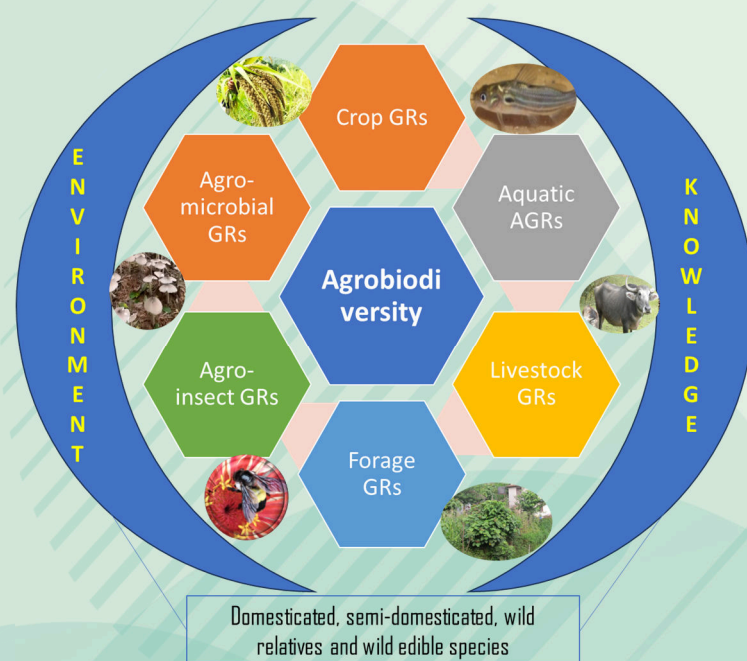


Agrobiodiversity components

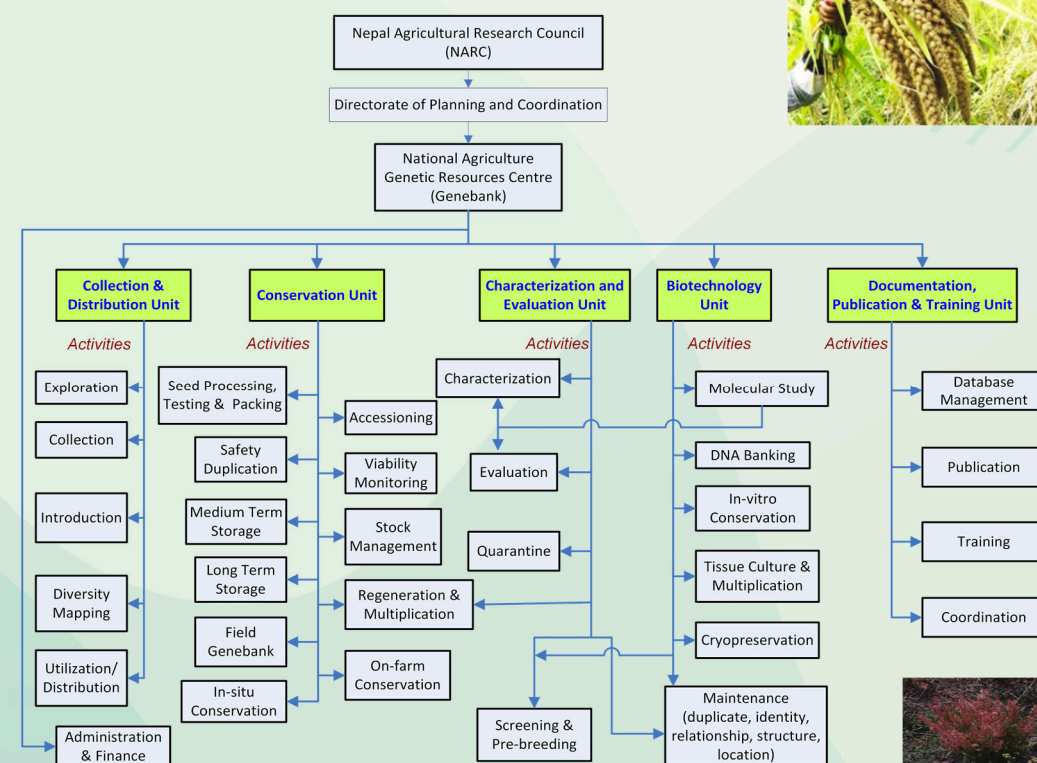


Important day, week and year

- २०७९ साल राष्ट्रिय कृषि जैविक विविधता वर्ष (National Agrobiodiversity Year 2022/23)
- माघको पहिले साता राष्ट्रिय कृषि जैविक विविधता सप्ताह र माघ १ गते राष्ट्रिय कृषि जैविक विविधता दिवस (२०७९ साल वाट शुरु) (Jan 3rd week: National Agrobiodiversity Week and Day)
- हरेक वर्ष आश्विन २१ गते राष्ट्रिय जिन बैंक तथा रैथाने कृषि दिवस (२०७५ साल देखी शुरु) २०७५ साल देखि नै उक्त दिन कृषि जैविक विविधता दिवसको रुपमा पनि मनाउँदै आएकोमा, २०७९ साल वाट कृषि जैविक विविधता दिवस माघ १ गते) (Oct 1st week: National Genebank and Indigenous Agriculture Day)
- बालाचतुर्दशी (मार्गशीर्षकृष्ण चतुर्दशी तथा शतबीज छर्ने) दिनलाई राष्ट्रिय कृषि अनुवांशिक स्रोत संरक्षण दिवस (प्रकृतिलाइ कृषि अनुवंशिक स्रोत दिवस) (२०७९ साल वाट शुरु) र यसै दिन मन्दिर/ पवित्रस्थलहरुमा कृषि वंशाणु आरक्ष स्थलको स्थापना (२०७५ साल वाट शुरु) (Dec: National agriculture genetic resource day (AGRs to nature day) and establishment of agro-gene sanctuary)
- बैसाख ७: राष्ट्रिय याक दिवस (April 3rd week: National Yak Day)
- बैशाख अक्षय तृतीया: केरा सार्ने दिन, April 4th week: Banana transplantation day
- पुस १५ : राष्ट्रिय च्याउ दिवस Dec 4th week: National Mushroom Day



Organization and major activities

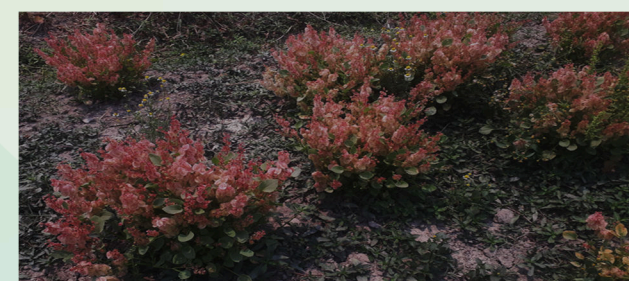


Future plan

- Establishment of Screen house, Glasshouse with Intensive care unit and Quarantine system
- Establishment of Field Genebank, crop specific parks, aqua pond genebank, livestock farm genebank, agro-insect field genebank, microbial field genebank, mushroom park, agro gene sanctuary, school field genebank, etc across the country
- Generation of ownership documents eg archeological evidence, phenotypic data, genotypic data, distinct form developed site and its maintenance and use by locals, etc
- Creation of searchable online database and safety duplication
- Repatriation of native germplasm
- Cryo Bank, Agro-microorganism bank and Agro-insect bank
- Locating DNA markers and genes/ QTLs, and Geographical indication
- Conservation of WR and WE species in Protected areas, Heritage, Ramsar and Religious sites

Genebank request

- Develop, generate and promote native/ maalik technologies, AGRs and marketing of native products and technologies at national and international levels, minimizing the replacement of native technologies by exotic one
- Develop and promote site specific stable crops/ varieties (food, vegetable, grain legumes, fruits), livestock and fish and food items
- Implement red zoning, red listing and agrobiodiversity impact assessment systems
- Establish a system of collection of native landraces before implementing cultivation or extension of modern varieties and breeds



- Establish field genebank, aqua pond genebank, insect and microbial field genebank, forage field genebank, livestock farm genebank, school field genebank, agro gene sanctuary in farms, school, college, religious sites, wetland, road sides, etc
- Organize agro-plantation in city areas, along the road sides and public areas
- Recognize agrobiodiversity rich farmers
- Consider each farmer's house as household genebank and shop
- Prepare profile of all locally available agricultural genetic resources
- Use native genetic resources and technologies in research and education and establish accessioning system in agricultural research
- Organize food fair, and diversity fair
- Ensure market of each item and irrigation facilities
- Establish nursery of native AGRs, for distribution as gift, agroplantation on different occasions
- Use and promote geographical indication and marketing of native products globally
- Make research and production areas Agro-insects, birds and Agro-microbial friendly

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National Agriculture Genetic Resources Centre Genebank



Mission

Conservation and utilization of agricultural genetic resources for food, nutrition, health, business and environment security



Nepal Genebank
<https://www.facebook.com/nepal.genebank>



nepalgenebank
<https://www.tiktok.com/@nepalgenebank?lang=en>



@NepalGenebank
<https://www.twitter.com/nepalgenebank>



Nepal Genebank
<https://www.youtube.com/@nepalgenebank5478>

Passport app from Genebank website, Passport data at <https://www.genesys-pgr.org/>



Nepal Agricultural Research Council
National Agriculture Genetic Resources Centre

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Nepal experiences a wide range of climatic and altitudinal variation, with 6 seasons {Basanta Ritu (Spring), Grishma Ritu (Summer), Barsha Ritu (Rainy/ Monsoon), Sharad Ritu (Autumn), Hemanta Ritu (Pre-winter), and Shishir Ritu (Winter)} and 3 agro-ecozones and 15 agro-ecosystems (Joshi et al 2024). Crop cultivation ranges from 60 m (Kechana Kalan, Jhapa) to 4700 m (Khumbu, Solukhumbu), and livestock and forage species up to 5000 m altitude (Joshi et al 2020). This resulted in the development of very diverse agricultural genetic resources (AGRs) across the country.

Nepal is tenth in position in term of flowering plant diversity in Asia and the 31st on a world scale. Among 24300 total species in the country, 28% are AGRs, termed as agrobiodiversity. Agrobiodiversity has six components (crops, forages, livestock, fish, aquatic, insects and microorganisms) and four sub components (domesticated, semi domesticated, wild relatives and wild edible). Agrobiodiversity on each component exists at agroecosystem, species, variety/breed/strain, genotype and allele levels. Estimated numbers of species are 1026 under crops, 510 under forages, 35 under livestock, 236 fish species (162 warm water and 62 cold water fish species), 250 under aquatic animals, 17 under aquatic plants, 3500 under insects and 800 under microorganisms (Joshi et al 2020). Nepal is the primary center of origin of 29 species of 11 genera of agronomic crops and 12 species of 6 general of horticultural crops. Thirteen species of 10 genera of different wild related plant species under primary gene pool are reported in the country. The estimated numbers of crop landraces are 30,000.

According to FAO, more than 75% of global crop diversity has disappeared irrevocably over the 20th century (1900 to 2000). About 40% of AGRs have been lost from Nepal. The most important reasons for the loss of genetic diversity, is the replacement of genetically diverse farmers’ varieties with modern varieties and adopting monoculture. A large number of wild relatives of important food crops are also likely to disappear over the next decades (20-25% have been lost over a decade) due to climate change and modernization.

Diverse genetic resources are the foundation for the development of agriculture and healthy environment. Their availability is a fundamental requirement for food, nutrition, health, business and environment security. About half of the average global production increase in cereals that were achieved under the Green Revolution was attributable to plant breeding, using diverse genetic resources from around the world. The role of genetic diversity and breeding are becoming more important for achieving food, nutrition, health and environment security. For this, it is crucial to conserve the existing agricultural diversity and to allow researchers, breeders and farmers access to it.



Realizing the significance of AGRs in national development and to meet the national obligation of implementing international agreements (CBD 1992 and ITPGRFA 2004), the Government of Nepal and Nepal Agricultural Research Council (NARC) have established the National Agriculture Genetic Resources Center (Genebank) in 2010 in Khumaltar for conservation and utilization of agrobiodiversity. NAGRC has promoted conservation and utilization of AGRS through 101 good practices Broadly the existing conservation methods and options are *i. Ex-situ, in-situ and on-farm conservation banks, ii. Conservation breeding, iii. Ritual practices (secrete crop species, Rudrakshya, Tulsi, Jau, etc), iv. Culturally protected areas (temple and other religious places), v. Protected areas (National parks, Conservation areas, Wildlife reserves, Hunting reserve) vi. World heritage sites, vii. Ramsar sites, viii. Leasehold, and community forests, ix. Farmers seed system, x. Legal protection of some plant species (Joshi et al 2020).* Within a country, more than 20,000 accessions of AGRs have been conserved in different kinds of banks. A total of 24683 accessions of Nepalese crops, forages and microbes have been conserved in different international and foreign genebanks. Genetic resources that are conserved are for safe conservation for future use, breeding materials for the sustainable development, direct use for agricultural production, conservation of diversity in ecosystems, scientific use for experimental materials and genetic enhancement (pre-breeding). Some working guidelines of National Genebank are:

- Agrobiodiversity formula: Genetic diversity at inter/ intra population (varieties, breeds, genotypes) ∝ Resilient (climate changes, stresses) population (adaptability) or system
- Agrobiodiversity is the basis of human life, and basis for advancing agricultural sciences
- Think agrobiodiversity first in any agricultural problems
- Go for local, work on local, respect local and globalize local
- Focus on making native AGRs/ technologies competent globally

A total of 2.5 ha is allocated for this Center in Block I. Genebank building has occupied 0.092 ha, 0.26 ha is allocated for Field Genebank and 0.93 ha for regeneration, multiplication, characterization, evaluation, post quarantine activities, display blocks and 0.006 ha for aqua pond genebank. Block II has 0.11 ha of which 0.097 ha is allocated for agro gene sanctuary and 0.006 ha for aqua pond genebank.



History

1937	Start of plant exploration missions undertaken by international organizations
1940	First collection and evaluation of indigenous plants materials by the then His Majesty's Government
1972	Vegetable Development Division
1984	Plant Genetic Resource Section in Agriculture Botany Division, NARC
1986	Medium-term ex-situ conservation
1993	Member of Convention on Biological Diversity
1994	First Community Seed Bank in Dalchowki; Landrace enhancement; National workshop on PGR conservation
2007	Agrobiodiversity policy
2009	Member of ITPGRFA
2010	National Genebank (NAGRC)
2012	Field Genebank, Community Field Genebank, Household Genebank
2013	Initiation of Tissue Bank, DNA Bank, Cryo Bank
2014	Base Collection Room (BCR-I and BCR-II) (long-term seed conservation), Registration of native landrace
2015	Potato Park, Sugarcane Park, Ginger and Turmeric Park; Start of evolutionary plant breeding
2016	Short-term storage for non orthodox plants, Aqua Pond Genebank, Livestock Farm Genebank, Rejuvenation of mango orchard
2018	Agro Gene Sanctuary, Started celebrating Genebank and Agrobiodiversit Day, Insect field genebank, microorganism field genebank
2021	Raithane nursery, Herbal tea conservation garden, online database, image bank
2022	Community genebank, household insect-field genebank, national agrobiodiversity year 2079, Agro-plantation

Objectives

- To explore, collect and conserve AGRs (CALFIM: crops, aquatic agri-genetic resources, livestock, forages, agro-insects and agro-microbes; DSWW: domesticated, semi domesticated, wild edible and wild relatives) for promoting sustainable use.
- To manage and handle the AGRs scientifically in the country according to the rules and regulations of genetic resources movement.
- To identify the endangered, rare and unique genetic resources and give emphasis to conserve and use them
- To create a single-entry point to get access to AGRs and data.
- To locate the center of diversity in the country.
- To characterize and evaluate genetic resources and avail the resources to researchers, academicians, farmers, entrepreneurs and related stakeholders.
- To screen genetic resources and identify markers associated with particular traits and develop elite lines through pre-breeding.
- To manage database associated with each accession including passport, characterization, evaluation and traditional knowledge.
- To develop and promote good practices of agrobiodiversity conservation and utilization

Conservation strategies and methods

Ex-situ conservation

- A. Seed Bank (Active and Base Collection) for orthodox seeds.
- B. Field Genebank and Tissue Bank for recalcitrant seeds and vegetatively propagated crop species.
- C. DNA Bank and Cryo Bank

On-farm Conservation: Community Genebank, Community Seed Bank, Household Genebank (Seed Bank plus Field Genebank), Community Field Genebank, School Field Genebank, Village Level Field Genebank, Farmers Seed Network System, Conservation through use, Landrace Enhancement and registration, Aqua pond genebank, Livestock farm genebank

In-situ Conservation: For wild edible and wild relatives of AGRs in collaboration with relevant stakeholders and in farming areas

Conservation Breeding: Evolutionary rather than non-evolutionary, diversity not uniformity and specific not wide adaptation.

Facilities

Long Term Storage: Freezer store room (Base Collection Room) with -20°C for storing about 1,00,000 accessions for 100 years.

Medium Term Storage: Cold store room (Active Collection Room) with 4-10°C and 35-45% RH for storing about 50,000 accessions for 15 years.

Short Term Storage: Ambient condition for seasonal storage

Field Genebank: For non-orthodox species.

Root and tuber park: Part of field genebank

Mushroom park: For native mushrooms

Agro insect field genebank: Creating favorable environment for agro-insects

In-vitro Culture Lab and Tissue Bank: For tissue culture and in-vitro cold storage.

Molecular Research Lab and DNA Bank: For DNA works and conservation eg genotyping, genetic diversity assessing, identification (DNA fingerprinting, MAS), genes mapping and tagging, storing DNA.

Seed Processing and Testing Lab: For seed cleaning, health testing, viability testing, drying and characterizing.

Experimental Plot: For display blocks, regeneration, multiplication, characterization, evaluation and pre-breeding.

Database Management: For passport, management, characterization, evaluation, pre-breeding, genotyping and utilization data.

