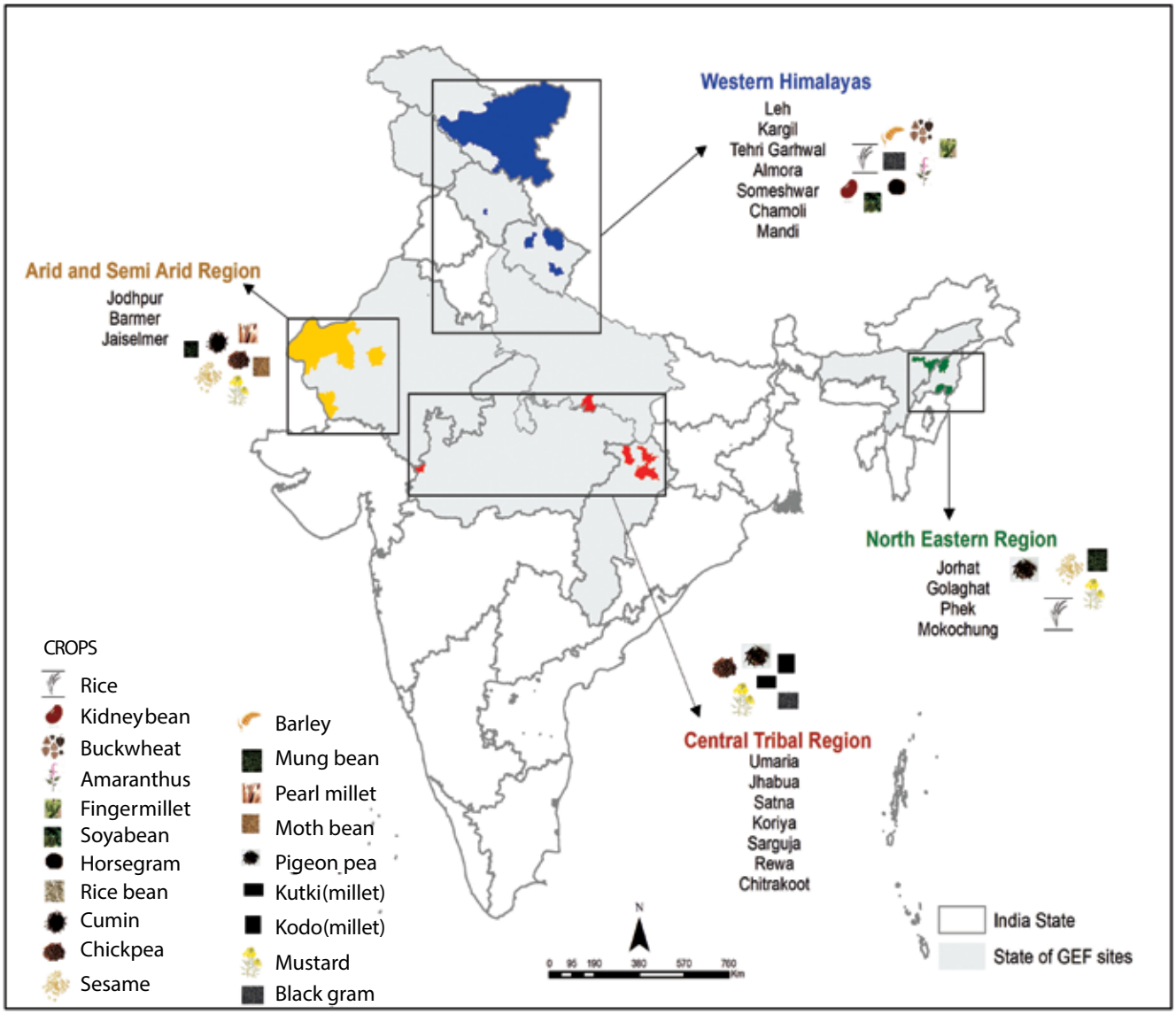
Mainstreaming agricultural biodiversity conservation and utilization in agricultural sector to ensure ecosystem services and reduce vulnerability



Project Sites and Crops

Cover photo credit: Bioversity International/ S. Dsouza

Map credit: Bioversity International/ A. Paliwal

Background and Context

India, a megadiverse country with only 2.4% of the world's land area, harbours 7-8% of all recorded species, including over 45,000 species of plants and 91,000 species of animals. Being one of the 17 identified megadiverse countries; India has 10 biogeographic zones and 4 global biodiversity hotspots represented by the Himalaya, the Western Ghats, the North-east, and the Nicobar Islands. India is recognized as forming part of one of the Vavilov Centres of Diversity of crop plants. About 166 species of crops including 25 major and minor crops have been domesticated and developed significant unique diversity in the country. About 741 species of wild relatives of crop plants are also known to occur in India. The rich crop diversity originating in India has been complemented by the introduction of several additional important crop species that have evolved unique features adapted to the wide diversity of agro-ecosystems found in the country.

India also possesses globally important agricultural biodiversity, which is central to the livelihoods of the small-scale farmers, rural communities and indigenous peoples that makes an essential contribution to the country's resilience and adaptability to varied situations. Traditionally, agricultural biodiversity has provided the natural resource base essential to rural livelihood strategies, providing not only for food, but also for fuel, fibres, building materials, medicines and income in respect of products that can enter trade and commerce. Further, climate change requires crops and varieties that are adapted to the changing environments and can cope with fluctuating or extreme weather conditions. Traditional crops and varieties play a significant role in climate change adaptation strategies by virtue of their diversity, niche specific adaptability, robustness and quality.

Threats

The continuing loss of genetic diversity in agriculture is a major threat to the sustainability and resilience of production systems in the face of change (particularly climate change), to the ecosystem function and to the farming communities and indigenous peoples' livelihoods. Analysis of threats, root causes and barriers to mainstreaming agricultural biodiversity were investigated and reviewed. Major drivers and factors responsible for the continuing decline in use of the rich diversity of traditional crops and varieties were identified as: changes in cropping pattern, agriculture intensification, population/ demographic changes, land fragmentation, changes in food habits, irrigation, changes in rainfall patterns, temperature and other weather parameters, policy issues, lack of research and development efforts on conservation and use of traditional crops and varieties, and promotion of new High Yielding Varieties (HYV) in low inputs oriented production environments of small and marginal farmers.

This project addresses the multifaceted challenges of conserving and using diversity of crops in four agro-ecoregions chosen by virtue of the value of diversity found in these regions and the contribution that it can make to peoples' livelihoods. The project approaches embed the inclusion of crop and genetic diversity into the livelihood and development strategies through their use in adaptation and income generation in the selected regions.

PROJECT INFORMATION

The UN Environment implemented GEF project '*Mainstreaming agricultural biodiversity conservation and utilization in agricultural sector to ensure ecosystem services and reduce vulnerability*' jointly executed by Indian Council of Agricultural Research and Bioversity International aims to mainstream the conservation and use of agricultural biodiversity for resilience in agriculture and sustainable production to improve livelihoods and access and benefit sharing capacity of farming communities across four agro-ecoregions of India.

Budget

- GEF contribution : USD 3,046,347
- Co-financing : USD 10,294,750
- Co financing partners: United Nations Environment Programme, Bioversity International, Indian Council of Agricultural Research, Protection of Plant Varieties and Farmers' Right Authority, State Agriculture Universities, Action for Social Advancement, Gramin Vikas Vigyan Samiti, Lok Chetna Manch, Mount Valley Development Association and Himalayan Research Group.

Executing partners: Bioversity International and Indian Council of Agricultural Research

Approach:

Several tested community-based participatory approaches are being used which support the maintenance of existing crop diversity and the introduction and deployment of appropriate new genetic diversity of at least 20 crops. The approaches include evolutionary plant breeding and participatory evaluation and identification of suitable crop diversity through crowdsourcing, awareness campaigns, seed fairs, diversity fora, strengthening local seed supply systems, establishment of community genebanks, and other adaptive technologies that enable farmers to adopt and benefit from diversity rich solutions. It also includes livelihood improvement actions through value addition, nutrition profiling, product development from local crops and high-quality landraces and their commercialisation through entrepreneurship development and effective market links. The project places special emphasis on capacity building and empowerment of women and youth through conservation and use of agricultural biodiversity. The project envisages to develop national and regional level strategies and plans on integrated sustainable agricultural improvement and use of agricultural biodiversity that will improve ecosystem services and provide an enabling environment for diversity deployment in order to support adaptation of agricultural ecosystems.

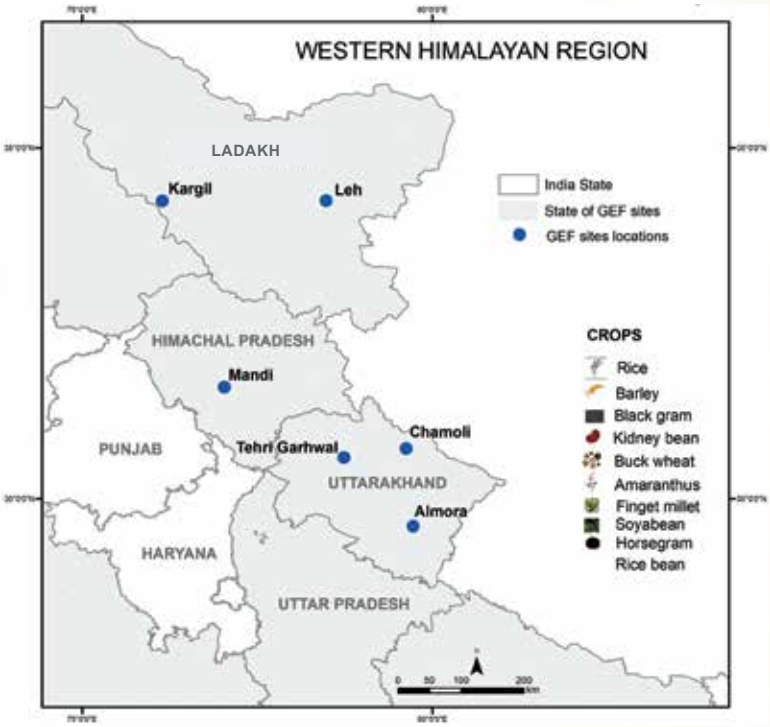
Target agro-ecological regions:

- Western Himalayan region (Uttarakhand, Himachal Pradesh, Ladakh)
- North-eastern region of Eastern Himalaya (Assam, Nagaland)
- Central tribal region (Madhya Pradesh, Chhattisgarh, Bundelkhand region of Uttar Pradesh)
- The Western arid/semi-arid region (Rajasthan)

Credit: Bioversity International/J. Rana

WESTERN HIMALAYAN REGION

This region can be divided into sub-agro-climatic zones comprising the cold arid, high hill temperate, sub-temperate Shivalik to tarai region. The mean annual rainfall is 1,000–2,000 mm for northern plain, hot sub-humid region, and 1,600–2,000 mm for Western Himalayan warm sub-humid region. The Himalayan region is rich in water resources, but more than two-thirds of its gross cropped area is rainfed. Hilly and mountainous terrain makes harnessing of river waters difficult. Land holdings are very small, and the topography is undulating. Mechanization is rare and is compounded by the topography and the small terrace cultivation. Rich genetic diversity occurs in maize, rice, wheat, barley, small millets, pseudocereals, pulses particularly beans, lentil, horse gram, field peas, vegetables and several other crops including vast variety of temperate fruits and medicinal plants, possessing traits of high value and tolerance to cold and drought conditions.



The region is also credited with many endemic crops such as saffron, seabuckthorn, black cumin, pine nut, hazel nut, dry apricot, wild *Alliums*, and black soybean (Kala bhatt).

Partners:

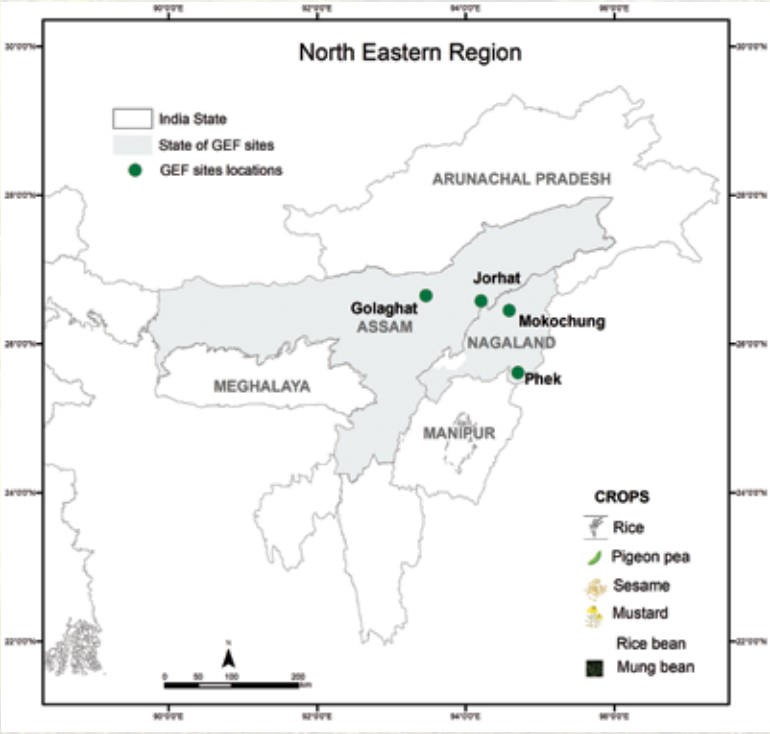
- ICAR-National Bureau of Plant Genetic Resources, Regional Station, Bhowali (Uttarakhand)
- ICAR-National Bureau of Plant Genetic Resources, Regional Station, Shimla (Himachal Pradesh)
- ICAR-Vivekanand Parvatiya Krishi Anusandhan Sansthan, Almora (Uttarakhand)
- ICAR-Central Arid Zone Research Institute, Regional Station, Leh (Ladakh)
- Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur (Himachal Pradesh)
- Lok Chetna Manch, Nainital (Uttarakhand)
- Himalayan Research Group, Simla (Uttarakhand)
- Mount Valley Development Association, Tehri Garhwal (Uttarakhand)

Credit: ICAR-CAZRI/M. Raza

Credit: Bioversity International/J. Rana

NORTH EASTERN REGION OF EASTERN HIMALAYA

The North-eastern region of the Eastern Himalayas covers Karbi Anglong and Cachar Hills in Assam and the entire territories of Arunachal Pradesh, Nagaland, Meghalaya, Manipur, Mizoram, Sikkim and Tripura. The region has a per-humid to humid climate and receives copious rains of about 2450 mm in a year. The soil is classified red sandy to laterite. The region is characterized by difficult terrain, wide variation in slopes and altitudes, land tenure systems, and cultivation practices. Majority of population is dependent on agriculture and allied land-based activities. Shifting cultivation (slash-and-burn agriculture) is still the means of livelihood of few tribal people. There exists a rich genetic diversity in cereals - rice, maize (including the primitive pop-corn), barley, wheat; pseudocereals - buckwheat, chenopods, amaranth and soft-shelled forms in Coix; millets - finger millet, foxtail millet; legumes - rice bean, winged bean, black gram, sem/Dolichos, soybean, sword bean, peas; oilseeds - *Brassica* spp., *Perilla*, sesame; vegetables - cucurbits (*Cyclanthera*, *Cucurbita*, *Momordica*, *Cucumis*, *Luffa*, *Lagenaria*, *Benincasa*); fibres - *Corchorus* spp., tree cotton, kenaf and mesta; taro/yam and several other tuberous/rhizomatous/bulbous types, and in Citrus, Musa, bamboos and a variety of leafy vegetables and medicinal & aromatic plants.



Partners:

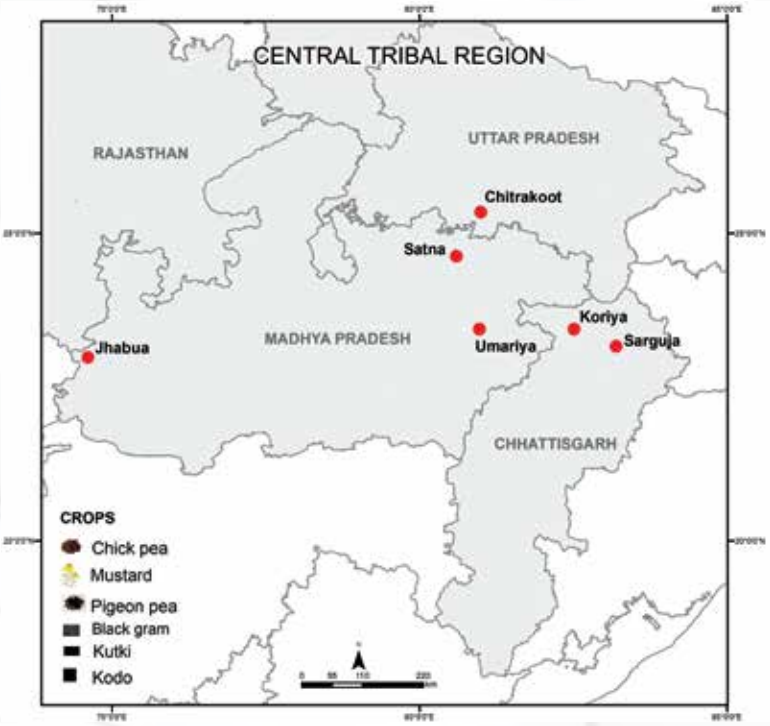
- ICAR-National Bureau of Plant Genetic Resources, Regional Station, Shillong (Meghalaya)
- ICAR-Research Complex for NEH Region, Barapani (Meghalaya)
- Assam Agriculture University, Jorhat (Assam)
- Foundation for Development Integration, Guwahati (Assam)

Credit: ICAR-NBPGR/S. Ahlawat

Credit: ICAR-NBPGR/S. Ahlawat

CENTRAL TRIBAL REGION

The central plateau is characterized by typical rainfed area, with the maximum issues and problems pertaining to subsistence agriculture, very poor irrigation infrastructure, dismal extension services and awareness among the tribal communities. Though the region is rich in natural resources, yet the geography, fragile environment and low awareness levels of the tribal community have led to food insecurity, malnutrition, migration, etc. The climate of the region is characterized by hot and wet summer and dry winter. The annual precipitation in the region ranges from 500 to 1000 mm. This Bundelkhand region is usually subject to drought once in 3-4 years. The frequent inter drought spells often lead to crop failure and the region is thus earmarked as drought-prone area. The dominant soils of the region are deep, loamy to clayey and nearly level to very gently sloping red and deep black soils. Dryland farming is the common practice in the region. The *Kharif* (rainy) crops usually cultivated in the area are-rice, sorghum, pearl millet, pigeon pea, groundnut, soybean, maize and pulses. The common *Rabi* (post rainy) crops are sorghum, safflower, sunflower and gram. Overall the region possesses rich diversity in rice, wheat, maize, sorghum, minor millets, grain legumes - particularly cowpea, chickpea, pigeon pea, black gram and green gram; oilseeds - niger, sesame, Brassica spp., cucurbits and other vegetables.



Partners:

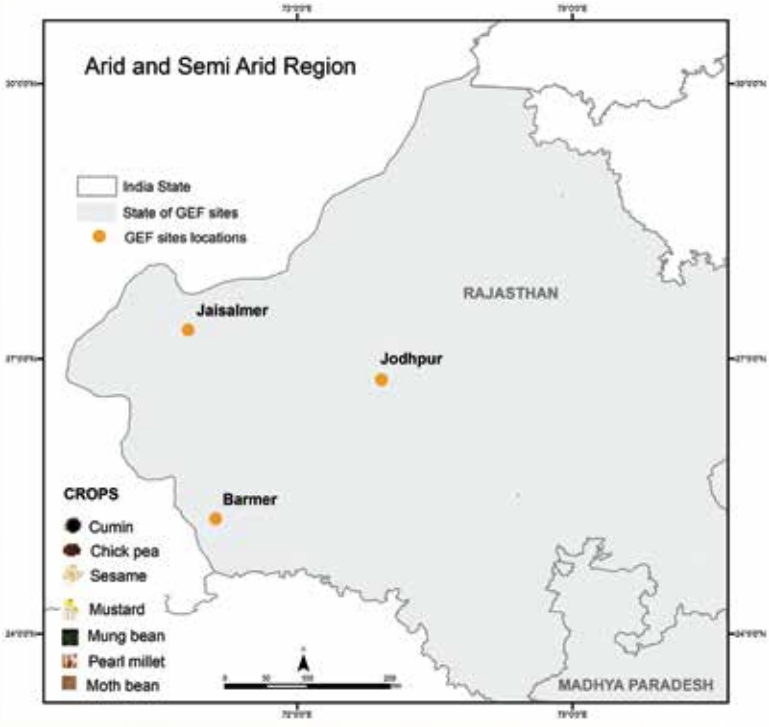
- ICAR-NBPGR Regional Station, Ranchi (Jharkhand)
- Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (Madhya Pradesh)
- Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh)
- Deendayal Research Institute, Chitrakoot (Madhya Pradesh and Uttar Pradesh)
- Action for Social Advancement, Bhopal (Madhya Pradesh)

Credit: ICAR-NBPGR/S. Ahlawat

Credit: IGKV/D. Sharma

THE WESTERN ARID/SEMI-ARID REGION

The hot arid and semi-arid regions are characterized by typical hot summers. The mean annual precipitation is less than 400 mm. This results in large deficit of water throughout the year and the growing period is less than 90 days annually. Groundwater is getting depleted as well as polluted. In general, every third year is a drought year in most of the districts of Rajasthan. Soils are generally sandy and are moderately calcareous and alkaline in reaction. The area is under rainfed mono-cropping (traditional) agriculture. The resistant and short duration rainy season crops, such as pearl millet, 'chari' (fodder), and pulses are grown in non-saline areas. The region is well known for its traditional biodiversity comprising both plants and animals, which are of global significance. The region is rich diversity of pearl millet, sorghum, moth bean, cluster bean, cowpea, black gram, green gram, Brassicaceae, sesame, cucurbits, forage legumes and grasses. The yields are low under average management practices. The natural vegetation comprises sparse, sporadic tropical thorn forest. Desert trees and shrubs like *Khejadi*, *rohida*, *phog*, *ker*, *ber*, etc. are endemic. Production of rapeseed and mustard, coriander, cumin, fenugreek, cluster bean and moth bean are the highest in the country. Nevertheless, there is a need to improve sustainability of production systems and livelihoods through conservation and use of indigenous crops diversity.



Partners:

- ICAR-Central Arid Zone Research Institute, Jodhpur (Rajasthan)
- ICAR-National Bureau of Plant Genetic Resources, Regional Station, Jodhpur (Rajasthan)
- ICAR-All India Coordinated Research Project on Pearl Millets, Jodhpur (Rajasthan)
- Agriculture University, Jodhpur (Rajasthan)
- Gramin Vikas Vigyan Samiti, Jodhpur (Rajasthan)

Credit: GRAVIS/R. Kumar

Credit: GRAVIS/R. Kumar

Key Components and Interventions of the Project

Credit: Bioversity International/ S. Dsouza


Credit: Bioversity International/J. Rana


Credit: Bioversity International/J. Rana

COMPONENT 1. Adaptive Management of Crop Diversity for Resilient Agriculture and Improved Livelihoods

Outcome

Farmers (at least 25,000) across four agro-ecoregions covering 120,000 ha in India maintain and use an increased availability to diversity of 20 crops which enhances adaptation, resilience and improves income generation opportunities

Output 1.1

Extent and distribution of genetic diversity of 20 crops in 4 agro-ecoregions determined, together with documentation of factors that shape farmer decisions on diversity maintenance, including challenges presented by climate change

Output 1.2

New and traditional crop genetic diversity meeting farmers' needs and able to enhance ecosystem function, resilience and adaptation to climate change identified and made available

Output 1.3

Farmer identification, improvement and use of adaptive crop diversity through field experimental networks

Output 1.4

Improved farmers' access to genetic materials in all project sites through establishment of community biodiversity registers (CBRs), community seed banks (CSBs), and diversity fairs

Output 1.5

Production and non-market benefits/incentives from management and sustainable use of crop genetic diversity of 20 crops in four agro-ecoregions by farming communities identified and relevant intervention strategies for capturing and enhancing such benefits developed

Output 1.6

Local, regional and national markets identified and market chains developed for 20 crops to provide improved benefits to farmers and communities in all project sites for sustainably produced agrobiodiversity products

COMPONENT 2. Strategies and Policies for Sustainable Conservation and Use of Crop Diversity including Access and Benefit Sharing

Outcome

Mechanisms for improved coordination and implementation to promote better mainstreaming of conservation, use and sharing of crop diversity developed and supported by relevant policy instruments, regulations, strategies and plans including access and benefit sharing

Output 2.1

National and regional policy platforms, including involvement of ministries, local communities, indigenous organizations, farmers, private sector, to promote leadership and mainstreaming of agricultural biodiversity conservation and use including ABS established and implemented

Output 2.2

Analyses of public policies, relevant instruments and regulations undertaken and gaps identified and incentives for improved sustainable use and conservation of agricultural biodiversity including provisions and opportunities for improved access and benefit sharing recommended

Output 2.3

Model agreements that regulate access and benefit sharing with farmers communities and which recognise the core principles of Access and Benefit Sharing (ABS) established

Output 2.4

National and regional strategies and plans on integrated sustainable agricultural improvement, use and benefit sharing of agricultural biodiversity developed and supported by implementation programmes of work

Credit: GRAVIS/R. Kumar


Credit: Bioversity International/J. Rana

Credit: Bioversity International/J. Rana

Credit: Bioversity International/ S. Dsouza

COMPONENT 3. Improved agricultural support systems, institutional frameworks and partnerships that support crop diversity on farm

Outcome

Improved Agricultural Support Systems (Research, Outreach and Extension), Institutional Frameworks and Partnerships at national, regional and local levels to ensure improved agricultural biodiversity conservation, adaptability, resilience and farmer livelihoods

Output 3.1

One national and eight regional level capacity building training workshops on the value of agricultural biodiversity; its maintenance and use for resilient agriculture organised for different stakeholder groups including government ministries and agencies, policy makers, non-governmental organizations, farmers, extension workers, teachers, researchers and consumers

Output 3.2

Enhanced capacities of government ministries and agencies, policy makers, non-governmental organizations, farmers, extension workers, teachers, researchers and consumers in selecting and deploying adapted crop diversity through participatory approaches

Output 3.3

Improved national programmes which support mainstreaming of agricultural biodiversity and its improved use to support ecosystem function, resilience and adaptability activities are in place

Credit: Bioversity International/J. Rana

Back cover credit: ICAR-NBPGR/S. Ahlawat

Scaling up

The project will enhance the adaptive capacity of nearly 25000 small and marginal farmers across four agro-ecoregions covering 120,000 ha in India through enhanced conservation and use of genetic diversity of crops that are important for important for food security, nutrition and climate resilience. The project will identify adaptive diversity that will not only be maintained on farm but serve as source of livelihoods through value-added products and targeted markets. Its sustainability will be ensured through improved local seed systems and the establishment of community seed banks including processing. It will measure policies and guidelines for the sustainable use and conservation of crop diversity and will developed a suitable mechanism for sharing benefit from the access and benefit sharing provisions under Biological Diversity Act and Protection of Plant Varieties and Farmers' Rights Act, in India. It will also provide improved agricultural support systems (research, outreach and extension) that support the mainstreaming of agrobiodiversity for adaptability, resilience and farmer livelihoods.

For further information, contact:

Dr J C Rana, National Project Coordinator
Ms Sonal Dsouza, Senior Project Officer

UN Environment-GEF Project

Bioversity International-India Office

G-1, B-Block, NASC Complex, DPS Marg, Pusa Campus, New Delhi 110012
Tel.: (+91-11-25849000/01/04)