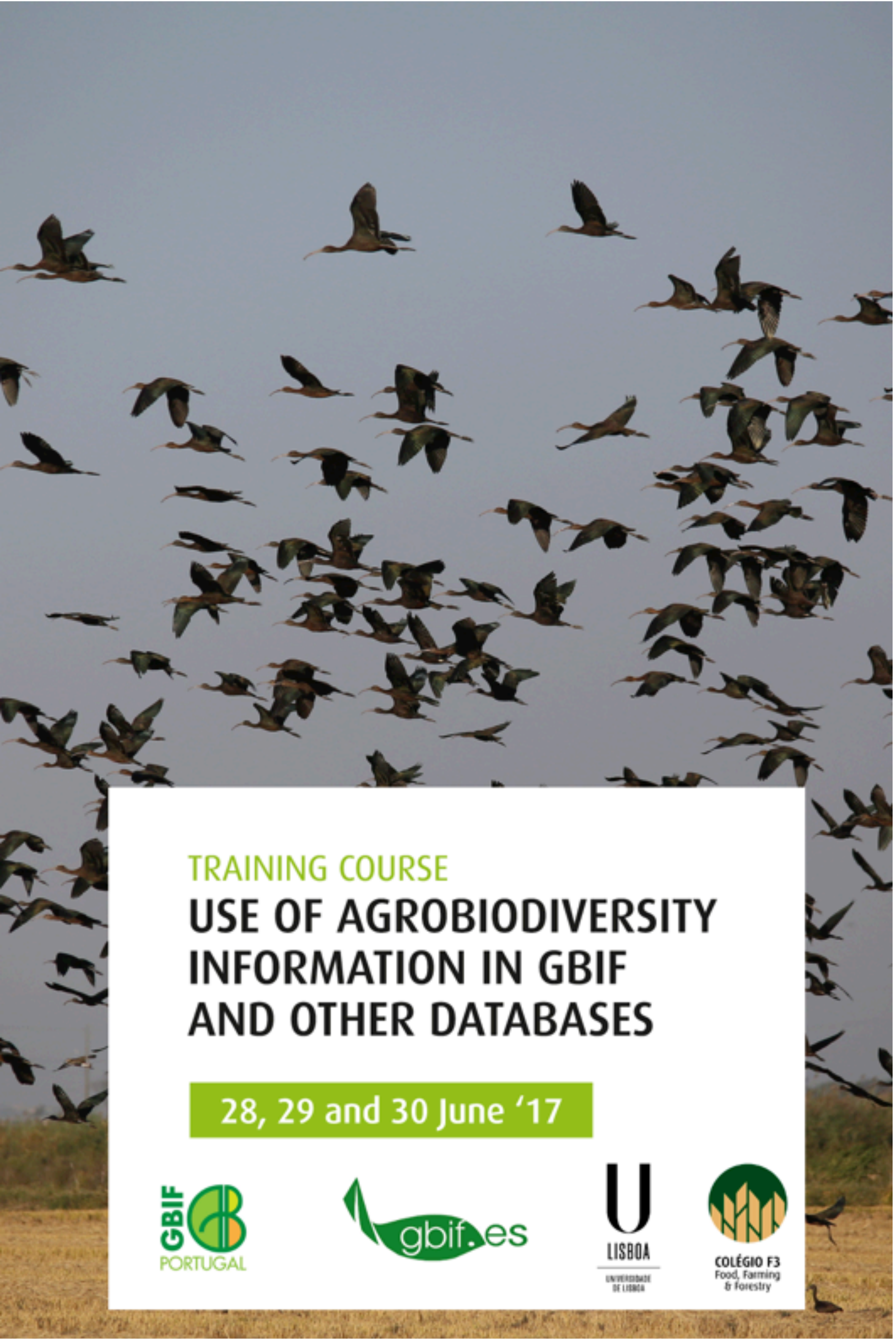

Agrobiodiversity:

from definition to application

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Outline

- The importance of AgroBiodiversity
- Components of Agrobiodiversity
- Prominence of traits incorporated in species consumed/produced
- Safeguarding Biological diversity
- Agrobiodiversity utilization and conservation: socioeconomic considerations

Why is Agricultural Biodiversity Important?

Biodiversity and agriculture are strongly interdependent

Biodiversity ⟷ Agriculture

Origin of all species of crops and domesticated livestock and the variety within them. It is also the foundation of ecosystem services essential to sustain agriculture and human well-being.

Today's crop and livestock biodiversity are the result of many thousands years of human intervention.

Biodiversity and agriculture are strongly interrelated because while biodiversity is critical for agriculture, agriculture can also contribute to conservation and sustainable use of biodiversity.

Sustainable agriculture both promotes and is enhanced by biodiversity.

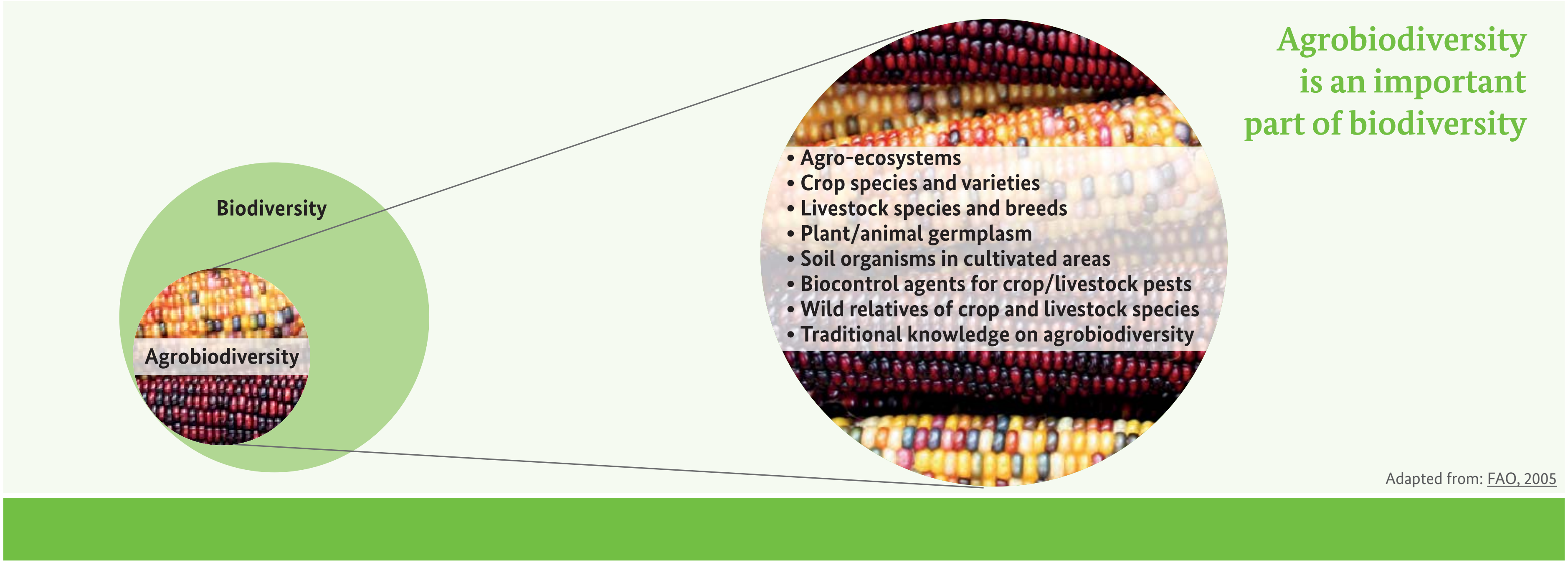
Biodiversity is essential to:
- ensure the production of food, fibre, fuel, fodder;
- maintain other ecosystem services;
- allow adaptation to changing conditions - including climate change
- sustain rural peoples' livelihoods .

What is Agrobiodiversity?

Agricultural biodiversity includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agroecosystem.

Agrobiodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by farmers and herders. It has developed over millennia, as a result of both natural selection and human interventions..

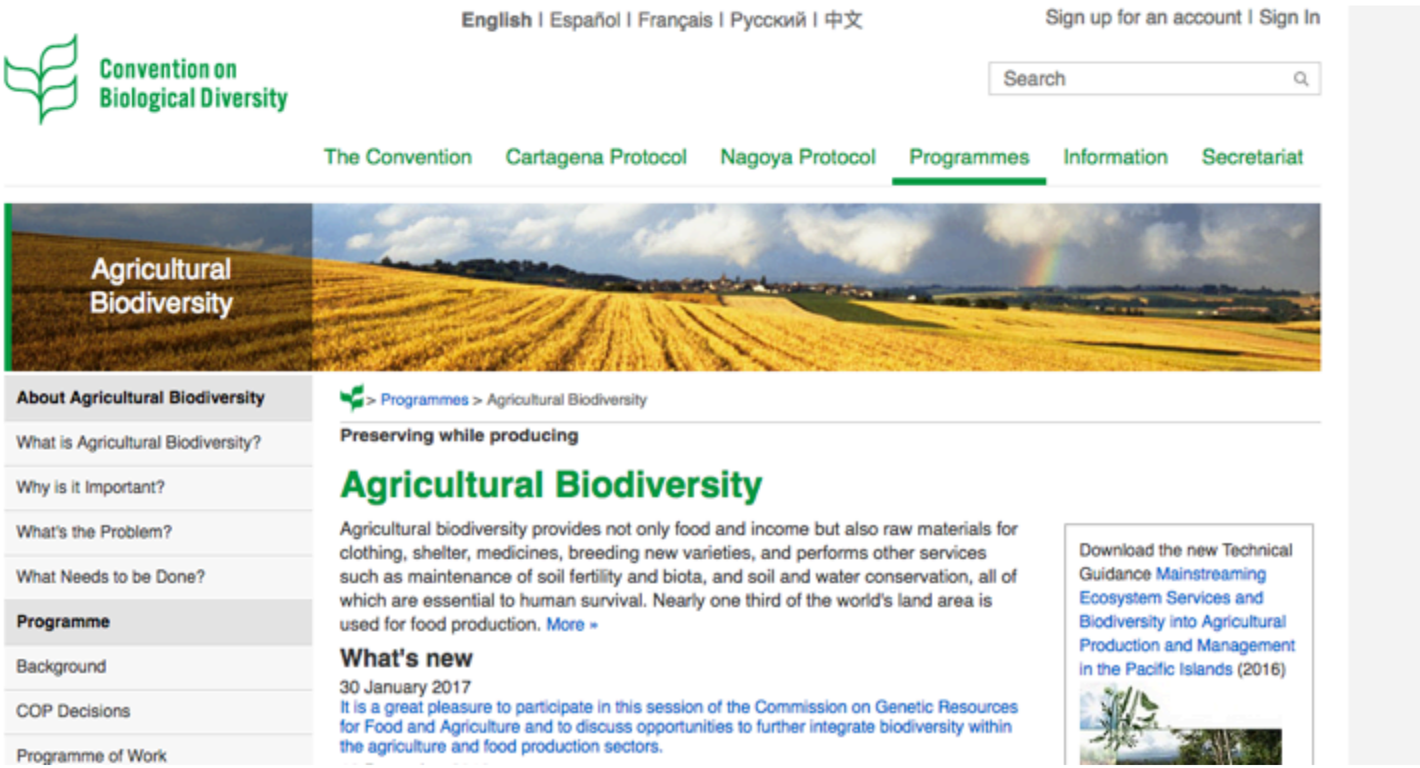
Components of Agrobiodiversity



Functional Agrobiodiversity

Functional agrobiodiversity (FAB) refers to *'those elements of biodiversity on the scale of agricultural fields or landscapes, which provide ecosystem services that support sustainable agricultural production and can also deliver benefits to the regional and global environment and the public at large*'.

The Convention on Biological Diversity was inspired by the world community's growing commitment to sustainable development. It **represents** the **conservation of biological diversity**, **the sustainable use of its components**, and **sharing of benefits** arising from the use of genetic resources.



According to CBD, **agrobiodiversity is comprised of four dimensions**

Components of Agrobiodiversity

1. Genetic resources for food and agriculture: PLANT

·Plant genetic resources, including crops, wild plants harvested and managed for food, trees on farms, pasture and rangeland species

The International Treaty on Plant Genetic Resources for Food and Agriculture- 2001

The Treaty aims at:

1. recognizing the enormous contribution of farmers to the diversity of crops that feed the world;
2. establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials;
3. ensuring that recipients share benefits they derive from the use of these genetic materials with the countries where they have been originated.

The Treaty facilitates access to the genetic materials of the 64 crops in the Multilateral System for research, breeding and training for food and agriculture.

Components of Agrobiodiversity

1. Genetic resources for food and agriculture: ANIMAL

- Animal genetic resources (AnGR) is used to include all animal species, breeds and strains that are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or the future.

Another equivalent term increasingly used is farm animal genetic resources.

More than **40 species of animals** that have been domesticated (or semi-domesticated) during the past 10 to 12 thousand years which contribute **directly** (through animal products used for food and fibre) and **indirectly** (through functions and products such as draft power, manure, transport, store of wealth etc.)

Table 1. List of animal species used for food and agriculture

Widespread species		**Localised species** (only some are domesticated)	
Species	*No. of breeds*		
Pig	350	Banteng	Bamboo Rat
Goat	320	Mithan	Red Deer
Sheep	850	Yak	Mouse Deer
Cattle	815	Gaur	Muntjac
Buffalo	70	Tamaraw	Water Deer
Horse	350	Kouprey	Duiker
Donkey/Ass	70	Anoas	Lizards
Dromedary	50	Rabbits	Green Iguana
Bactrian Camel	6	Agouti	Black Iguana
Llama	2	Capybara	Elephants
Alpaka	2	Coypu	Bees


Friesian bull


Holstein bull


Daweizi Pig


Yorkshire (Large White) boar

Source: http://agtr.ilri.cgiar.org/index.php?option=com_content&view=article&id=240&Itemid=298

Components of Agrobiodiversity

1. Genetic resources for food and agriculture: MICROBIAL and FUNGI

Microorganisms include all living organisms other than plants and animals and are mostly microscopic cellular organisms that include bacteria, mycoplasmas, protozoa, fungi and some algae.

Lack of information of microorganism diversity combined to lack of research programs related to their role in ecosystem functions.

It is difficult to detect early changes in ecosystems without proper techniques. One example is drinking water testing for microbial contamination.

Components of Agrobiodiversity

1. Genetic resources for food and agriculture: MICROBIAL and FUNGI

Fungi are among the most important organisms in the world, not only because of their vital roles in ecosystem functions but also because of their influence on humans and human-related activities.

Fungi are essential to such crucial activities as decomposition, nutrient cycling, and nutrient transport and are indispensable for achieving sustainable development.

Components of Agrobiodiversity

1. Genetic resources for food and agriculture

In situ versus ex situ conservation

Conservation of genetic resources in natural populations of plant or animal species

Advantages:

1. conservation of live populations requires no advanced technology;
2. This method of conservation also allows populations to adapt to changing environmental conditions and endemic diseases.
3. Survives to political instability and different measures
4. Maintain by breeders and farmers.

Process of protecting a plant species or animal outside its natural habitat

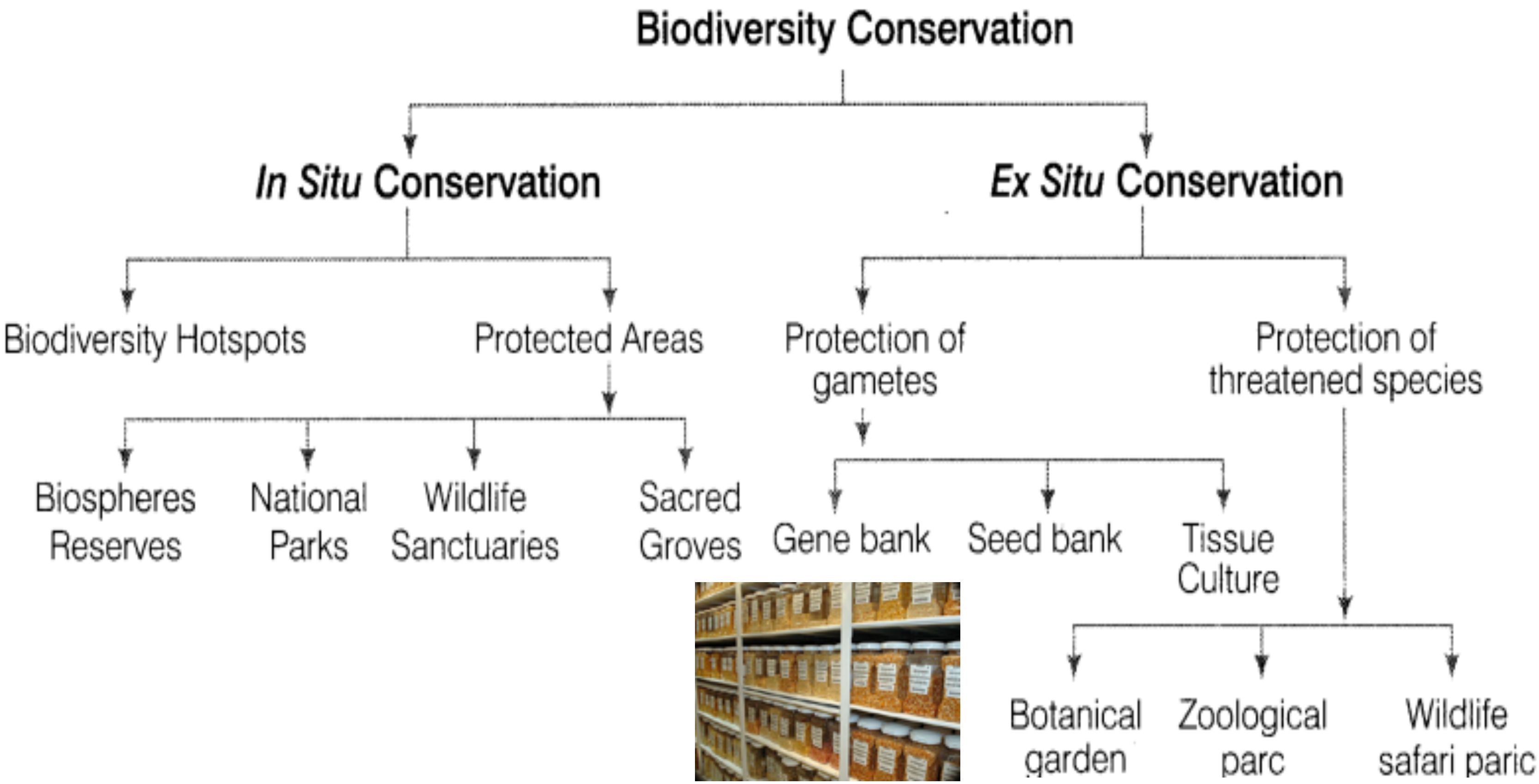
Advantages:

1. Preserved population suffer no genetically loss due to selection or drift
2. Animal/Plant genetic resources can be made available to livestock/crop breeding and research programmes throughout the world.
3. Low maintenance cost

Components of Agrobiodiversity

Safeguarding Biological diversity

Approaches to In situ and Ex situ conservation



Biodiversity Hotspots: interest to agriculture

The 36 biodiversity hotspots hold especially high numbers of unique species, yet their combined area now covers only 2.3 percent of the Earth's land surface.

Many encompass priority areas in multiple countries. Each one faces extreme threats and has lost at least 70 percent of its original habitat. **Harbors endemic plants, with potential to agriculture- e.g. CWR.**

BIODIVERSITY HOTSPOTS

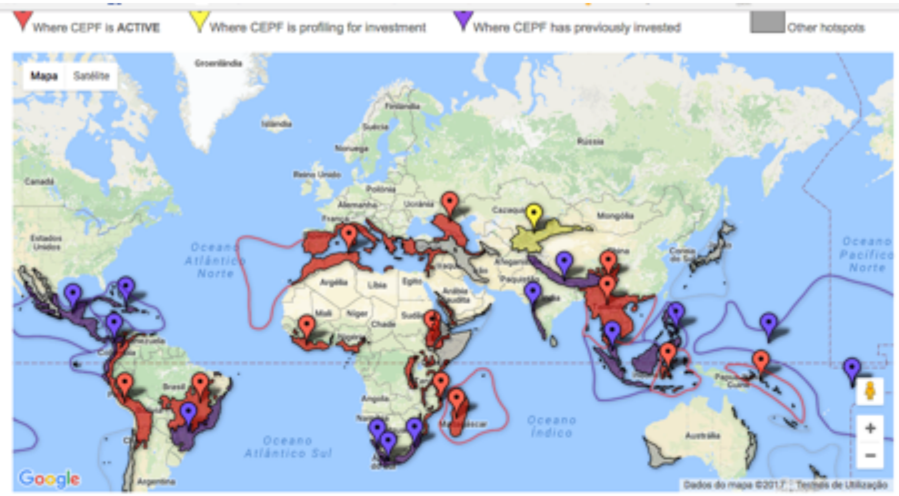
AFRICA
Eight Hotspots hold a diversity of plant and animal life, many of which are found no where else on Earth.

ASIA-PACIFIC
Composed of large land areas as well as islands dotting the Pacific seas, these 14 Hotspots represent important biodiversity.

EUROPE & CENTRAL ASIA
From the Mediterranean Basin to the Mountains of Central Asia, these four Hotspots are unique in their diversity.

NORTH & CENTRAL AMERICA
North and Central America play host to thousands of acres of important habitat.

SOUTH AMERICA
From Brazil's Cerrado to the Tropical Andes, South America has some of the richest and most diverse life on Earth.

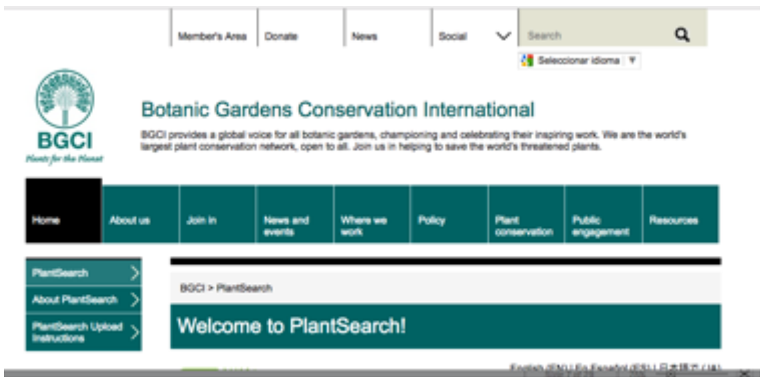


Critical Ecosystem Partnership Fund

Components of Agrobiodiversity

1. Genetic resources for food and agriculture

Databases Examples:



European Cooperative Programme for Plant Genetic Resources
ECPGR
eurisco
Finding seeds for the future

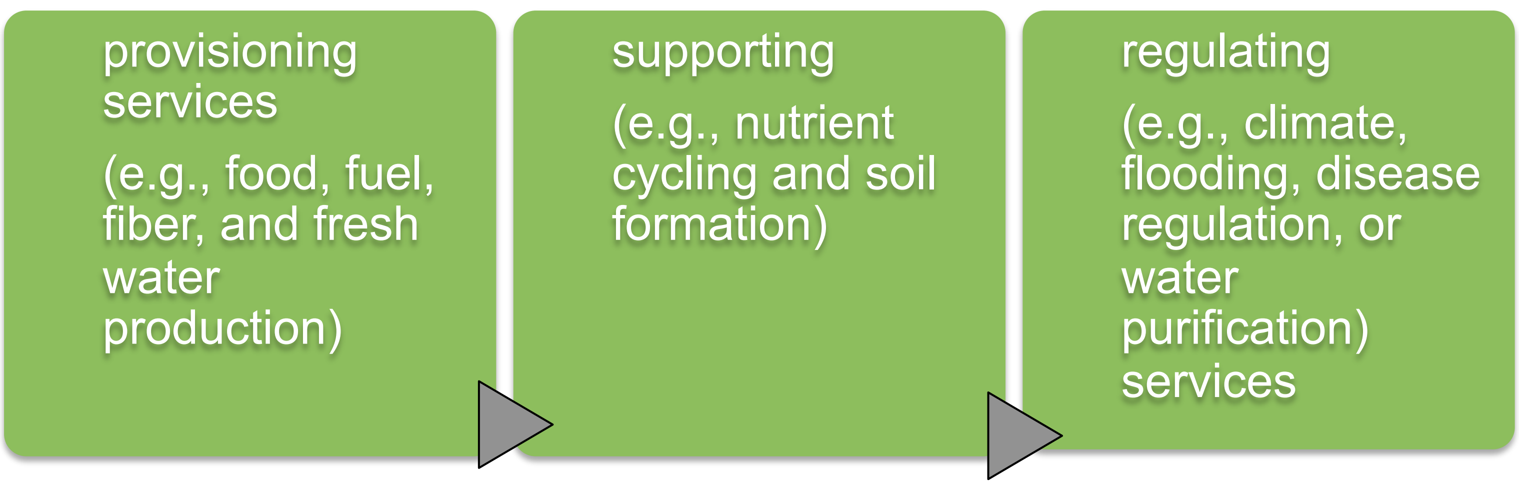
Components of Agrobiodiversity

2. Components of biodiversity that support ecosystem services upon which agriculture is based

These include a diverse range of organisms that contribute to nutrient cycling, pest and disease regulation, pollination, pollution and sediment regulation, maintenance of the hydrological cycle, erosion control, carbon sequestration and climate regulation.

Premises:

The economic assessment of services provided by agrobiodiversity at the landscape level is affected by the juxtaposition of different types of agricultural and nonagricultural ecosystems



The importance of natural pest control as an ecosystem service

Crop pests constitute a serious threat to crop production.

Insect pests can cause severe crop losses both on the field (pre-harvest) and during crop storage (post- harvest). It is estimated that approximately a third of crop production is lost to pests, diseases and weeds.

In natural ecosystems, on the other hand, plant-feeding insects (known as pest species in agricultural crops) usually do little damage.

This is to a large extent due to the fact that natural habitats tend to be teeming with insect predators and parasitoids that attack plant feeders, keep their numbers in check and thereby protect plants from serious damage.

How can landscape management support natural pest control?

Insect predators that naturally occur in agricultural systems can be preserved and enhanced with simple cultural techniques.
Such practices may involve provisioning natural enemies with resources that are lacking within the agricultural crop, such as nectar, pollen, alternative prey, or shelter (overwintering sites).

Adding floral resources can be a simple and effective tool to support predators and parasitoids and to harness the biocontrol services they provide.

An example:

the majority of *Diadegma semiclausum* (a parasitic wasp) failed to attack any Diamondback moth (Plutella xylostella) larvae in the cages without nectar plants, whereas individuals provided with a nectar plant parasitized more than 300 larvae each. Thus, adding food sources to agro-ecosystems could be a simple and effective way to enhance the effectiveness of biological control programmes.

A parasitic wasp on *Apiaceae*.© Felix Wäckers.

Pollinators

Pollinators play a critical role in agriculture and food security and for the broader functioning of ecosystems. Pollination enables the natural fertilization and reproduction of flowering plants.

Seventy-five percent of the world's leading food crops, from cacao to pumpkins, are partially reliant on animal pollinators for fruit and seed production.

One-third of all crop production depends on animal pollinators. The overall value of pollination services globally was estimated at $173 billion per year in 2009, and the acreage of crops requiring pollination is increasing.

Bees are thought to be the most important pollinators in most environments, including agriculture.

Why Do Pollinators Matter?

Honey bees are the main pollinators managed today for farming; yet native bees and other wild pollinators are now known to be as important, if not more so, in agriculture.

The diversity and abundance of wild insect pollinators have declined in many agricultural landscapes.

Whether such declines reduce crop yields, or are mitigated by managed pollinators such as honey bees, is unclear

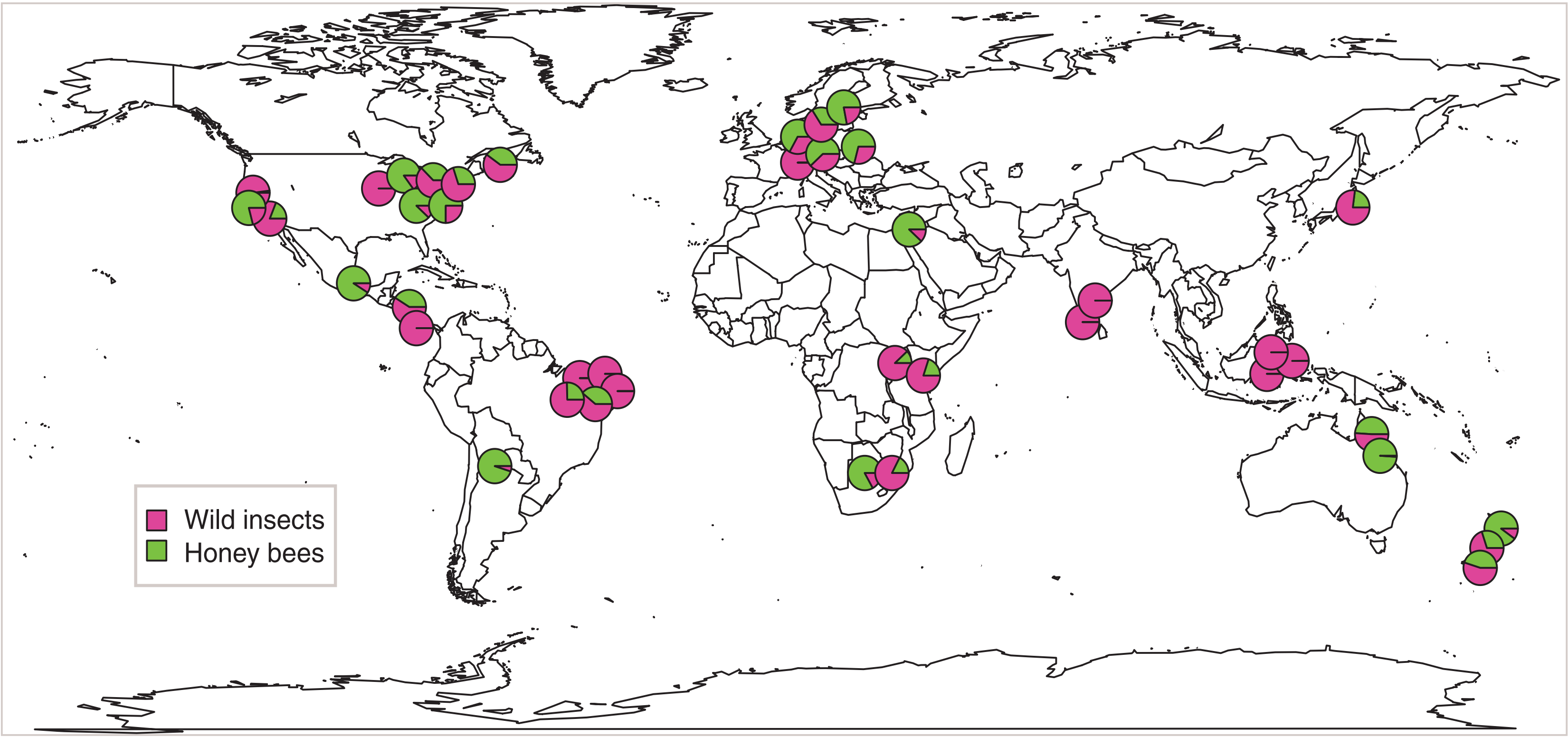


Fig. 1. Relative visitation by honey bees and wild insects to flowers of 41 crop systems on six continents. Honey bees occur as domesticated colonies in transportable hives worldwide, as a native species in Europe (rarely) and Africa, or as feral populations in all other continents except Antarctica.

Garibaldi et al. 2013 *Science*

www.sciencemag.org SCIENCE VOL 339 29 MARCH 2013 1609

It was found positive associations of fruit set with flower visitation by wild insects in 41 crop systems worldwide.
In contrast, fruit set increased significantly with flower visitation by honey bees in only 14% of the systems surveyed.

Results suggest that new practices for integrated management of both honey bees and diverse wild insect assemblages will enhance global crop yields.

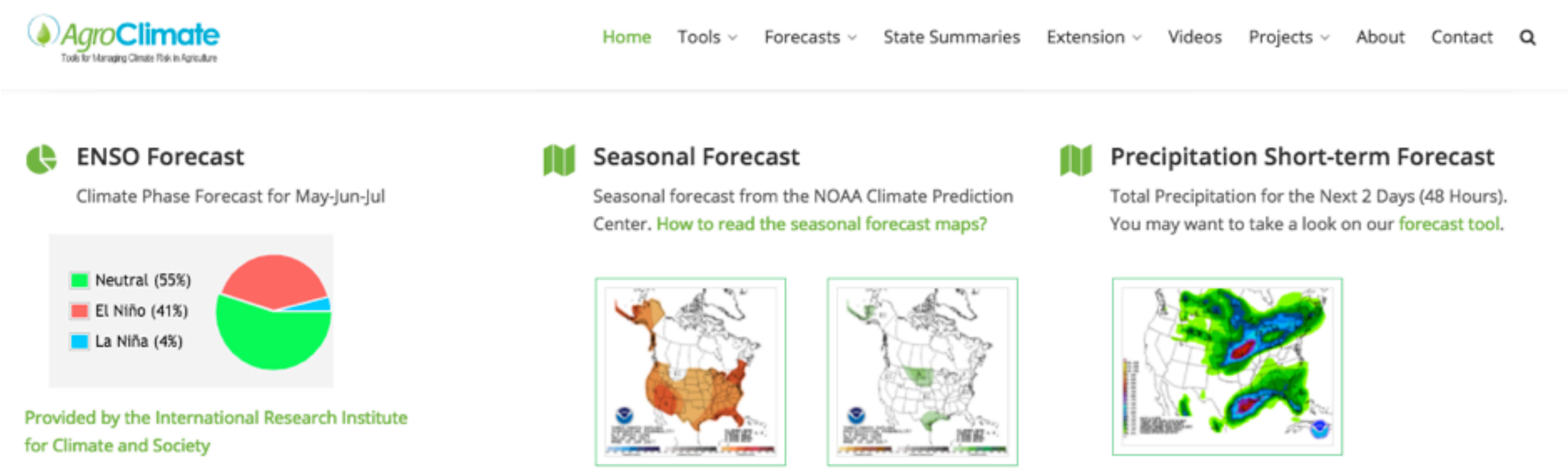
Components of Agrobiodiversity

3. Abiotic factors, such as local climatic and chemical factors and the physical structure and functioning of ecosystems, which have a determining effect on agrobiodiversity.

Agro-climatic forecasts to the rescue

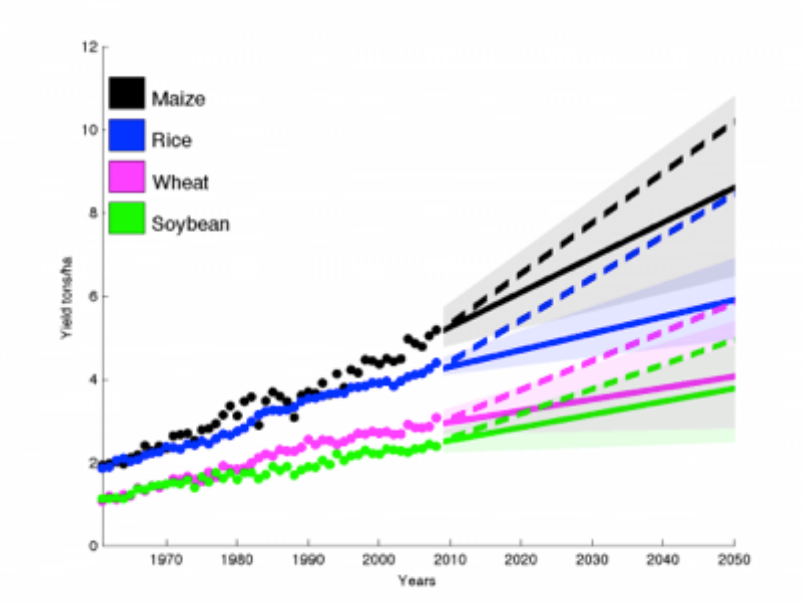
climatic information to then provide recommendations tailored for agriculture.

For example, farmers need to know what they should plant and when it should be planted.



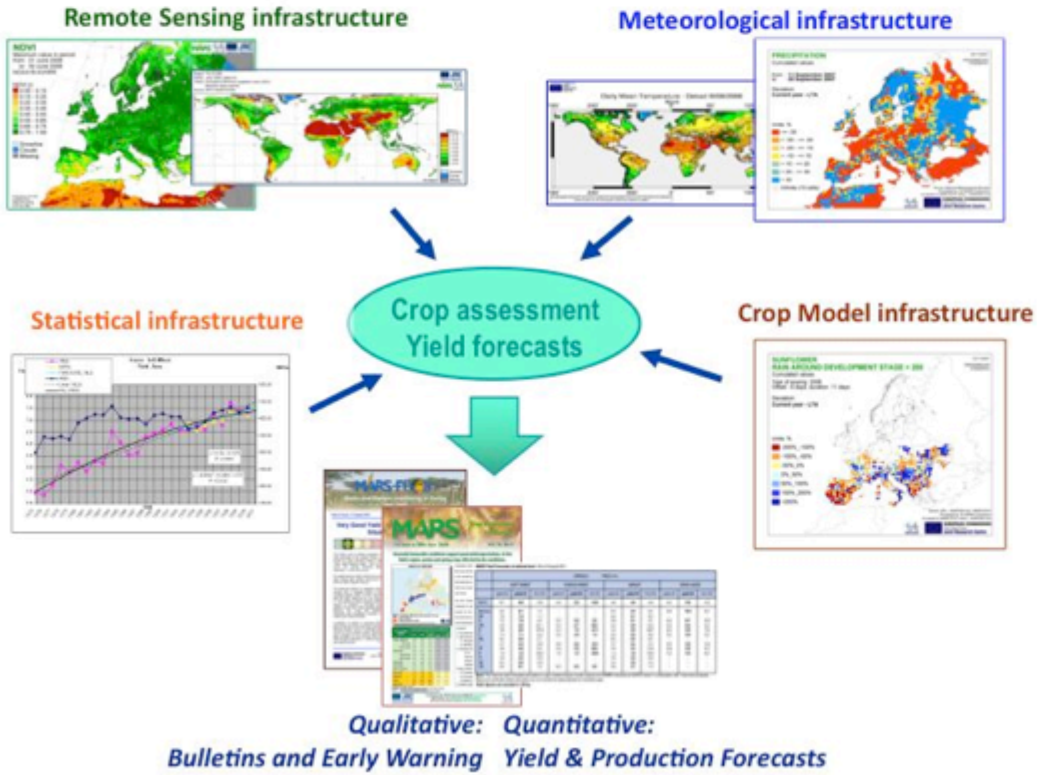
Crop Modelling: an emerging yet difficult field

Relation to demand needs



Crop yields worldwide are not increasing quickly enough to support estimated global needs in 2050

Suitable Databases standards for application



Components of Agrobiodiversity

4. Socio-economic and cultural factors. Agrobiodiversity is largely shaped and maintained by human activities and management practices, and a large number of people depend on agrobiodiversity for sustainable livelihoods.

Links between cultural and biological diversity

Traditional local communities and indigenous peoples often have a profound understanding of their environment and its ecology.

Such traditional knowledge – for example about the use of wild plants and animal products for food, medicine and dyes – is of importance to the conservation and sustainable use of agrobiodiversity.

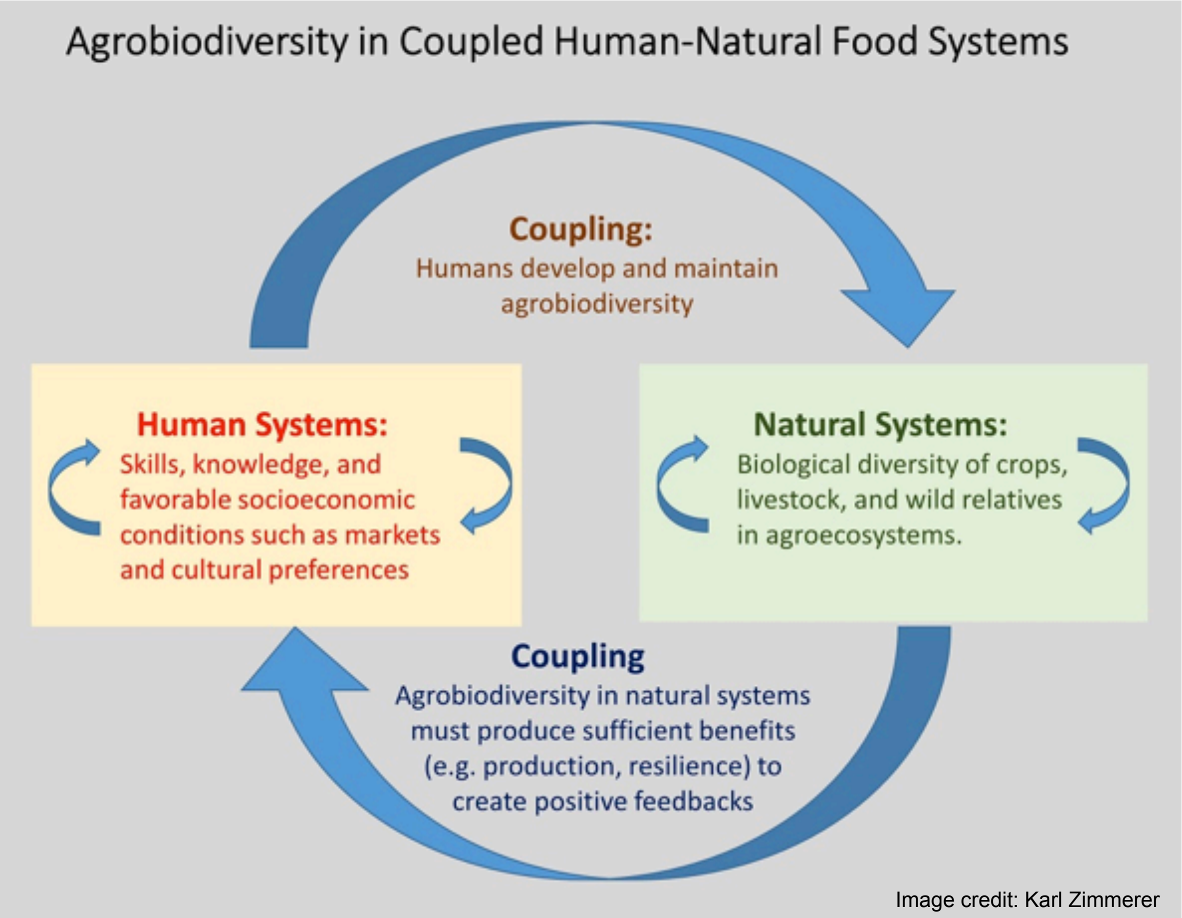
Women play an important role in the conservation of agrobiodiversity.

Photos, l.t.r.: © GIZ, © Ilse Köhler-Rollefson, © GIZ/Ursula Meissner

Traditional knowledge and indigenous agro-biodiversity conservation

INDIGENOUS PARTNERSHIP FOR AGROBIODIVERSITY AND FOOD SOVEREIGNTY

Local knowledge, and related gender differences, can be seen as key factors in shaping and influencing plant and animal diversity.



Farmers' selection and management practices, and their use of genetic resources, have played an important role in agrobiodiversity conservation.

Unlocking traits in species for agriculture used

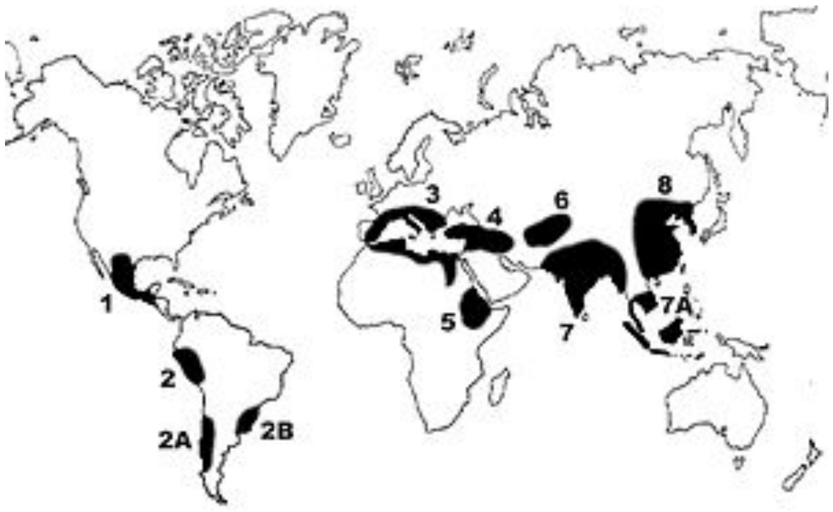
Introducing the concept of Center of Origin or Diversity

A center of origin is a geographical area where a group of organisms, either domesticated or wild, first developed its distinctive properties.

Major crops and most livestock species have their origins in the tropics and subtropics.

At least **12 major geographic 'centres of diversity'** – regions, or hotspots, that harbour a high percentage of plant, livestock, and cultural diversity.- are recognized.

'Centres of diversity' refer both to regions where crops and livestock were originally domesticated from their wild ancestors, and regions of subsequent spread where ongoing adaptation to their environment and selection by farmers and herders takes place.



proposed by the Russian scientist Nikolai Vavilov (1887-1943)

Unlocking traits in species for agriculture used

Center of origin/diversity: implications to agrobiodiversity

The center of diversity of a plant is defined as the geographic area wherein the plant exhibits the highest degree of variation

The center of origin of a plant is that location where it is considered to have first appeared. The primary criterion in identifying a center of origin is the presence of wild relatives.

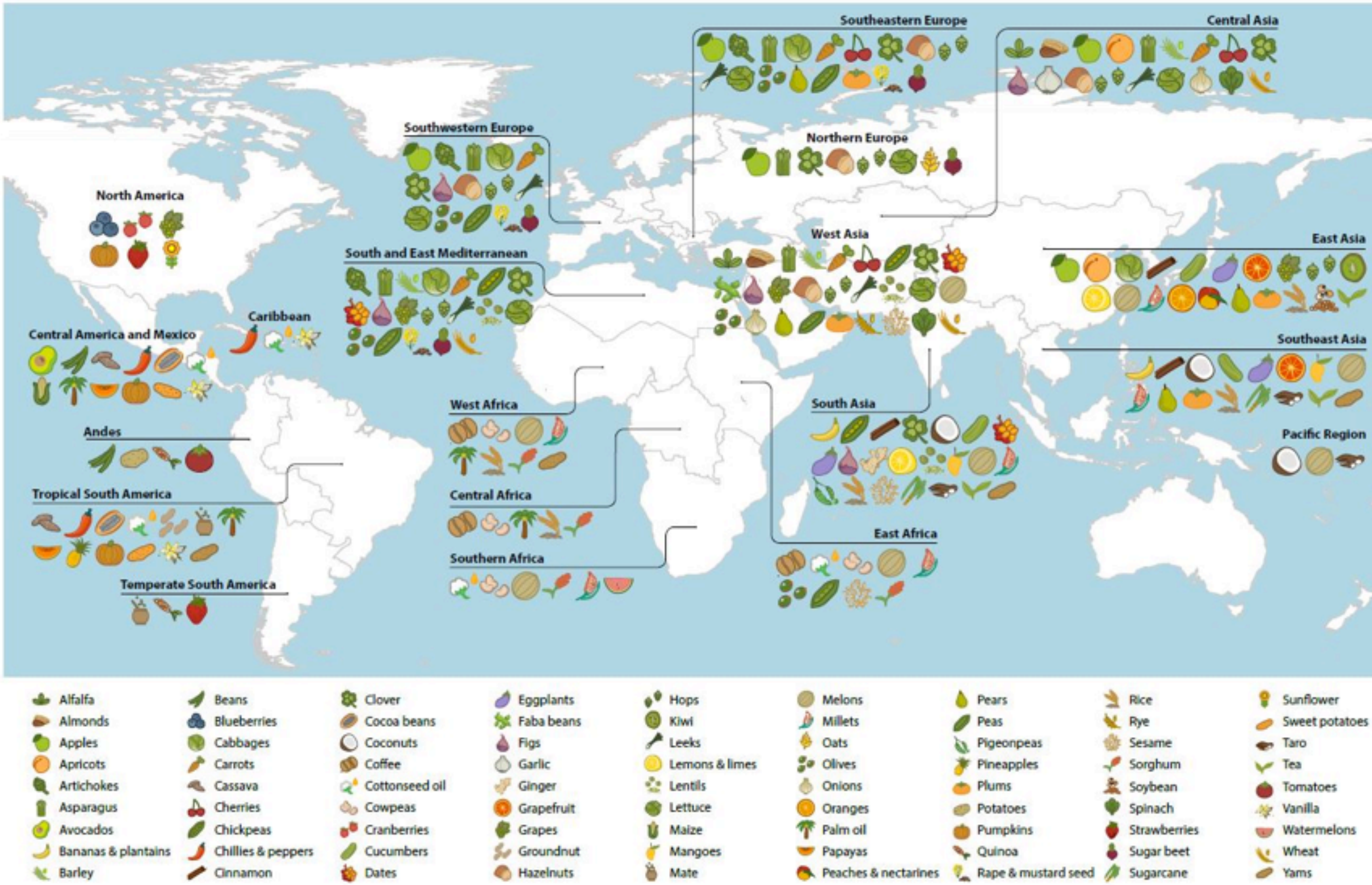
Though centers of origin and diversity are highly correlated, they do occasionally diverge. This happens when there is a high variation in cultivated crops, but no or few wild relatives.
The variation occurs due to environmental forces and human intervention that may have conspired to increase a plant's diversity away from its site of origin. A plant species may also have more than one center of origin or diversity.

e.g., wheat is listed in Central Asia, West Asia, and the South and East Mediterranean

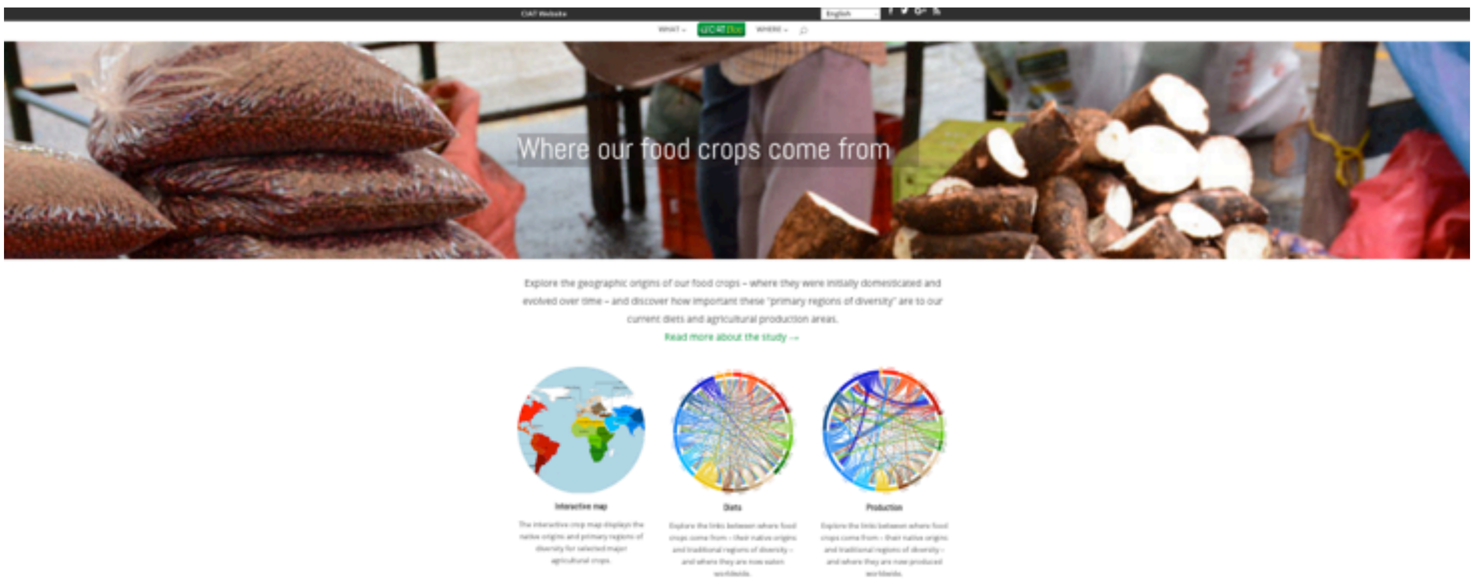
ORIGINS AND PRIMARY REGIONS OF DIVERSITY OF AGRICULTURAL CROPS

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Khoury CK, Achicanoy HA, Bjorkman AD, Navarro-Racines C, Guarino L, Flores-Palacios X, Engels JMM, Wiersema JH, Dempewolf H, Sotelo S, Ramírez-Villegas J, Castañeda-Alvarez NP, Fowler C, Jarvis A, Rieseberg LH, and Struik PC (2016). Origins of food crops connect countries worldwide. Proc. R. Soc. B 283: 20160792. DOI: 10.1098/rspb.2016.0792.



Locating the origin of crop plants is basic to plant breeding. This allows one to locate wild relatives, related species, and new genes (especially dominant genes, which may provide resistance to diseases).



Knowledge of the origins of crop plants is important in order to avoid genetic erosion, the loss of germplasm due to the loss of ecotypes and landraces, loss of habitat (such as rainforests), and increased urbanization.

Germplasm preservation is accomplished through gene banks (largely seed collections but now frozen stem sections) and preservation of natural habitats (especially in centers of origin).

The Irish potato famine – a lack of genetic diversity

The Irish potato famine of 1846–1850 illustrates the importance of agrobiodiversity and a broad genetic base in agricultural production.
During that time, the population of Ireland decreased by two million, or 25 %. One million died of starvation or diseases associated with the famine and one million emigrated to North America or parts of England.

Healthy potato

What happened?

People had mainly lived off subsistence farming and the potato was the country's most important staple food.
But only two varieties were under cultivation. A potato disease broke out, **potato late blight**, caused by the fungus-like microorganism *Phytophthora infestans*.
Because both potato varieties were susceptible to this disease, it was able to spread unhindered, wiping out large parts of the crop.

Potato with blight

The importance of genetic diversity in crops

Potato is indigenous to the Andes (South America), where some other closely related species are still cultivated. Potatoes were introduced to Europe in the second half of the 16th century by the Spanish.

Some potatoes would have carried the right genes to make it through the epidemic, and more of the resistant varieties could have been planted in the years following the first epidemic.

Later, scientists identified resistance genes in a potato from South America, where farmers have preserved the genetic variation of potatoes by growing many cultivated varieties alongside the potato's wild relatives.


USDA United States Department of Agriculture
Agricultural Research Service

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Potato Offers Resistance to Late Blight Disease

By Marcia Wood

ABERDEEN, Idaho, Dec. 17—A new potato with resistance to the world's worst potato disease is now available to plant breeders.

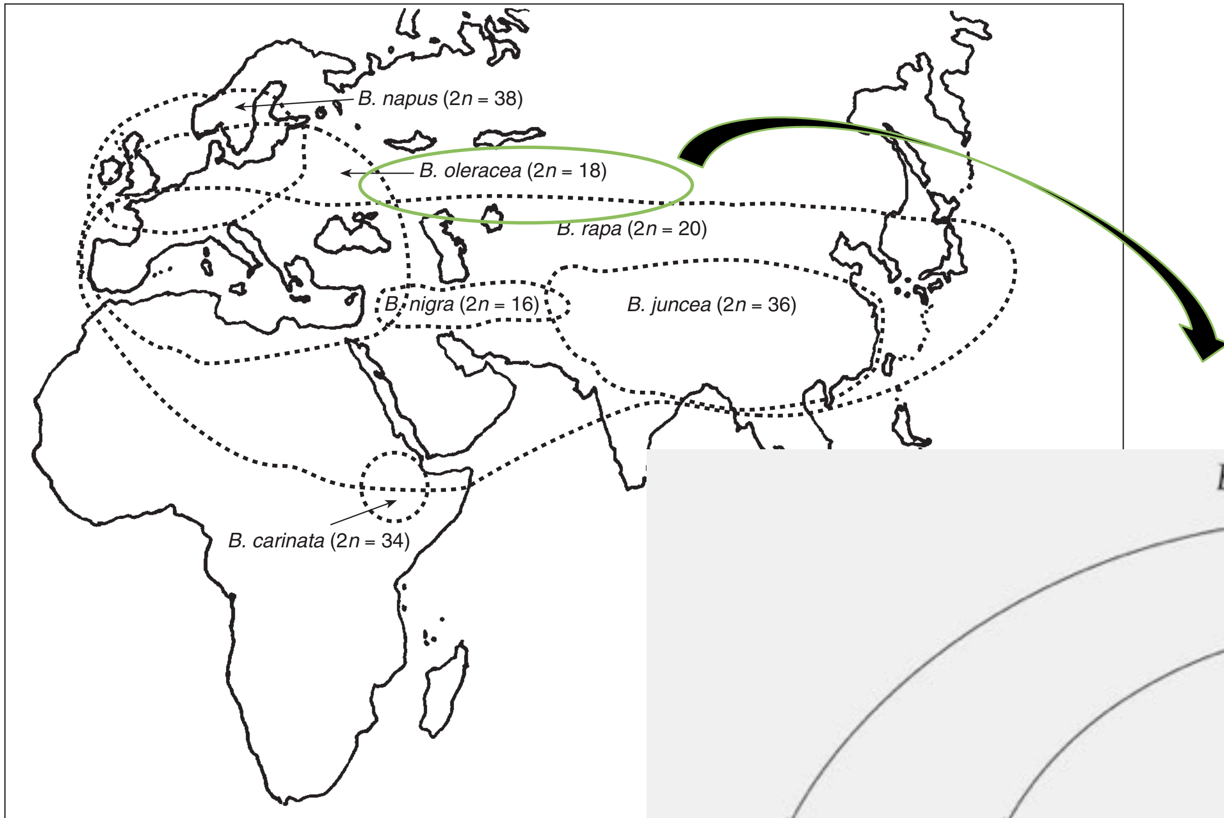
"This potato is highly resistant to attack by late blight, the disease that caused the Irish potato famine of the 1840s," said plant pathologist Dennis L. Corsini with the Agricultural Research Service in Aberdeen, Idaho. He and colleagues at Aberdeen and at Prosser, Wash., developed the new spud, known as AWN86514-2. The Agricultural Research Service is the chief research agency of the U.S. Department of Agriculture.

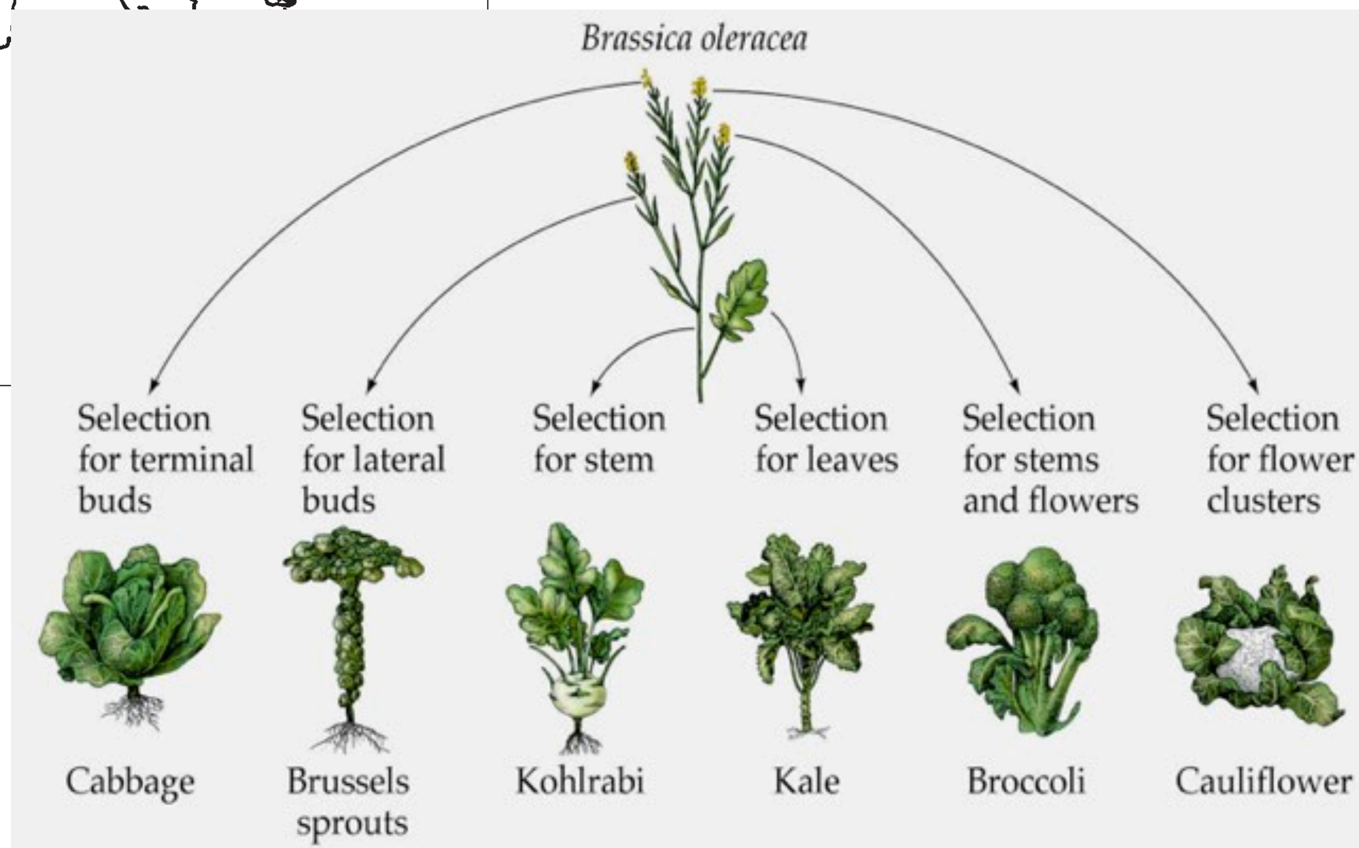
Commercial varieties bred from the new potato are at least six years away, Corsini cautions.

Late blight is caused by a fungus called *Phytophthora infestans*. New, more aggressive strains that are fungicide-resistant have appeared in recent years, so breeders have been scrambling to find potatoes with natural resistance.

"The new potato held up well when attacked by the newest and most virulent strains of the

Traits driven for crops development: from one to all





Corn Domestication as a case study

Maize (*Zea mays* L.) is the New World's preeminent grain crop, widely grown at the time of the European contact in both hemispheres, and was a staple food of many prehistoric societies.

Reconstruction of maize cultivation by a sedentary fisher communities of the Valley of Tehuacan, ca 3400 BC, Mexico. Mexico City, Biblioteca Nacional De Antropología E Historia

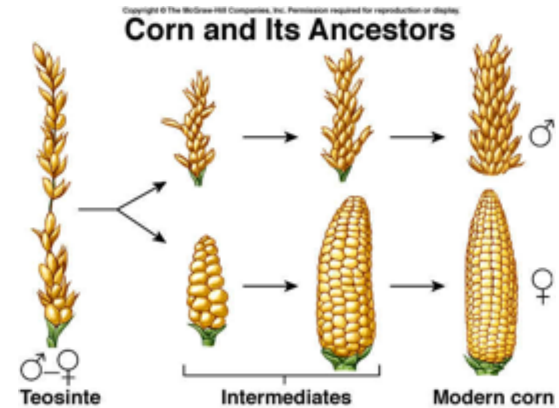
Most historians believe maize was domesticated in the Tehuacan Valley of Mexico, yet recent research indicated the adjacent Balsas River Valley of south-central Mexico as the center of maize domestication.

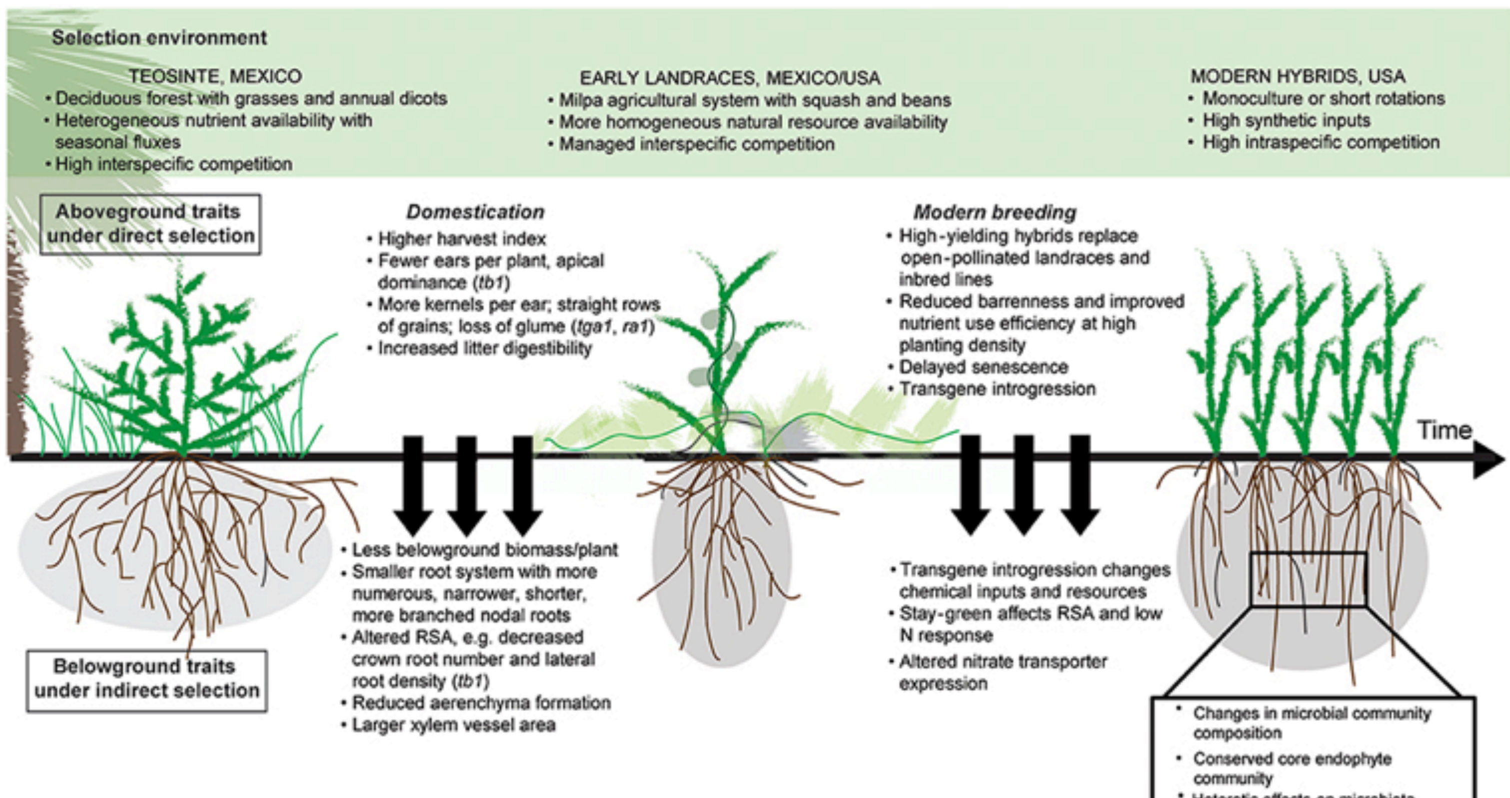
Beginning about 2500 BC, the crop spread through much of the Americas. After European contact with the Americas in the late 15th and early 16th centuries, explorers and traders carried maize back to Europe as parte of The **Columbian Exchange** event.

Corn Domestication as a case study

Before they were domesticated, maize plants only grew small, 25 millimetres long corn cobs, and only one per plant.

Many centuries of artificial selection by the indigenous people of the Americas resulted in the development of maize plants capable of growing several cobs per plant that were usually several centimetres/inches long each.





Schmidt JE, Bowles TM and Gaudin ACM (2016) Using Ancient Traits to Convert Soil Health into Crop Yield: Impact of Selection on Maize Root and Rhizosphere Function. Front. Plant Sci. 7:373. doi: 10.3389/fpls.2016.00373

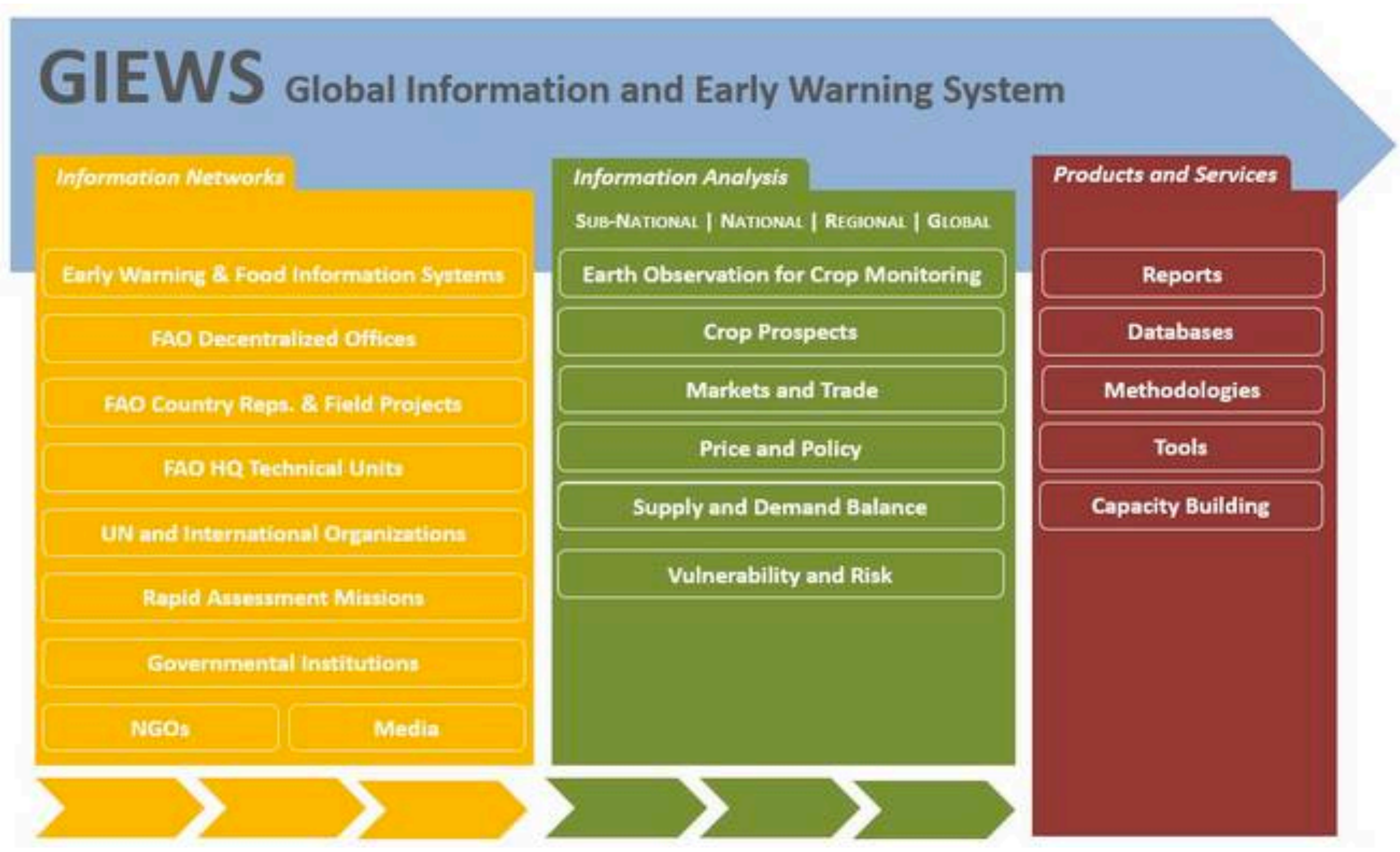
Food and Agriculture Organization of the United Nations

FAO play a central role in developing computer programmes to support the "GIEWS - Global Information and Early Warning System for Food Security"

The GIEWS continuously monitors food supply and demand and other key indicators for assessing the overall food security situation in all countries of the world.

Performance of EWS is critical to improved decision making and timely and well-targeted interventions to alleviate food insecurity and improved crisis management.

GIEWS Streamline

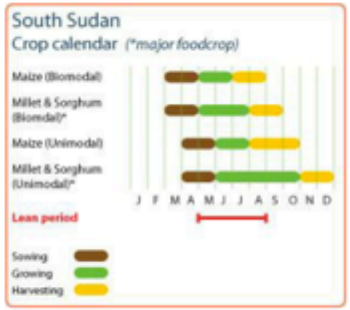


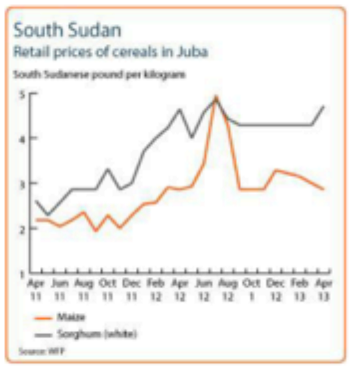
GIEWS Example Reports

GIEWS Country Brief
South Sudan

Reference Date: 03-June-2013

FOOD SECURITY SNAPSHOT
- Planting of 2013 cereal crops is concluded in southern area, while it is ongoing in northern areas
- Reduced planted area expected in most conflict-affected areas
- Timely onset and good amounts of seasonal rains favouring crops and pasture
- Prices of sorghum, the main food staple, on the rise in most markets
- About 1.2 million people are estimated to be severely food insecure until next harvest starts in August/September





Abundant rains favour the establishment of 2013 cereal crops

In southern Greenbelt and Greater Equatoria states, the March-to-May rains were generally favourable with a timely onset and abundant amounts received in most cropping areas, favouring planting and crop development. In particular, well above average rains during the month of May have increased soil moisture surpluses in most south-western areas of the country with positive effects on crop yields and availability of grazing resources. As pastures are being regenerated, livestock are gradually trekking back from dry season grazing areas. In northern areas of the country, seasonal rains started with a slight delay of one-two dekads in mid-May and planting of crops, to be harvested during the last quarter of the year, is underway.

Civil insecurity hampers planting operations

In areas affected by the prevailing civil insecurity due to conflict and inter-tribal clashes, such as parts of Jonglei, Unity, Warrap and Lakes states, access to land is often limited and although official estimates are not available, planted area is expected to decline.

Sorghum prices increasing seasonally in most markets

Prices of locally produced cereal crops are increasing in most markets as the lean season progresses and household food stocks begin to dwindle. From January to April, retail prices of the main staple sorghum increased in Bor and Aweil by 15 and 12 percent, respectively, following seasonal patterns, while they were mostly stable in the capital Juba. By contrast, over the same period, sorghum prices decreased in Malakal by 18 percent due to increased informal imports from neighbouring Sudan.

Since the beginning of the year, prices of maize decreased by 11 percent in Juba, mainly due to the availability of imports from Uganda and Tanzania. Prices are expected to increase further in the coming months as the lean season progresses and most roads, especially in remote areas, become impassable during the rainy season thus disrupting market supplies.

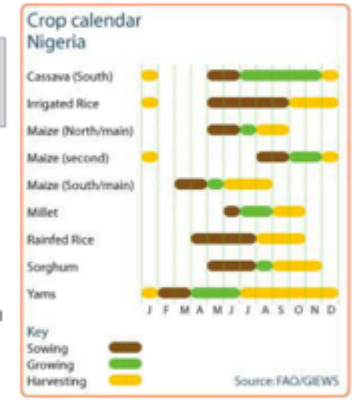
Improved food security in parts, but food emergency remains, especially among IDPs and

GIEWS global information and early warning system on food and agriculture

GIEWS Country Brief
Nigeria

Reference Date: 15-January-2013

FOOD SECURITY SNAPSHOT
- Abundant rains in the major producing regions led in 2012 to increased crop production at national level
- However, torrential rains from August through October caused flooding and damaged crops and livestock in several regions



Heavy rains damaged crops and livestock in several parts of the country in 2012

Harvesting of the 2012 cereal crops is almost complete. Several Nigerian states have been affected by torrential rains from August through October 2012 which led to substantial flooding and resulted in considerable human casualties and damage to crops and livestock. An inter-agency assessment carried out in November 2012 in 14 most affected states estimated that about 5.7 million animals have been killed and nearly 2 million hectares of crop land (rice, sorghum, maize, cassava and yam) lost, which may have a significant impact on the final crop production estimates. Rice and maize crops have been most affected.

Official estimates point to increased cereal production at national level

However, the joint field evaluation survey conducted by the National Agricultural Extension and Research Liaison Services (NAERLS) and the Federal Department of Agriculture in August-September 2012 estimated about 5 percent increase in cereal production compared to 2011. This joint assessment did not take into account the full impact of the flooding which lasted until October.

Cereal prices declined reflecting improved harvest positions

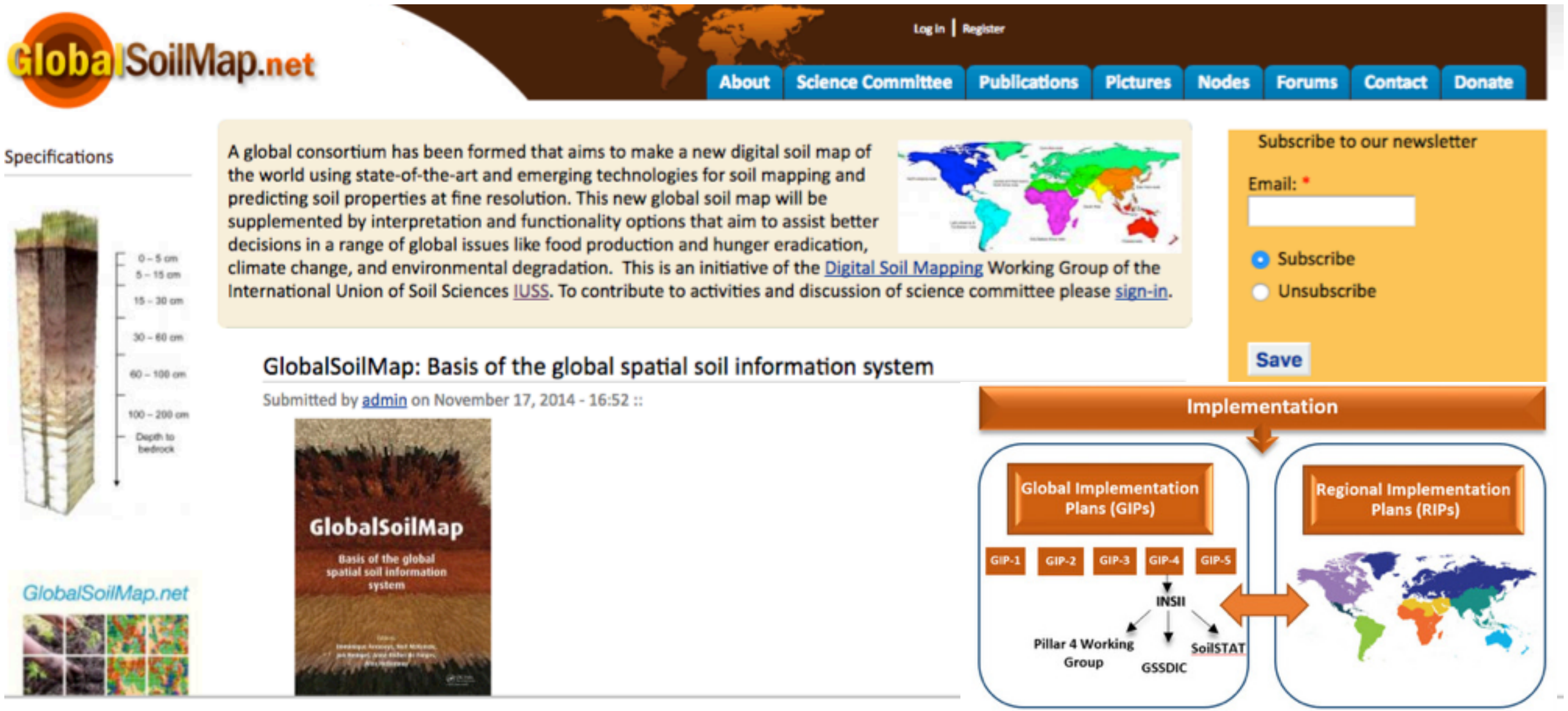
Reflecting ample supplies in Nigeria and across the subregion, markets are well supplied and cereal prices have declined significantly across the country. For example, following a peak in May 2012, maize prices dropped by over 25 percent in October before increasing slightly in November in Kano, in the northern part of the country.

GIEWS global information and early warning system on food and agriculture

FAO applications software availability according to 4 main types:

1. Agrometeorology utilities, including crop water balance models: **FAOINDEX**, **FAOMET** and **CROPWAT** (calculation of crop water requirements and irrigation requirements based on soil, climate and crop data.)
2. Agricultural and environmental databases: **CPSZ** and **AGDAT**;
3. Plants environmental databases: **ECOCROP**-1 and **ECOCROP**-2;
4. Soils databases and related applications: Digital Soil Map of the World and Derived Properties, Multi-lingual Soil Database **WORLD-SOTER**.

Databases examples:



WOCAT has developed a well-accepted framework for documentation, monitoring, evaluation and dissemination of SLM knowledge, covering all steps from data collection, to a database and to using the information for decision support. WOCAT tools provide a unique, widely accepted and standardised method of application.

Local level: Two comprehensive questionnaires on SLM Technologies and SLM Approaches for case study documentation have been developed and are constantly up-dated

National / regional level: The SLM Mapping methodology has been developed in collaboration with the LADA-project and providing a tool for assessing the spatial coverage of land degradation and conservation/ SLM.
Impact monitoring of degradation and SLM as well as the assessment of ecosystem services needs further efforts. WOCAT has established a taskforce dealing with these issues.

Up-scaling and decision support are growing demands. The question of how to achieve “maximum impact” through “least effort” is constantly being asked at the local, national and at the global level.

Flexible tools and methods: Further development of the global and national standard tools and methods with flexible options/ alternatives is important as needs are constantly changing.

Network partners have been involved in formulating the needs, and in testing and developing these tools.

New Index for direct application?

Biodiversity International is developing the **Agrobiodiversity Index** for **public** and **private** investors and **practitioners** to optimize the capacity of agrobiodiversity to improve food and nutrition security, human health and environmentally- friendly farming systems, now and in the future.

It is a consistent long-term tool to measure and manage agrobiodiversity across four dimensions: nutrition, production, seed systems and conservation.

It will help decision-makers – governments, investors, companies, farmers and consumers – ensure that food systems are more diverse and sustainable.

Agrobiodiversity is a critical component of a sustainable food system.

Without agrobiodiversity a food system cannot be sustainable

To manage agrobiodiversity, we need to measure it

What measures Agrobiodiversity Index?

It is comprised of a simple set of measures to:

- Apply across four inter-connected dimensions of diets, production, seed systems and conservation

- Use in different locations by different actors to provide insights into agrobiodiversity trends

- Provide key data for allocation of financial resources

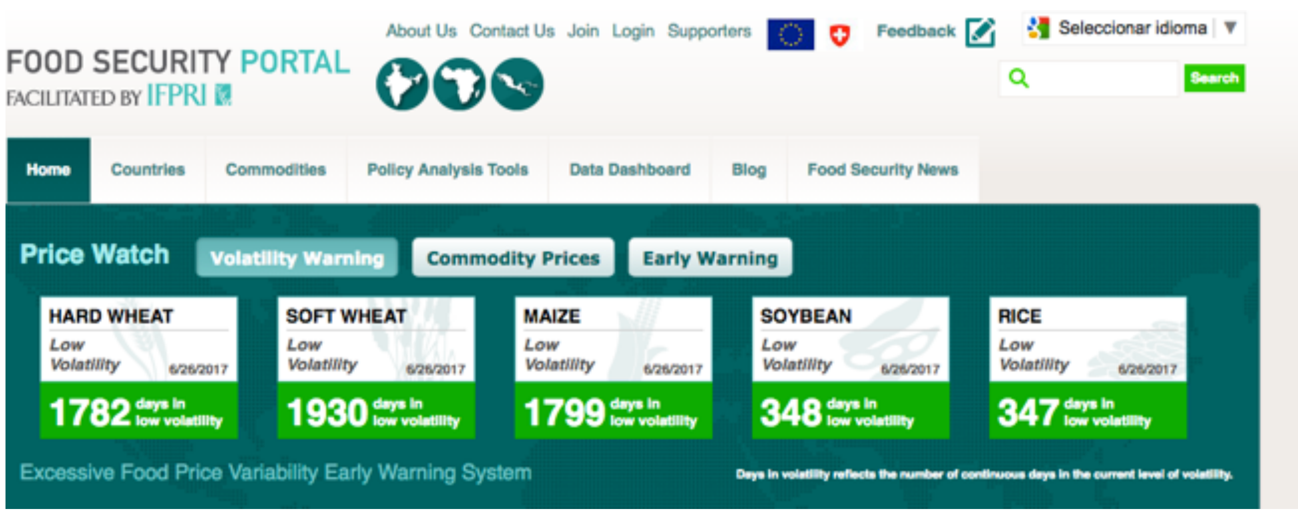
- Measure progress towards relevant targets in the Sustainable Development Goals and the Convention on Biological Diversity.

Crosstalk between environmental and economic interests

Profitability & Productivity

High Standards & Environmental sustainable land management

Agrobiodiversity and Sustainability



Final Remarks:

Underestimating the importance of agrobiodiversity, still neglecting the risks associated with poor agrobiodiversity.

Food systems are not fit-for-purpose and are not ready to handle environmental and socio-economic changes.

The consequences already happening:

1. Malnutrition affects one in three people on the planet.
2. Agriculture contributes around 24% of the world's greenhouse gas emissions.
3. Agriculture is the single largest user of fresh water on the planet.
4. 62% of IUCN globally threatened species are adversely affected by agriculture.
5. Global diets are increasingly homogenous
6. Just three species (rice, wheat and maize) provide more than 50% of the world's plant-derived calories.