ICARDA

Science for resilient livelihoods in dry areas

Dryland agrobiodiversity and food security under climate change challenge

icarda.org

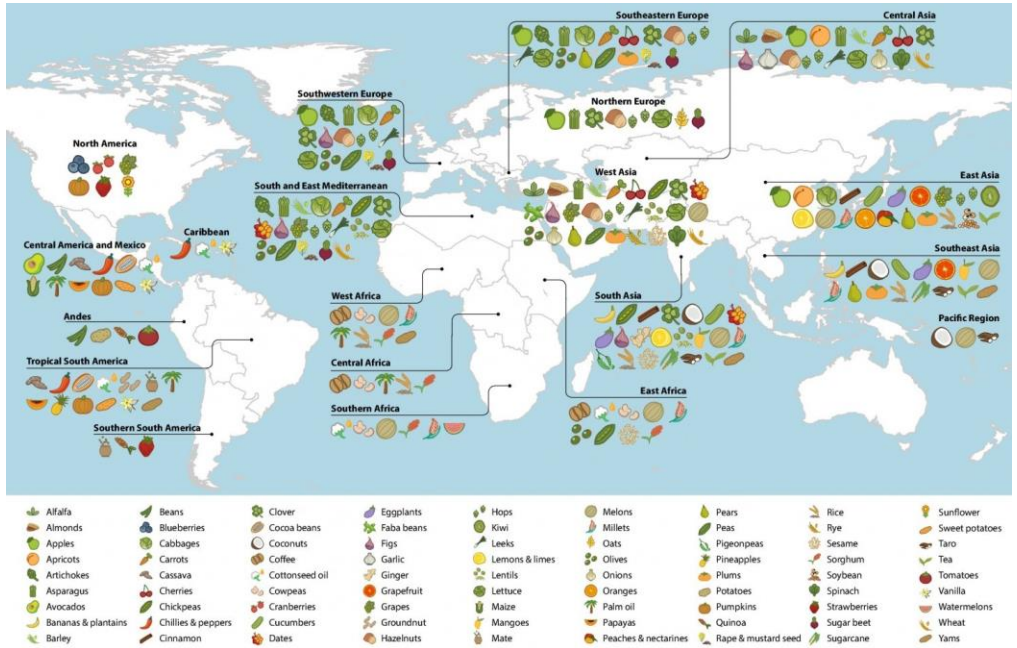
International Center for Agricultural Research in the Dry Areas

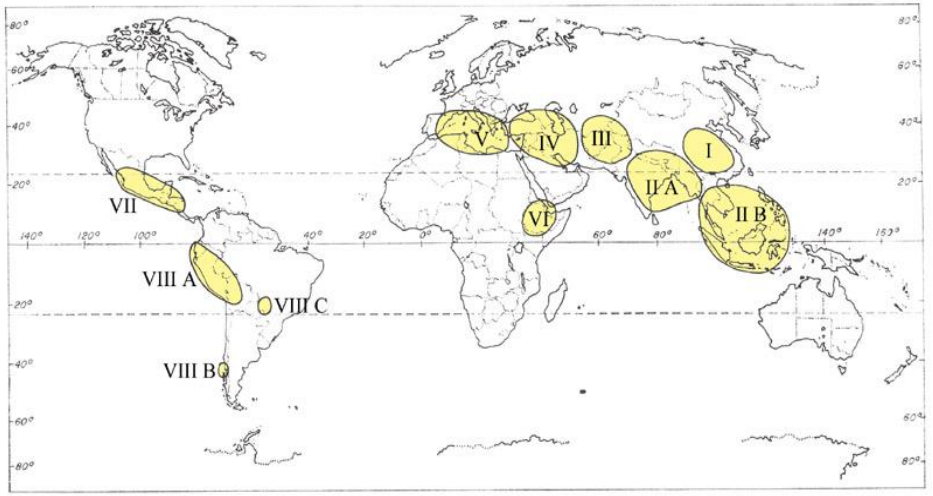
cgiar.org

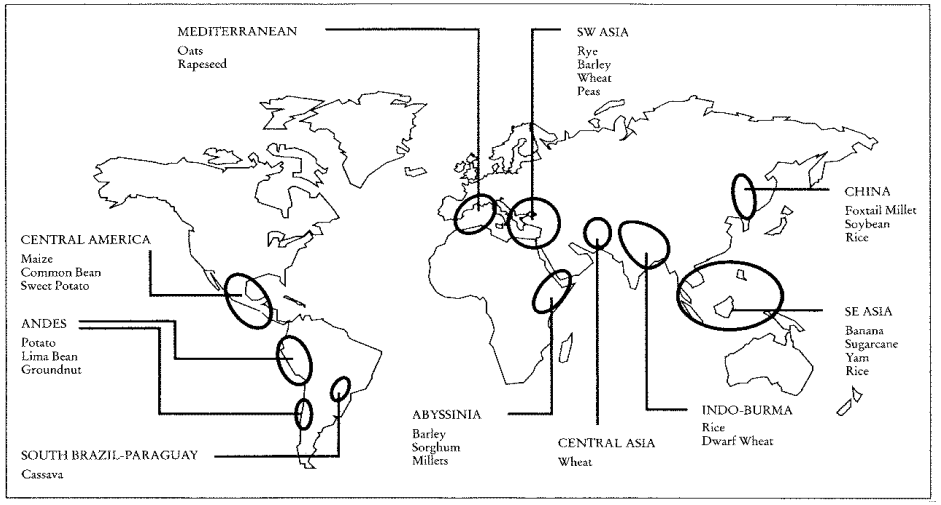
A CGIAR Research Center

CGIAR

Centers of diversity for crops of global significance

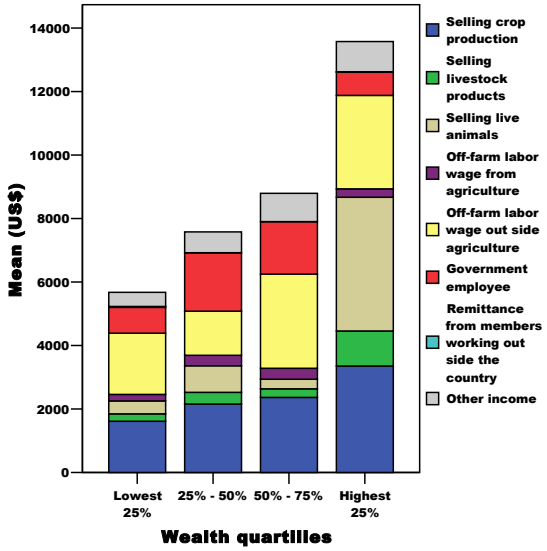


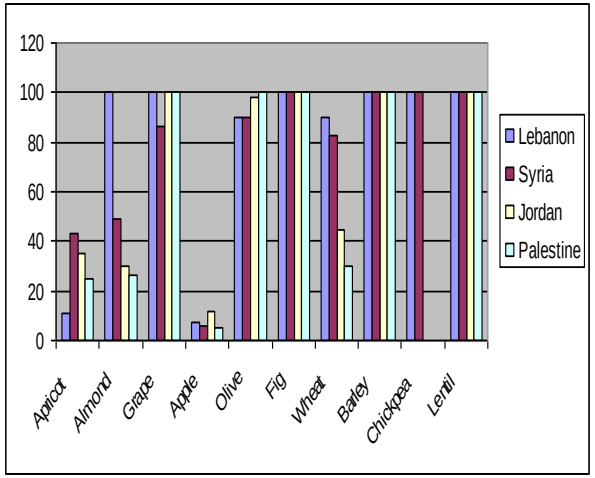




Importance of dryland agrobiodiversity

- Agrobiodiversity continues to support the livelihoods of rural poor in drylands and mountainous areas;
- Reservoir of valuable traits for breeding programs around the world including genes for adaptation to climate change adverse effects;
- Source of material for rehabilitation of degraded eco- and farming systems;
- Several other social and environmental benefits/services.





Activities of ex situ and in situ conservation approaches

Ex situ Conservation

Enrich with new accessions

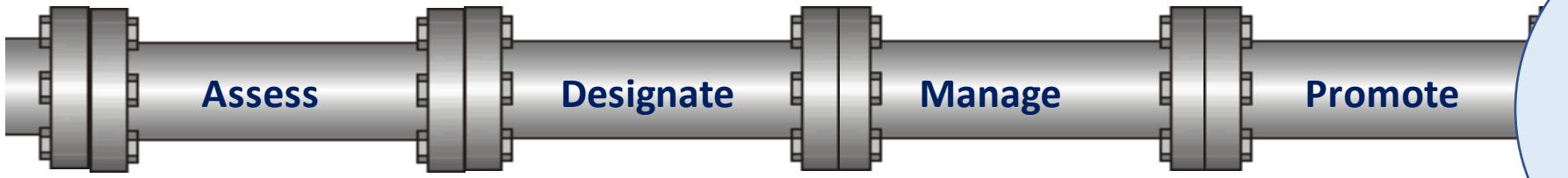
Use best practices

Identify valuable traits

Use in pre-breeding and breeding

Breeding efforts to release new varieties

In situ conservation



Status and Threats

Selection hot spots

Management Plan

Valorization Awareness

Empowerment of the custodians to conserve agrobiodiversity

Genetic Resources Activities at ICARDA

collect | conserve | characterize | evaluate/use | document | distribute

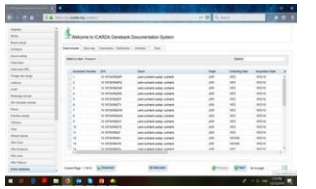
Second level Safety duplication at Svalbard

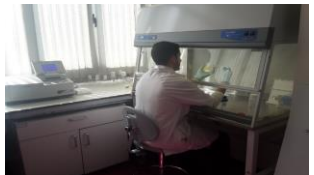
Safety duplication

Lebanon: Collections of faba bean, forage Lathyrus, and range species and crop wild relatives (90,000)

Morocco: Collections of cultivated species of barley, wheat, lentil and chickpea (150,000 acc.)

- **Genetic diversity, Collected, analyzed and conserved**
- **Gap analysis**
- **FIGS development**
- **Research on best practices**
- **Evaluation of germplasm**
- **Pre-breeding**





- ***In situ* conservation of agro-biodiversity**
- **Development of field guides**
- **Herbarium maintenance**
- **Rhizobium collection**
- **Participation to GRFA Global System**

Number of accessions originating from CAC countries

Country	No. of Accessions
Armenia	1317
Azerbaijan	1500
Georgia	1186
Kazakhstan	550
Kyrgyzstan	216
Tajikistan	2250
Turkmenistan	568
Uzbekistan	929
Total	8516

Armenia	Cereals	741
Armenia	Food legumes	132
Armenia	Forage & range	72
Armenia	Forage legumes	372
Azerbaijan	Cereals	979
Azerbaijan	Food legumes	263
Azerbaijan	Forage & range	40
Azerbaijan	Forage legumes	218
Georgia	Cereals	529
Georgia	Food legumes	147
Georgia	Forage & range	164
Georgia	Forage legumes	346
Kazakhstan	Cereals	383
Kazakhstan	Food legumes	20
Kazakhstan	Forage & range	84
Kazakhstan	Forage legumes	63
Kyrgyzstan	Cereals	94
Kyrgyzstan	Food legumes	12
Kyrgyzstan	Forage & range	49
Kyrgyzstan	Forage legumes	61
Tajikistan	Cereals	1206
Tajikistan	Food legumes	440
Tajikistan	Forage & range	141
Tajikistan	Forage legumes	463
Turkmenistan	Cereals	373
Turkmenistan	Food legumes	31
Turkmenistan	Forage & range	47
Turkmenistan	Forage legumes	117
Uzbekistan	Cereals	507
Uzbekistan	Food legumes	330
Uzbekistan	Forage & range	4
Uzbekistan	Forage legumes	88

Potential for sources of valuable traits from CAC region

Sunn pest – first time in bread wheat

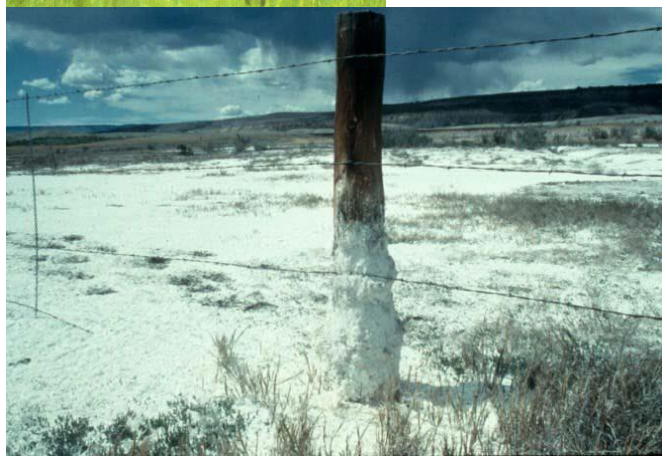
RWA resistance – new gene indicated

Hessian fly - resistance to Syrian bio-type

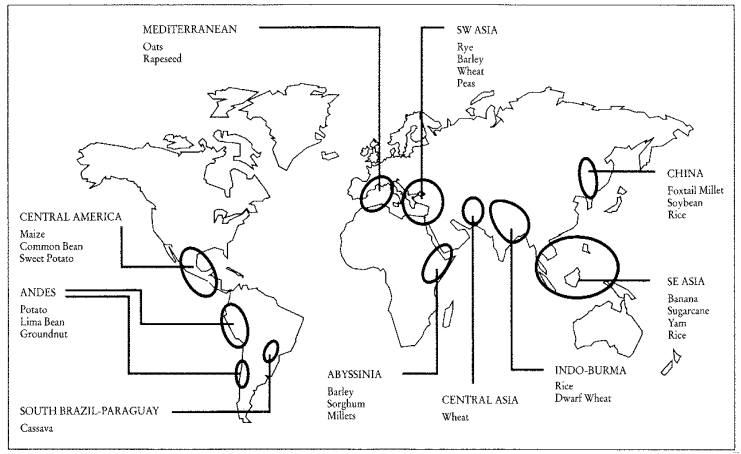
Powdery mildew –new funcitonal genes

Salinity and drought tolerance

Cold tolerance in food legumes



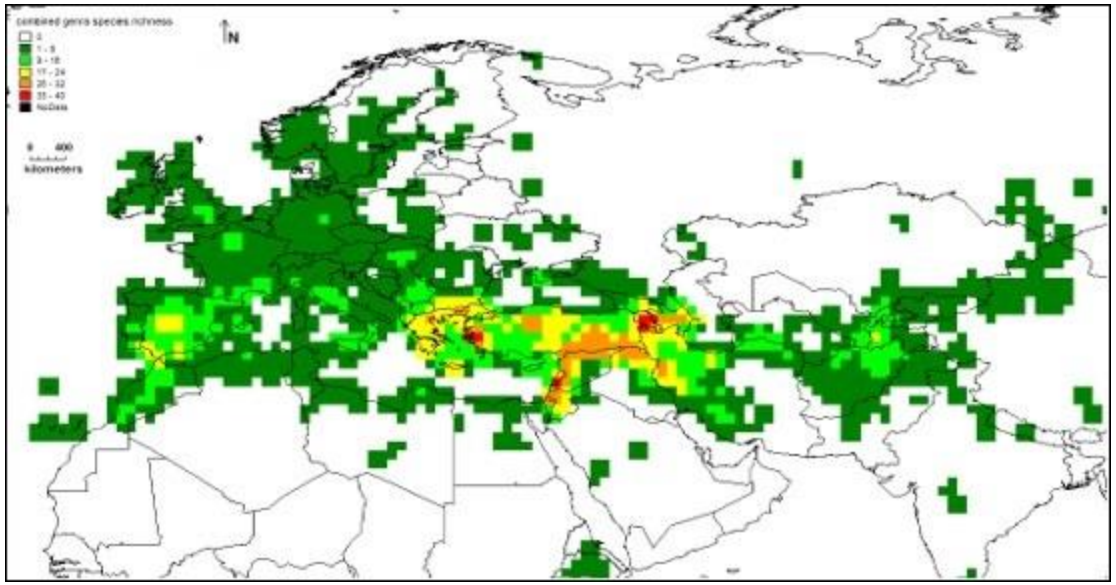
ICARDA efforts on promoting genetic resources conservation in CAC region



Precipitation change projections in Central Asia and Xinjiang Province in 2080/2099, according to the average of 21 GCM models under greenhouse gas emission scenario A1b (IPCC, 2007)

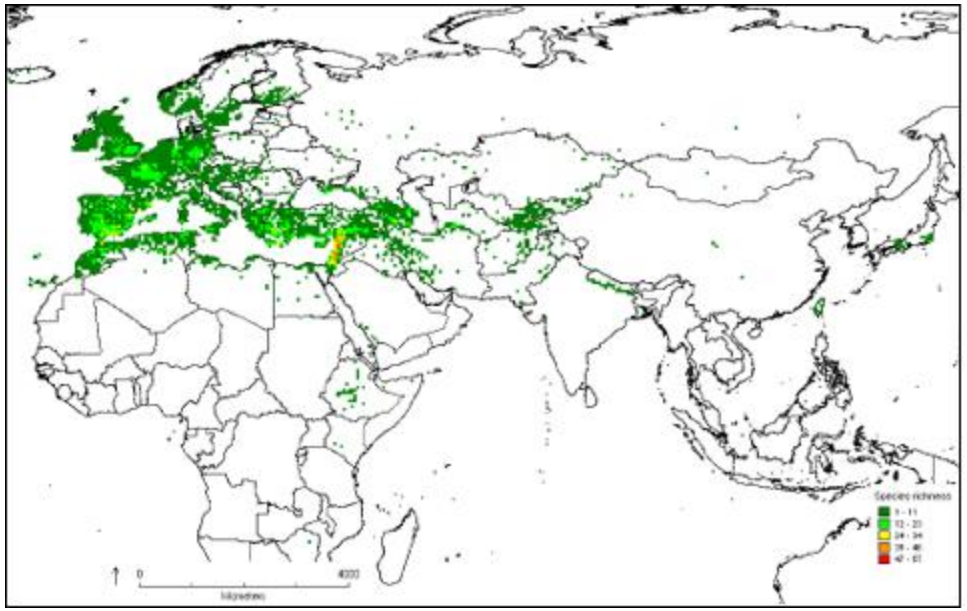
Kazakhstan
Kyrgyzstan
Tajikistan
Turkmenistan
Uzbekistan
Armenia
Azerbaijan
Georgia

Mapping of species richness for priority species



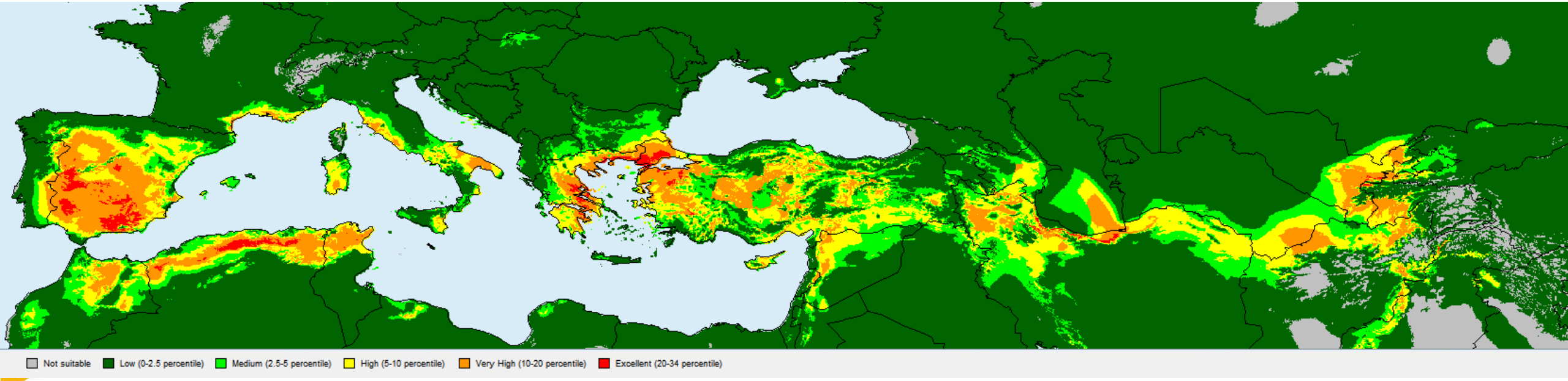
Aegilops, Avena, Hordeum, Secale and *Triticum* species

Cicer, *Lathyrus*, *Lens*, *Medicago*, *Pisum* and *Vicia* species

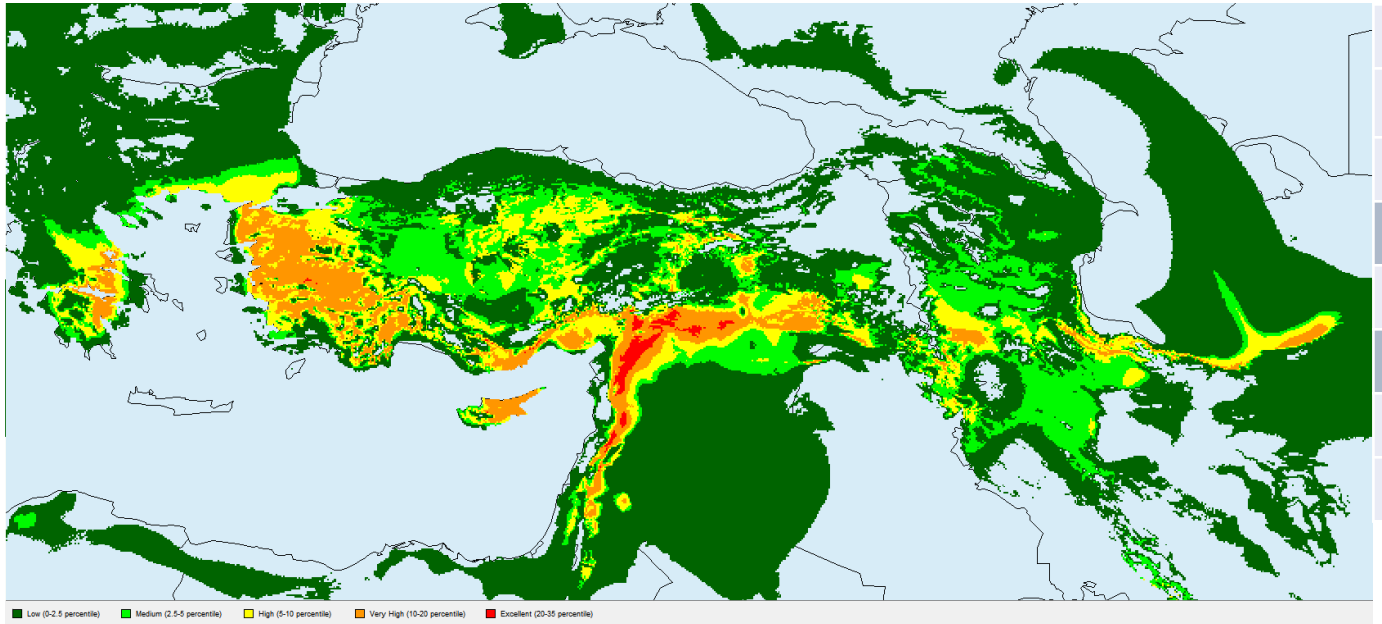


Sources: Katherine Whitehouse, Holly Vincent, Ahmed Amri and Nigel Maxted (2012) and Maxted et al (2010)

Niche Model for *Aegilops* Distribution



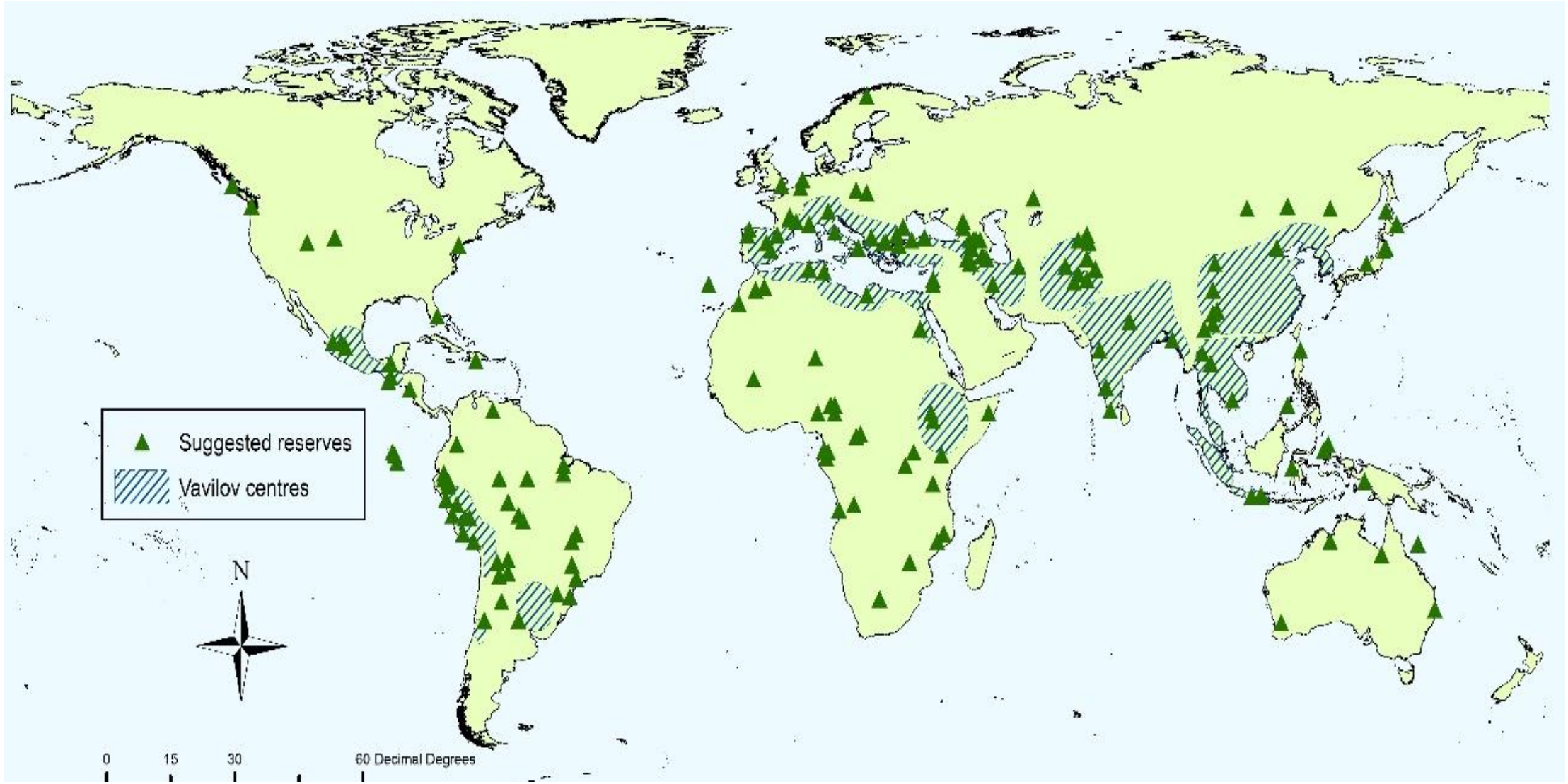
Niche Model for Wild *Triticum* Distribution



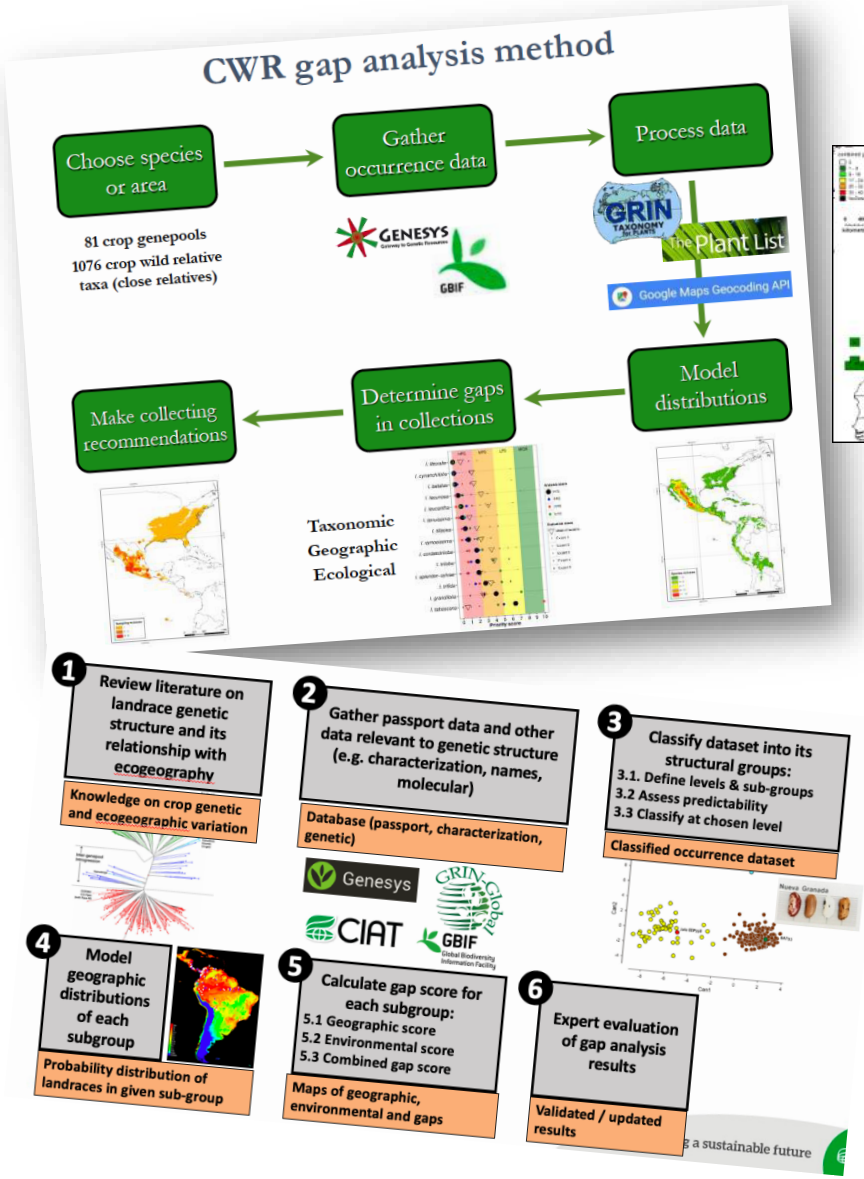
Number of species and accessions of Aegilops

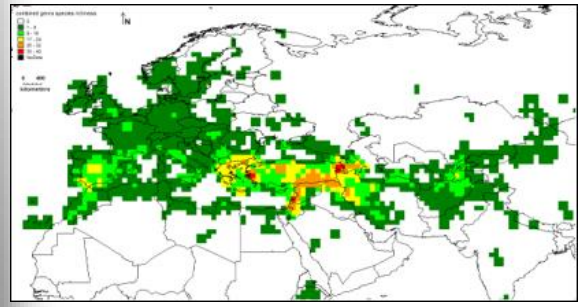
Country	species	accessions	Concerns
Afghanistan	7	510	Unique
Armenia	12	1830	Safety
Azerbaijan	18	1793	Unique
Tajikistan	6	342	Unique
Turkey	21	3932	Unique
Turkmenistan	13	356	Unique
Uzbekistan	14	327	?

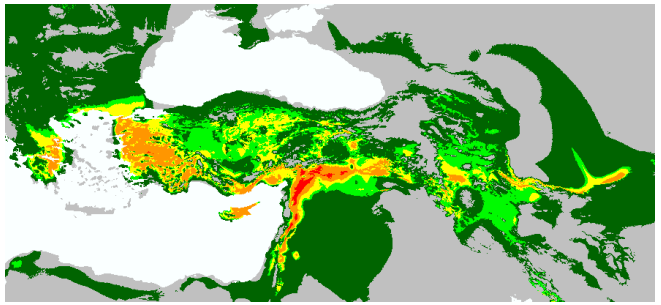
Priorities for global in situ CWR conservation (Vincent et al., 2015).



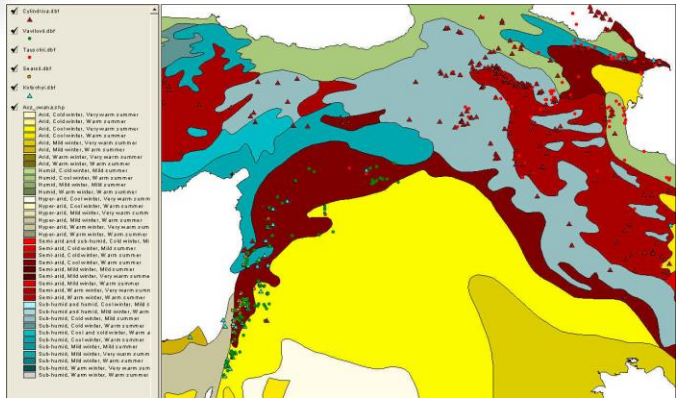
Novel GIS-based methods to predict gaps in collections



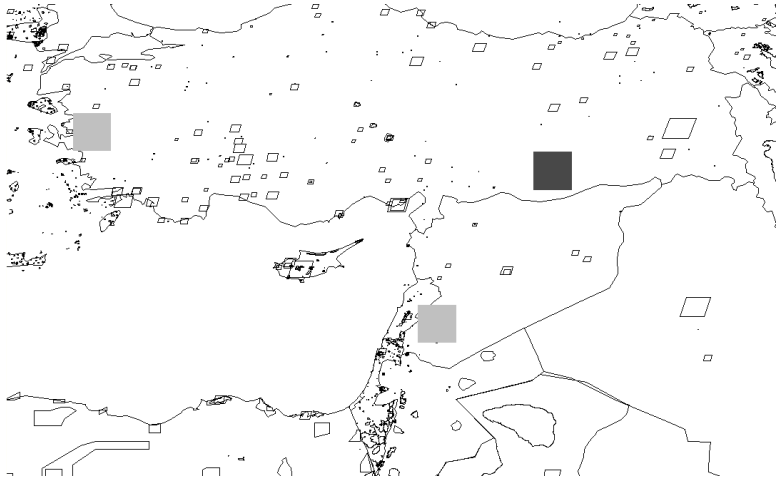




Gaps based on geographic distribution in *Aegilops* and wild *Triticum*



Gaps based on adaptive traits

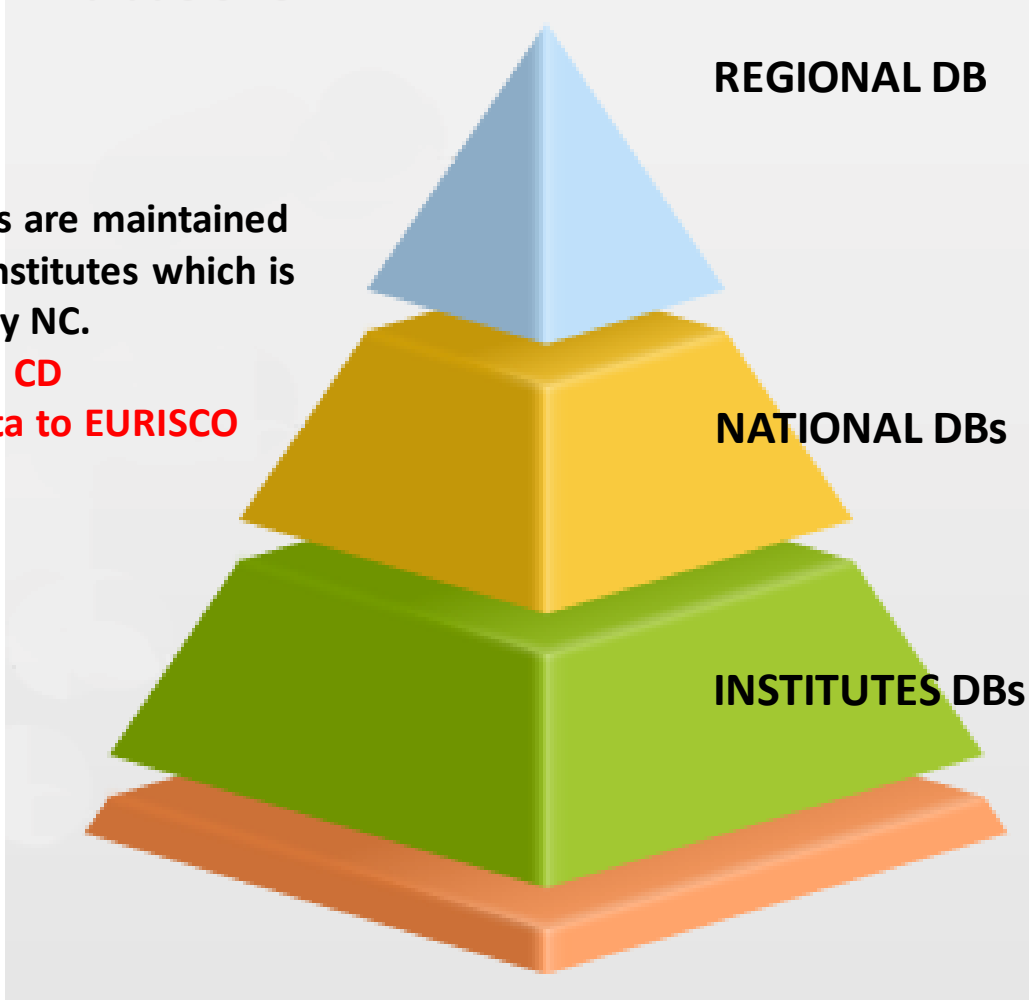


In situ conservation gaps

Documentation

Developed in 2007
Maintained by ICARDA
Updated by National Focal Point
Available on CD

National DBs are maintained by leading institutes which is appointed by NC.
Available on CD
Provides data to EURISCO



REGIONAL DB	No of accessions
Armenia	5,256
Azerbaijan	8,245
Georgia	2,227
Kazakhstan	45,530
Kyrgyzstan	1,010
Tajikistan	2,940
Turkmenistan	999
Uzbekistan	58,535
TOTAL	**124,742**

Institutional, National and Regional Databases require regular update and change to web-facilitated version developed by ICARDA

Potential areas for strengthening collaboration

- Undertake gap analysis and joint collecting missions;
- Identification of biodiversity hot spots for in situ characterization including for fruit trees;
- Review of genetic resources conservation activities towards the development of reliable genebanks and national strategies for conservation and sustainable use of agrobiodiversity;
- Enhancing genebanks documentation systems by migrating to the new web-based genebank documentation system of ICARDA;
- Training on best practices for conservation and use of genetic resources and management of genebanks including;
- Joint evaluation of genetic resources;