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# *In situ* & on-farm conservation of plant genetic resources for food and agriculture

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# My talk:

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- Course outline
  - Training objectives
  - Main parts and topics of the training
- Definition of key categories:
  - Biodiversity
  - Agro-biodiversity
  - Plant genetic resources
    - Landraces
    - Crop wild relatives
    - Local knowledge

# Course outline

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## Training objectives

- To up-grade knowledge of the participants with the concepts related to *in situ* conservation of pgrfa;
- To provide guidance for conducting collecting missions of crop wild relatives and land races;
- To exchange and generate information with respect to present state and trends of *in situ* conservation of pgrfa;
- To promote integration of *in situ* on-farm conservation into national pgr programme.

# Course outline

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## **Main parts and topics of the training:**

- Module 1. Definition of key categories
- Module 2. Guidelines for collecting seeds and herbarium vouchers
- Module 3. Case study – “Survey and collection of diversity conserved on-farm in Maramures area”
- Module 4. Practical applications

# Module 1. Definition of key categories - biodiversity

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## *Definitions*

- **Biodiversity** (biological diversity) is the variety of life on Earth and its processes.

(Keystone Center, 1991)

- **Biodiversity** is the totality of genes, species, and ecosystems of a region.

(World Resources Institute, 1992)

# Module 1. Definition of key categories - biodiversity

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## *Reference definition*

**Biodiversity** (biological diversity) is the variability among living organisms from all sources, including “*inter alia*”, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part.

(CBD, 1992)

# Module 1. Definition of key categories - biodiversity

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## Types of biodiversity:

- **genetic diversity** – genetic information contained in all of the individual plants, animals and micro-organisms;
- **species diversity** – variety of living species;
- **ecosystem diversity** – variety of habitats, biotic communities, and ecological processes.

# Module 1. Definition of key categories - biodiversity

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## **Main feature of biodiversity**

Pool of living diversity is **dynamic**

- it increases:

- a new genetic variation is produced
- a new species is created
- a novel ecosystem is formed

- it decreases:

- genetic variation within a specie is reduced
- a species becomes extinct
- an ecosystem is lost

# Module 1. Definition of key categories - biodiversity

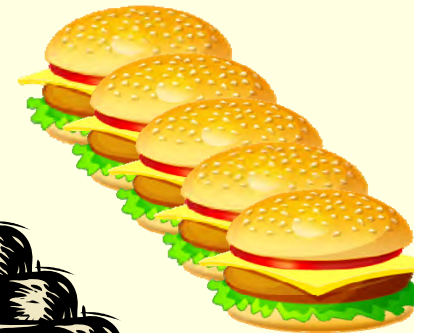
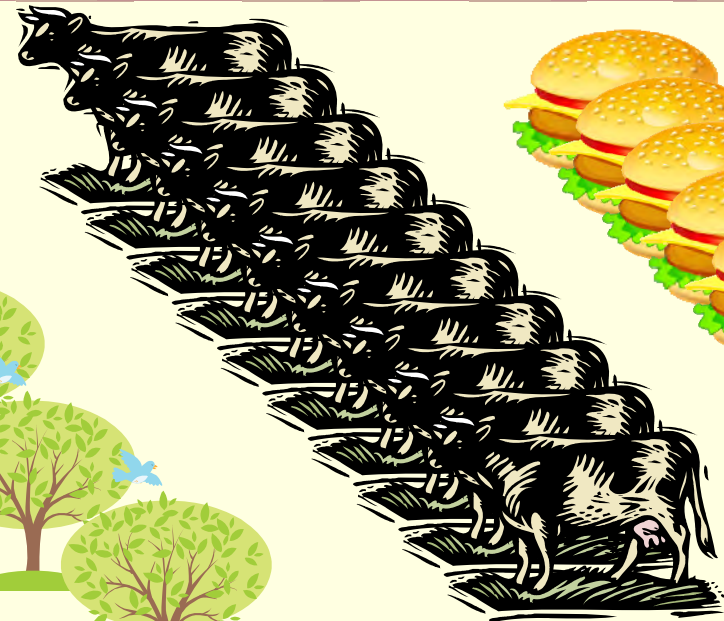
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## Distribution of species diversity

- species are not evenly distributed across the globe
- sp. richness – in equatorial regions
- number of sp./unit area in the tropics > temperate regions > polar territories
- in land ecosystems sp. diversity decreases with increasing altitude
- in marine ecosystems sp. richness is found on continental shelves

# Module 1. Definition of key categories - biodiversity

Why is diversity important?



# Module 1. Definition of key categories - biodiversity

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## Benefits arising from biodiversity conservation

- Ecosystem services:
  - Nutrient cycling
  - Pollution breakdown and absorption
  - Water purification
  - O<sub>2</sub> production, CO<sub>2</sub> fixation
  - Soil formation and protection
  - Climate regulation

# Module 1. Definition of key categories - biodiversity

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## **Benefits arising from biodiversity conservation:**

- **Biological resources:**
  - Food
  - Medicines
  - Natural products
  - Breeding stocks for better crops
- **Social benefits:**
  - Cultural value
  - Research and education
  - Recreation
  - Ecotourism

# Module 1. Definition of key categories – agro-biodiversity

## **Agro-biodiversity (agricultural biodiversity)**

is a vital sub-set of biodiversity, including all components of biological diversity of relevance to food and agriculture, as:

- Plants (crops & trees): landraces, obsolete and modern cultivars
- Wild crop relatives
- Livestock and fish species
- Semi-domesticated relatives of livestock
- Soil micro-organisms
- Biocontrol agents for crop/livestock pests
- Cultural and local knowledge of diversity

# Module 1. Definition of key categories – agro-biodiversity

## *Formal definition*

**“Agricultural biodiversity** encompasses the variety and variability of animals, plants and micro-organisms which are necessary to sustain key functions of agro-ecosystem, its structure and processes for, and, in support of food production and food security”

(FAO, 1999)

# Module 1. Definition of key categories – agro-biodiversity

## *Distinctive features of agro-biodiversity*

- Managed by farmers
- Landraces – a basic component of agro-biodiversity – would not survive without farmers management and conservation
- Local knowledge and culture are integral parts of agro-biodiversity
- Conservation of intra- and inter-specific diversity of crops depends on sustainable use
- Intra-specific variation is very important

# Module 1. Definition of key categories – plant genetic resources

## *Definition*

**PGR** – any genetic material of plant origin, including reproductive or vegetative propagating material of actual or potential value for food and agriculture, and belonging to the following categories of plants:

- Cultivated varieties in current use and newly developed varieties
- Obsolete cultivars
- Primitive cultivars (landraces)
- Wild and weed species, near relatives of cultivated species
- Special genetic stocks (including elite, and current breeders' lines and mutants)

*(ITPGRFA, 2004)*

# Module 1. Definition of key categories – landrace

## *Definitions*

“... distinct local races adapted to the many variants and interactions of natural and cultural environments to which crop species were gradually exposed...”

(Harlan, 1975)

“landraces are crop populations in balance with their environment, and remain relatively stable over a long period of time”

(IBPGR, 1980)

# Module 1. Definition of key categories – landrace

## ***Most comprehensive definition***

“... a landrace is a dynamic population of a cultivated plant that has historical origin, distinct identity and lacks formal improvement, as well as often being genetically diverse, locally adapted and associated with traditional farming systems...”

(Chamacho Villa et al., 2005)

### *Synonymies:*

- farmers' varieties
- folk cultivars
- traditional varieties

# Module 1. Definition of key categories – landrace

## *Types of landraces*

- Primary landrace – has never been subjected to formal breeding, it developed through farmers' selection
  - Autochthonous LR – a variety grown in the original location, where it developed its unique characteristics
  - Allochthonous LR – a variety grown in another location than the place of origin
- Secondary landrace – has been developed in the formal plant breeding sector, but for a couple of years is maintained through in situ grower selection and seed saving

# Module 1. Definition of key categories – landrace

## *Features of landraces*

- Locally adapted, showing tolerance to abiotic and biotic factors
- The product of farmer selection
- Often, highly genetically diverse (in vegetative propagated crops, a landrace is likely to be made up of very similar genotypes)
- High yield stability
- Low or medium yield levels
- Often, but not necessarily associated with low input traditional farming systems
- Frequently associated with traditional uses, habits, celebrations

# Module 1. Definition of key categories – crop wild relative

## *Definitions*

### *Broad definition*

CWR would be any taxon belonging to the same genus as a crop

A CWR is a taxon more or less close related to a species of direct socio-economic importance, including:

- Food, fodder and industrial crops
- Medicinal & spicy plant species and ornamentals
- Forestry species

# Module 1. Definition of key categories – crop wild relative

## ***Definitions***

### *Reference definition*

“A CWR is a wild plant taxon that has an indirect use derived from its relatively close genetic relationship to a crop; this relationship is defined in terms of the CWR belonging to gene pools 1 or 2, or taxon group 1 to 4 of the crop”

(N. Maxted et al., 2006)

# Module 1. Definition of key categories – crop wild relative

***How to assess the genetic relatedness of CWR  
to a crop?***

Two systems are used:

- Gene pool
- Taxon group

# Module 1. Definition of key categories – crop wild relative

## *What is gene pool concept?*

It was introduced and explained by Harlan and de Wet, 1971, and provides a classification of wild plants in relation to their associated crops, based on hybridisation experiments.

- Primary gene pool (GP1) - taxa in the same species
- Secondary gene pool (GP2) – taxa in the same section or series
- Tertiary gene pool (GP3) – taxa in the same genus

# Module 1. Definition of key categories – crop wild relative

## *What is taxon group concept?*

It was introduced and explained by Maxted, and provides a classification system for the relationship between crops and their wild relatives, based on taxonomy.

- TG1 – taxa within the same species
- TG2 – taxa within the same section or series
- TG3 – taxa within the same sub-genus
- TG4 – taxa within the same genus
- TG5 – taxa in different but related genera

# Module 1. Definition of key categories – local knowledge

## *Definition*

**LK** is one component of the global knowledge system, including the information that people in a given community have generated and accumulated over time, and that is orally transmitted from generation to generation.

## *Synonymies*

Traditional knowledge

Indigenous knowledge

# Module 1. Definition of key categories – local knowledge

## *Features of LK*

- Locally bound
- Dynamic, continuously developing
- Non-formal knowledge, and usually not documented
- Embedded in community practices, rituals, ceremonies
- Based on local people's creativity and experience
- Often influenced by links with external, formal knowledge systems
- Not evenly spread across a community

# Module 1. Definition of key categories – local knowledge

## *Types of LK*

- *Common knowledge* – held by, almost, all people in a community; e.g. everyone knows how to cook bean or maize in rural part of Maramures area; what tools are used for planting and harvesting
- *Shared knowledge* – held by, relatively, many members of a certain community; e.g. technology for brandy making from fruits (plums, apples, pears) in the Northern Romanian villages.
- *Specialized knowledge* – kept by a few people having special skills; e.g. information on medicinal plant properties

# Module 1. Definition of key categories – local knowledge

Type of LK people have is related to:

- Age
- Gender
- Occupation, experience and skills
- Socio-economic status
- Labour division within family
- Level of education

# Module 1. Definition of key categories – local knowledge

## *How is LK handed down?*

Ways of transmission relate to types of knowledge

### Common knowledge:

- during daily activities

### Shared knowledge

- Public places, as markets, community mills or distillery

### Specialized knowledge

- By elders or healers to selected people, usually within family members

# Module 1. Definition of key categories – exercises

- What makes up PGR of a crop?
- Based on your knowledge and experiences, give examples of:
  - Common knowledge
  - Shared knowledge
  - Specialized knowledge