







Plant genetic resources – located mainly in developing countries



The centres of origin



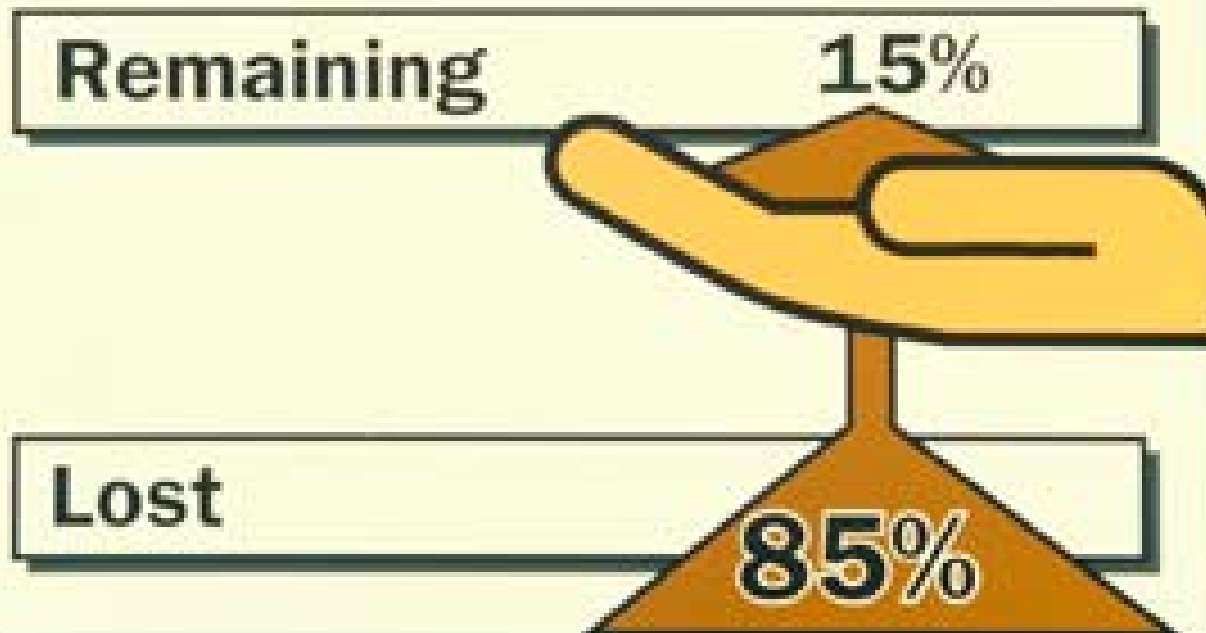
VARIABILITY IN SORGHUM GERMPLASM





Crop Genetic Erosion in the Field

Wheat-Middle East



Crop Genetic Erosion in the Field

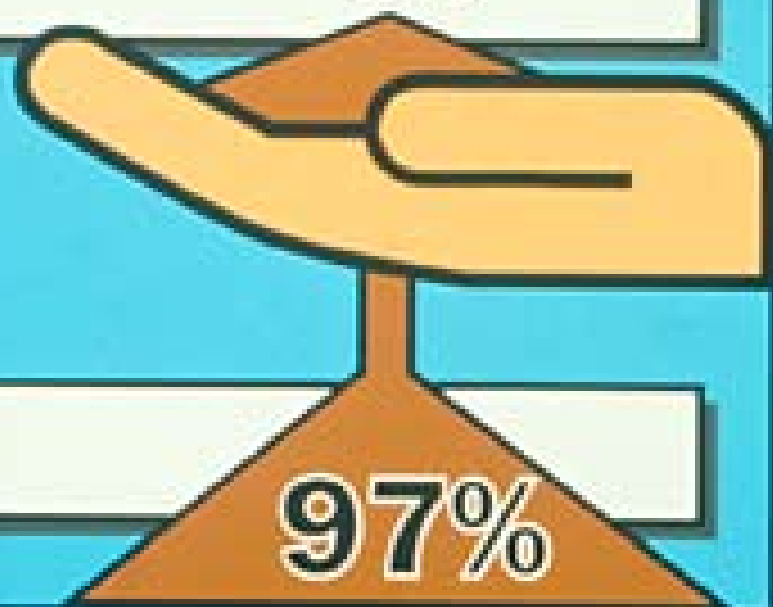
Vegetable and Fruit Varieties-USA

Remaining

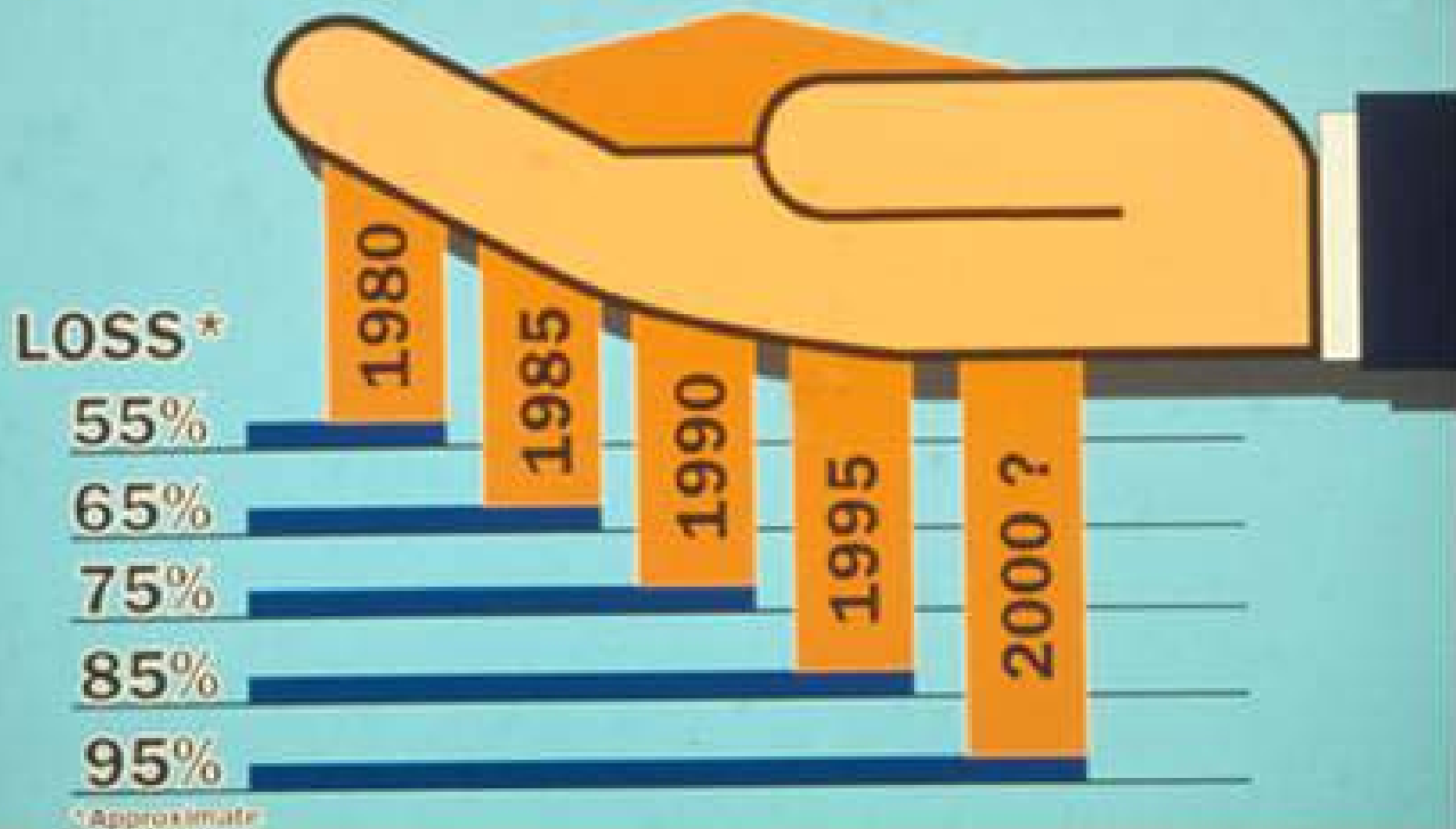
3%

Lost

97%



Crop Genetic Erosion in the Field



World Dependence on 20 Major Food Crops



**Banana, Barley, Beans, Cassava, Groundnut, Maize, Millets, Oats, Oil Palm, Peas, Potato
Rapeseed, Rice, Rye, Sorghum, Soyabean, Sugarcane, Sweet Potato, Wheat, Yam**

Regional Dependence on World's 20 Major Food Crops

North America, Europe & Australia's
Dependence:



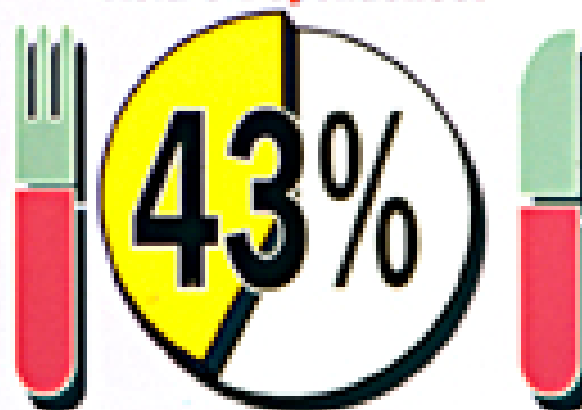
Africa's Dependence:



Latin America's Dependence:



Asia's Dependence:



Estimated range of dependency (%) for each EURAGRI member country from genetic resources from elsewhere

EURAGRI Member Countries	Minimum	Maximum
Austria	80.94	97.54
Belgium / Luxembourg	82.26	97.73
Bulgaria	88.17	99.36
Cyprus	78.93	90.19
Czech Republic	87.87	97.40
Denmark	81.18	91.96
Estonia	86.66	95.13
Finland	88.96	98.99
France	75.55	90.67
Germany	83.36	98.46
Greece	54.24	68.94
Hungary	86.85	98.04

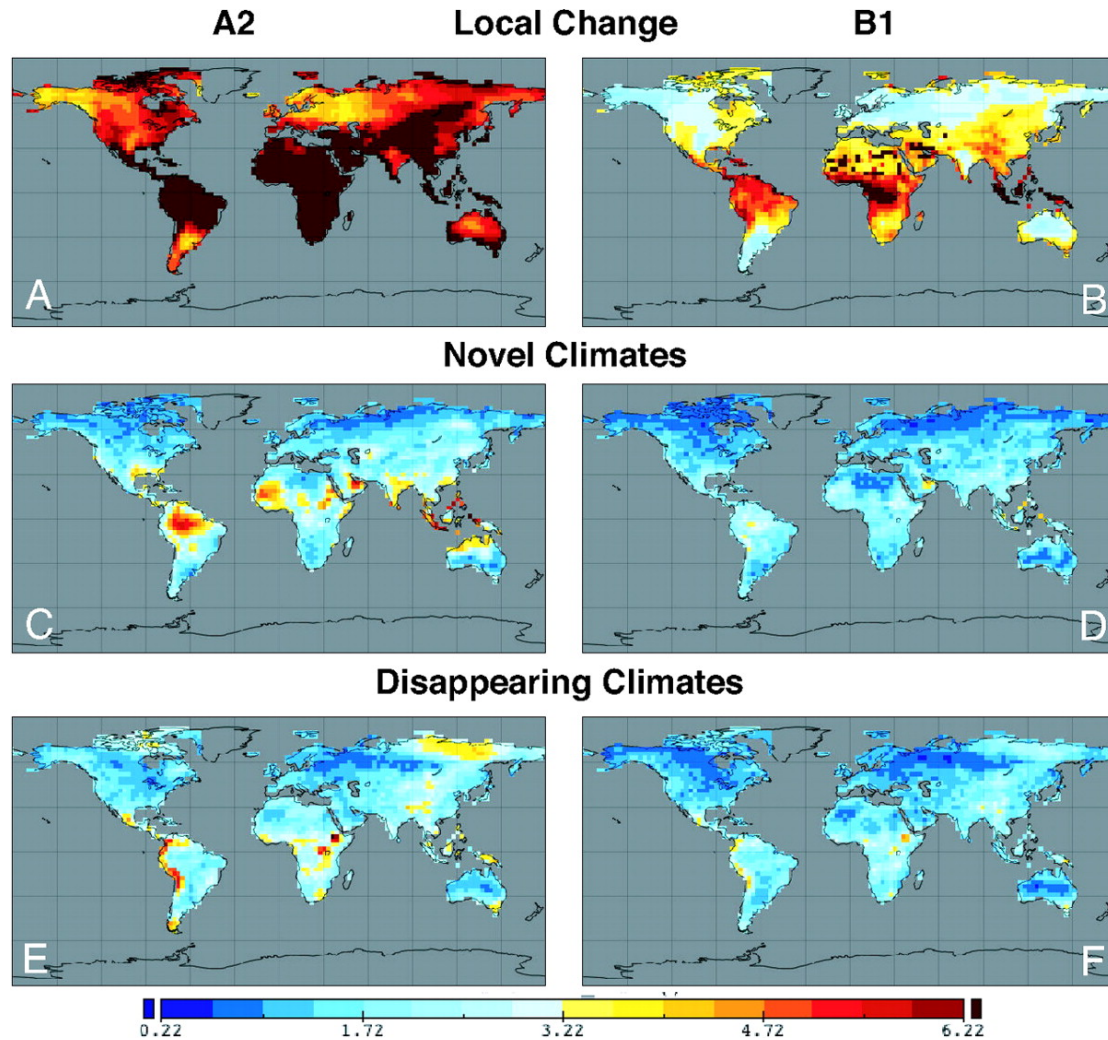
EURAGRI Member Countries	Minimum	Maximum
Ireland	84.59	99.45
Italy	70.82	81.21
Latvia	81.15	90.42
Lithuania	91.66	97.87
Malta	84.35	98.15
Netherlands	87.94	98.49
Norway	90.67	98.94
Poland	90.06	99.32
Portugal	78.86	90.88
Romania	90.34	99.44
Slovak Republic	85.10	96.60
Slovenia	89.99	98.81
Spain	71.41	84.84
Sweden	88.79	98.70
Switzerland	81.79	98.43
United Kingdom	89.23	99.10
AVERAGE	83.27	94.82



The Habsburg Emperor Rudolf II as Vertumnus,
by Giuseppe Arcimboldo, 1591.
Skokloster Castle, Sweden



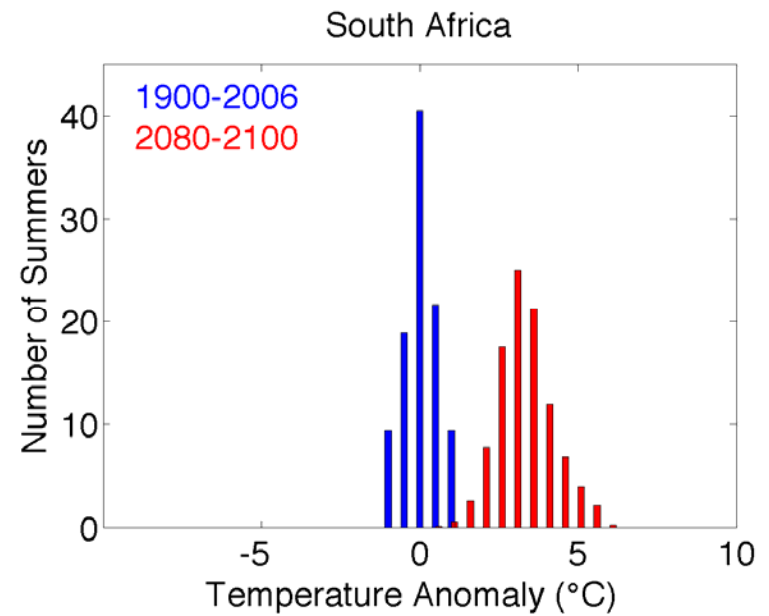
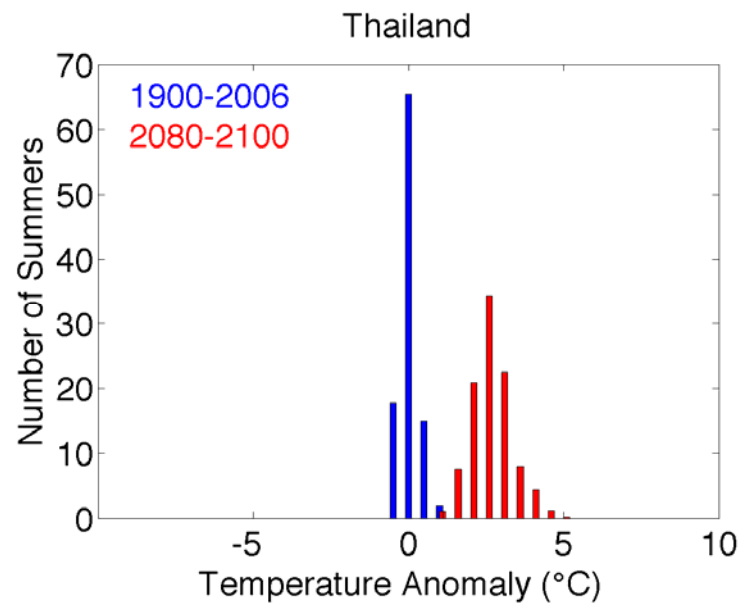
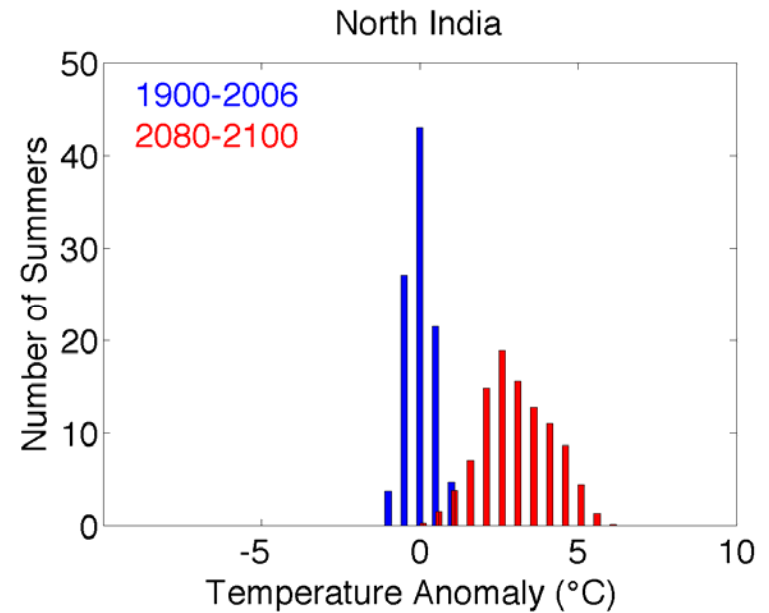
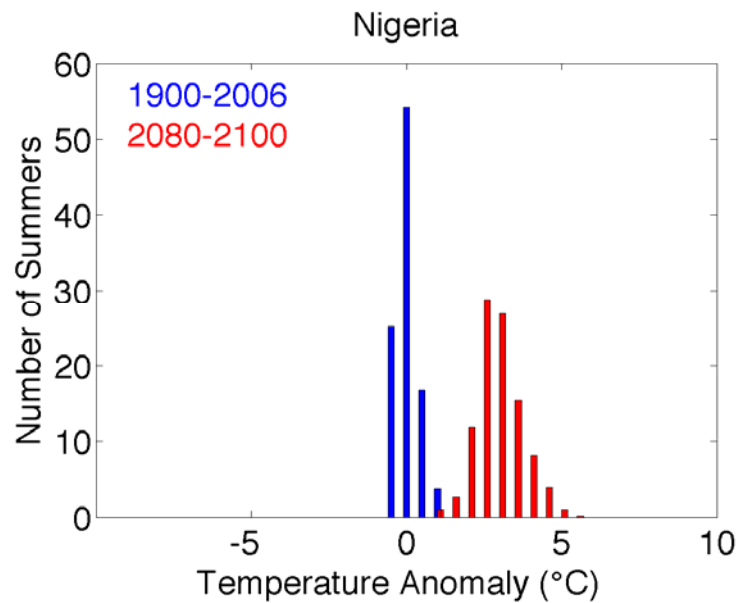
New climates and lost climates



Source: Williams J. W. et.al. PNAS 2007;104:5738-5742

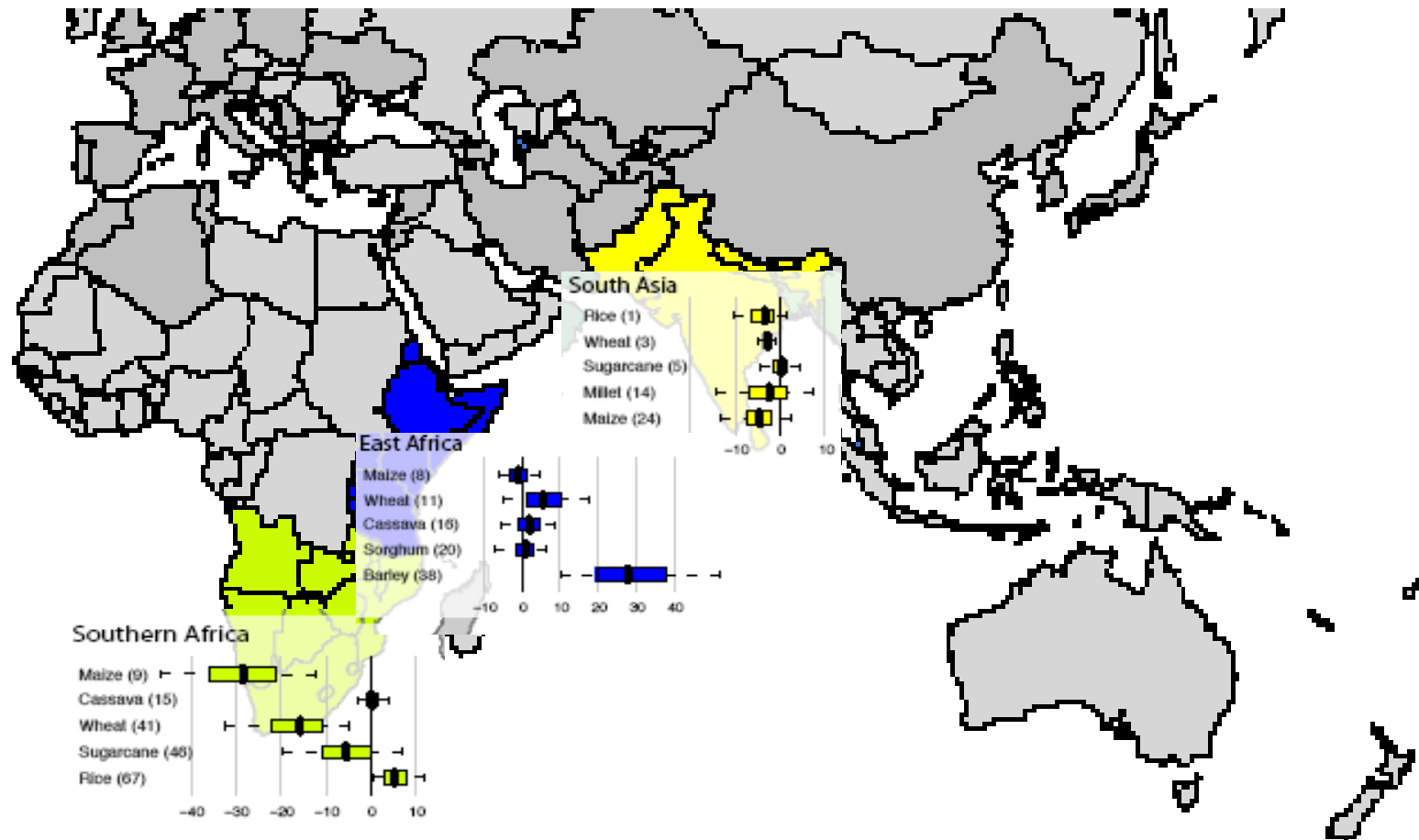


Magnitude of climate change





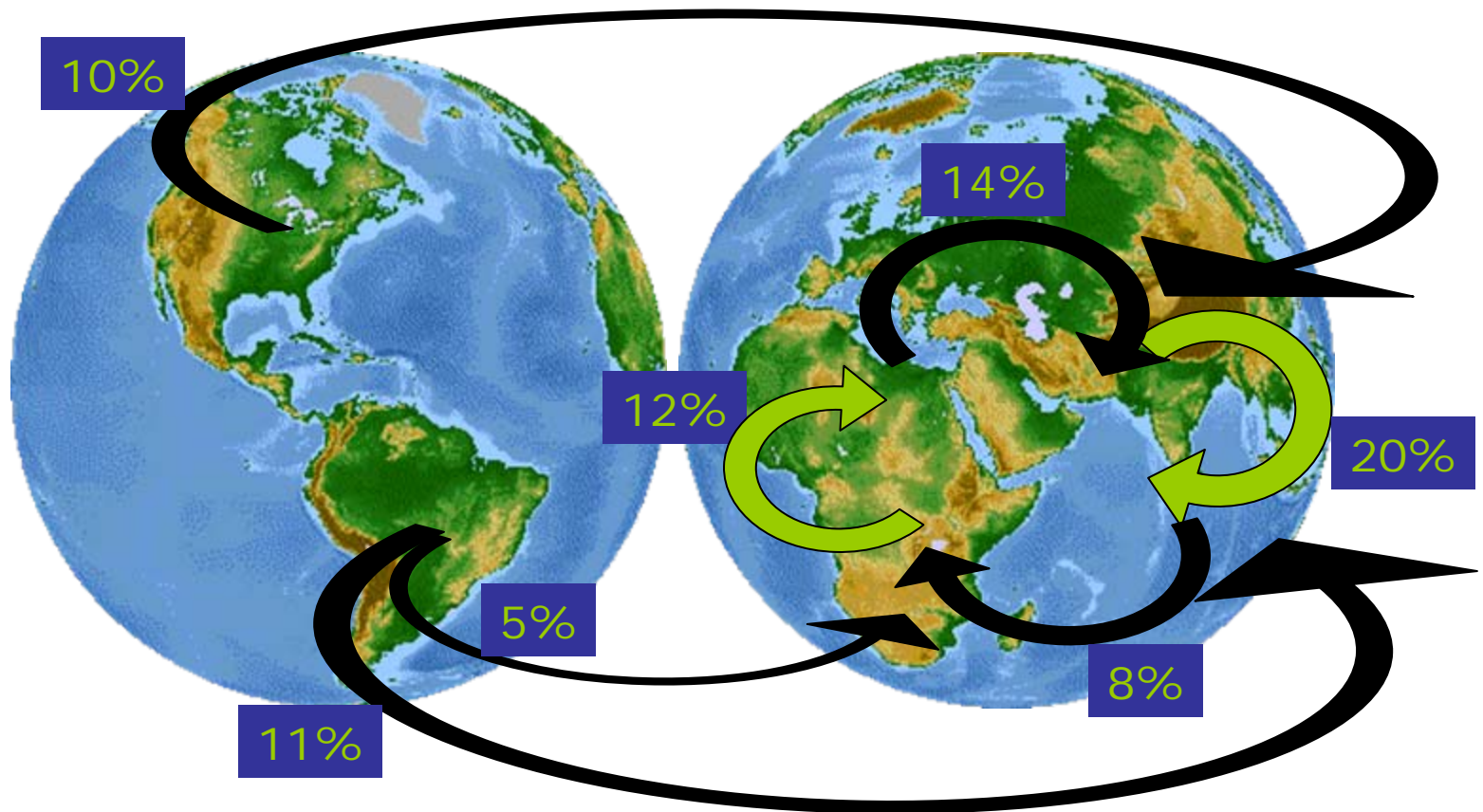
Agriculture projections



Adapted from Lobell et al., 2008



The importance of resource movement and the International Treaty on Plant Genetic Resources

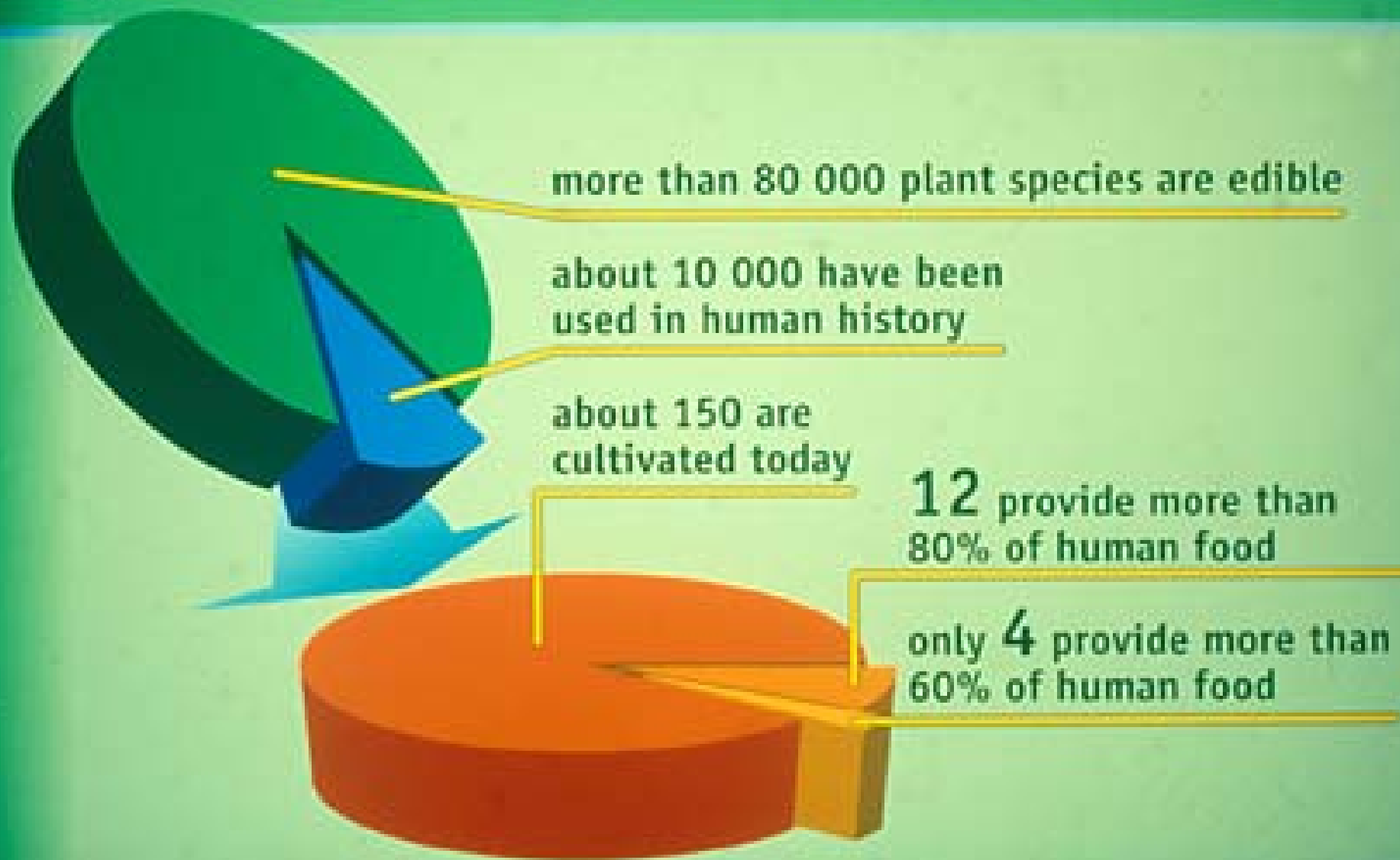


Germplasm flows: ICRISAT Groundnut

Geneflow

- Climate change exceeds the adaptive capacity of the currently used genetic portfolio
- Currently underutilized species / breeds may become more attractive, and species substitution will be an option.

The context – limited crop species









Climate change and genetic resources

- **Climate change will accelerate genetic erosion**
- **Genetic resources are crucial to buffer Climate Change effect in food production**
- **It will drastically increase countries' dependency on foreign GRFA**

Challenges and recommendations

- Scientific and technical challenges
- International cooperation
- Legal and institutional

Scientific and technical challenges

- Magnitude of changes requires significant adaptation.
- Massive extinction? Need to collect conserve endangered GRFA
- New genetic diversity within and between species, needed.
- Novel and unstable production environments would require different breeding approaches.
- Increasing need for adaptability and resilience, properties that to date have not been embedded in traditional breeding
- Potential of underutilized crops and other promising species.
- Role of new and traditional technologies in coping with Climate Changes



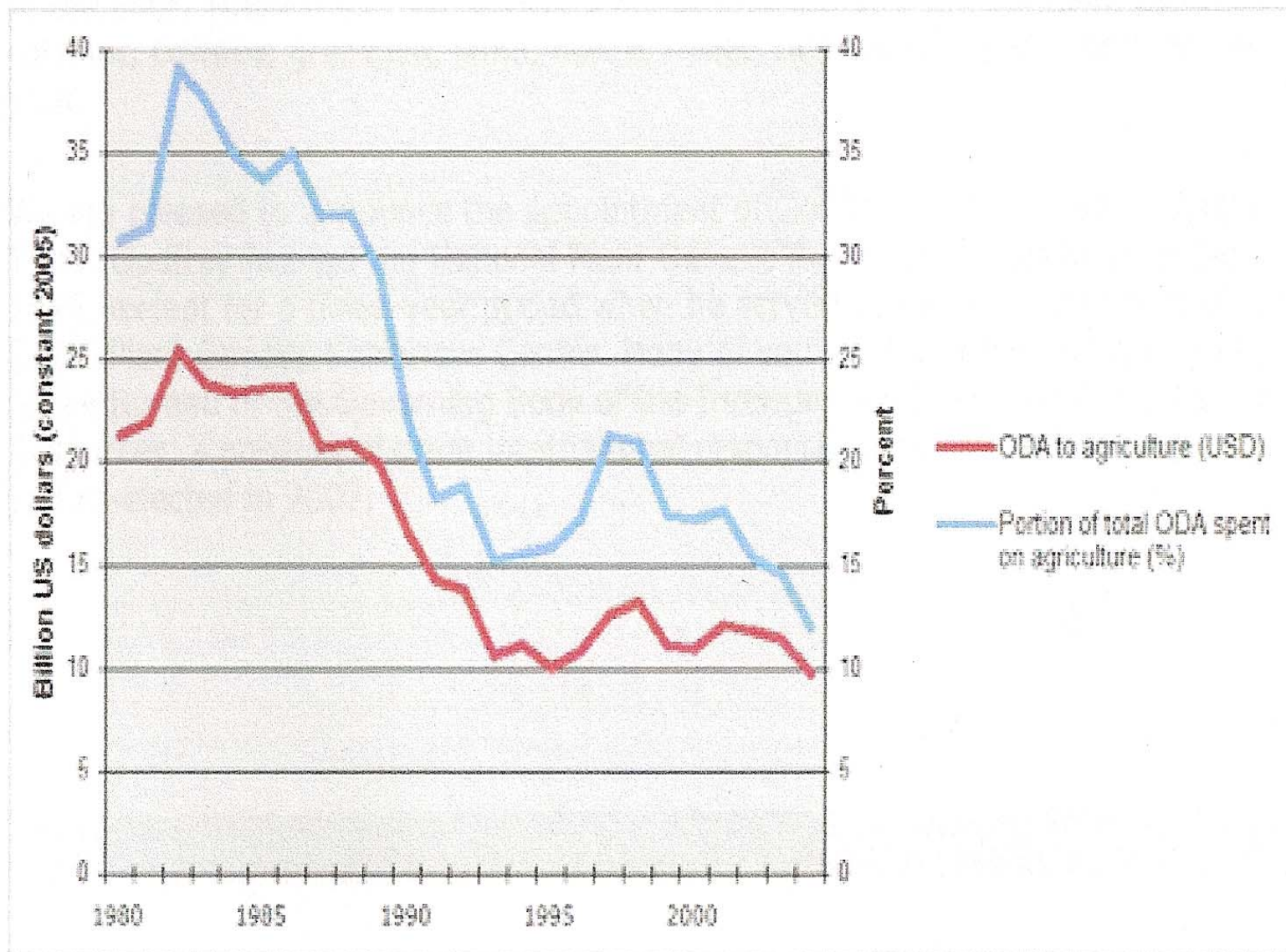




International cooperation challenge

- No country is self-sufficient in terms of genetic resources.
- The European countries are amongst the most depending ones on foreign genetic resources.
- Climate changes will drastically increase countries' dependency on foreign GRFA and therefore the need for international cooperation

Figure 2. The Decline in Overseas Development Assistance (ODA) to Agriculture



Source:

Legal and institutional challenges

Legal agreements that could be reviewed:

- **The International Treaty of Plant Genetic Resources for Food and Agriculture**
- **The agreements dealing with intellectual property rights, such as the UPOV and the WTO (e.g. TRIPs art. 27.3.b)**
- **The Convention on Climate Change:** More proactive action to reduce the loss of genetic diversity due to climatic events, and to promote universal access and use of this diversity.
- **The Convention of Biological Diversity:** Ongoing negotiations of its International Regime on Access and Benefit Sharing.

Conclusion

- To deal with climate changes in a global and interdependent world is not only a tremendous challenge, but also a unique opportunity to build up an equitable and sustainable world in harmony with the environment