers so that these practices can benefit farmers in Uttarakhand and other farmers in other states in the same agro climatic conditions.

Uttarakhand and climate change

Uttarakhand is most vulnerable to climate-mediated risks. Mountainous regions are vulnerable to climate change and have shown “above average warming” in the 20th century. 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 changes in the Uttarakhand Himalayas 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 in snow in winter, rise in temperature, increasing intensity and frequency of flash floods, drying up of perennial streams, etc.

Vulnerability of agriculture to Climate Change¹

No detailed vulnerability and risk assessment of the agricultural sector in Uttarakhand to climate change currently exists. However, available evidence in qualitative terms suggests that:

¹ Uttarakhand State Action Plan on Climate Change, Sept, 2012

- The overall predictability of weather and climate would decrease, making the day-to-day and medium-term planning of farm operations more difficult;
- Increases in the frequency of droughts and floods are likely to affect production negatively, especially in subsistence sectors;
- Higher night temperature may increase dark respiration of plants, diminishing net biomass production;
- Productivity of most crops would decrease due to increase in temperature and decrease in water availability. Greater loss expected in Rabi as compared to Kharif;
- Loss of biodiversity from some of the most fragile environments, such as forests and agro-forestry systems;
- Spatial changes in tropical/sub-tropical crops diversity (maize, rice, etc.) and spatial changes in temperate crops diversity (apple, cabbage, cauliflower, carrot, potato);
- Increasing temperature would increase fertilizer requirement for the same production targets; and result in higher greenhouse gas (GHG) emissions & cost of crop production;
- Winterkill of pests is likely to be reduced at high latitudes, resulting in greater crop losses and higher need for pest control. The incidence of diseases and pests, especially alien ones, could increase;
- Present (agro) ecological zones could shift in some cases over hundreds of kilometres horizontally, and hundreds of meters altitudinally, which is crucial for the some plants, especially trees, and animal species, which cannot follow in time, and that farming systems cannot adjust themselves in time. For instance the cool upper stretch with the presently elevated maximum temperature of 25.5oC at Haridwar has become conducive to the warm water fishes. Warm water fishes like *Glossogobius giuris*, *Puntius ticto*, *Xenentodon cancila*, *Mystus vittatus*, *Catla catla*, mainly inhabiting middle and lower Ganga, are now available in upper Ganga at Haridwar and above;
- Higher temperatures would allow seasonally longer plant growth for the crop growing in cool and mountainous areas, which remain snowbound (or very low temperature not suitable for vegetation) for most of time, allowing in some cases increased cropping and production. In contrast, in already warm areas climate change can cause reduced productivity;
- High organic matter contents can be found at cool and moist sites where conditions for primary production are still sufficient but decomposition of their litter is limited due to low temperature and limited soil aeration;
- There will be damaging effects of increasing UV-B on crops. Reductions in yield up to 10 percent have been observed experimentally with very high UV-B values, and would be particularly effective in plants where the CO₂ fertilization effect is strongest. On the other hand, UV-B increase could increase the amount of plant's internal compounds that act against pests.

The Action Plan of Uttarakhand has a listed a number of impacts and vulnerabilities of agriculture and allied sector. However, strategies suggested fall short of addressing the vulnerability comprehensively.

Objectives of the workshop

The workshop will provide a platform to farmers to share best practices of agriculture adaptation so that other farmers in the hill and plains can also benefit from their experience and innovation

Specific objectives:

1. Document impact of climate change in hill and plain agriculture, specific crops and different agro climatic zones

2. Document and share best practices of agricultural adaptation (crop based, agri practices best, irrigation and water management, forest produce, scientific knowledge and weather forecasting, technology, others) and assess their environmental, social and economic value
3. Assess the existing policy (agri, water, energy, agri research, technology innovation etc) and their suitability to promote the adaptation practices, gaps and limitations etc.

Expected outcomes of the workshop

The expected outcome of the workshop is to create a state platform/network to engage in advocacy with the state to improve policy architecture to promote and support agricultural adaptation in the state. The workshop will also produce a document on best practices and experiences of agriculture adaptation in the state of Uttarakhand.

Workshop Content

The two day workshop will involve farmers, farmers groups, agri scientists, water management experts, academics, environmentalists having experience in adaptation practices and having manifested capacity in introducing innovative practices in agriculture. The discussion will include impact of climate change on agriculture, adaptation practices, and agriculture policy, gaps and imperative changes.

Climate change impacts: The climate change impacts have been mostly talked about in futuristic projections, and there is very limited data on the changes that are already taking place. Most of the impacts listed are on the basis of hearsay, and has not been validated with scientific data. Lack of data brings a number of limitations in agricultural and policy planning. Therefore, the workshop will document the impact of climate change in terms of temperature, rainfall, ground frosting, changing weather pattern, induced migration, glaciers, rivers and traditional water bodies etc. it will also document impacts on different agro-climatic regions, crops, agricultural productivity and farmers income etc.

Agricultural adaptation: The discussion will mainly focus on following practices, and environmental, social and economic benefits of successful experiments.

Crop based adaptation; switching over to climate hardy varieties, traditional seeds, crop/seed replacement, crop to horticulture, organic farming

Agriculture practices based adaptation: crop rotation, change in sowing harvesting, introducing mixed farming/ integrated farming, minimum tillage, residue management, weed and pest management, soil nutrient management

Irrigation based adaptation: soil moisture enrichment, innovation in irrigation, watershed management

Scientific knowledge and technology based practices: weather forecasting, technology integration, food processing practices, etc.

Agricultural policies and institutional support to adaptation: The agricultural policies have yet not been able to factor in climate change impacts. The National Action Plan on Climate Change (2008) and National Mission on Sustainable Agriculture (2010) talk about looking into mitigation and adaptation in agriculture, however, they continue with the same old approach of maximizing production rather than minimizing risks in agriculture in changing climate. The State Action Plan on Climate Change (Oct, 2012) aims at introducing resilience in agriculture, however, it falls severely short of proposing climate change focused strategies and providing adaptation support to the farmers. The existing agricultural policies are

highly technology driven, and promote untested seeds, technology, and biotechnology. The agricultural research has largely failed farmers and extension has hardly been able to bring benefits of research to the ground, if any. The state has immense potential in horticulture and medicinal plants, which remains to be explored through appropriate policy support. Policy support is severely wanting in extension of credit, infrastructure, risk and insurance.

Who can participate

The workshop will have farmers, farmers associations, agricultural scientists and economists, forest dependant communities, women, research institutes, water management and irrigation experts, representatives from department of agriculture, water, forest, and environment as participants. We encourage farmers and NGOs having demonstrated capacity in agriculture, food security, climate change, and adaptation to participate and share their experience.

Logistics; Dates, venue and agenda and registration for participation

The workshop will be organized on 15th and 16th February at Dehradun at Hotel Kamla Palace. The detailed agenda will be shared in the coming week.