

Conservation of Genetic Resources



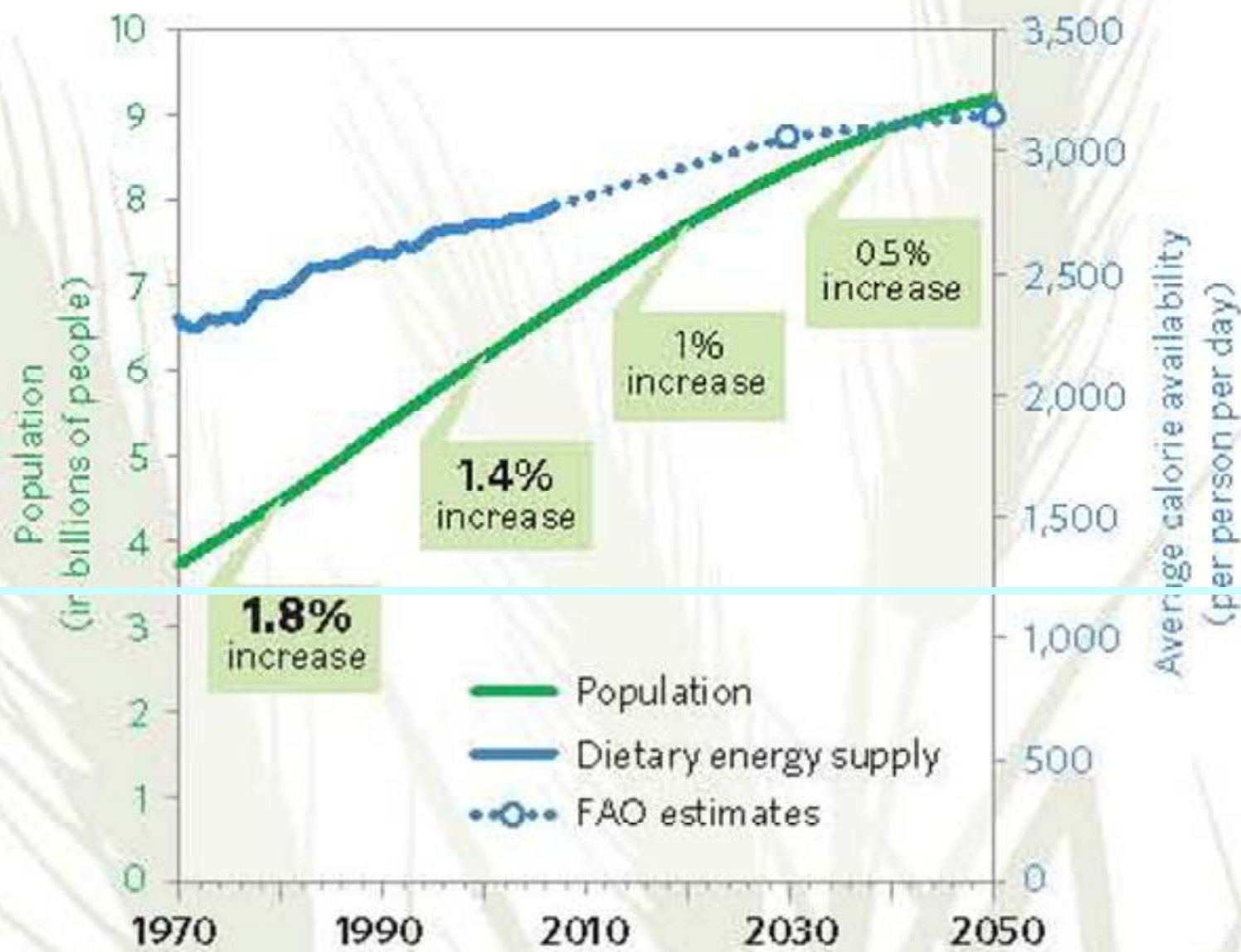
September 13, 2010, Saskatoon, SK, Canada
Henry L. Shands

Biodiversity Overview

- 1.8 million species identified out of some estimated 100 million
- Biodiversity under threat:
 - 70% plants (current plant extinction rate about 100 times long-term rate of 1 species/M/year)
 - 35% invertebrates
 - 21% known mammals
 - 28% reptiles
 - 37% fresh water fishes

Plant Genetic Resources provide:

- Food
- Feed for our animals
- Fuel
- Fiber
- Flowers

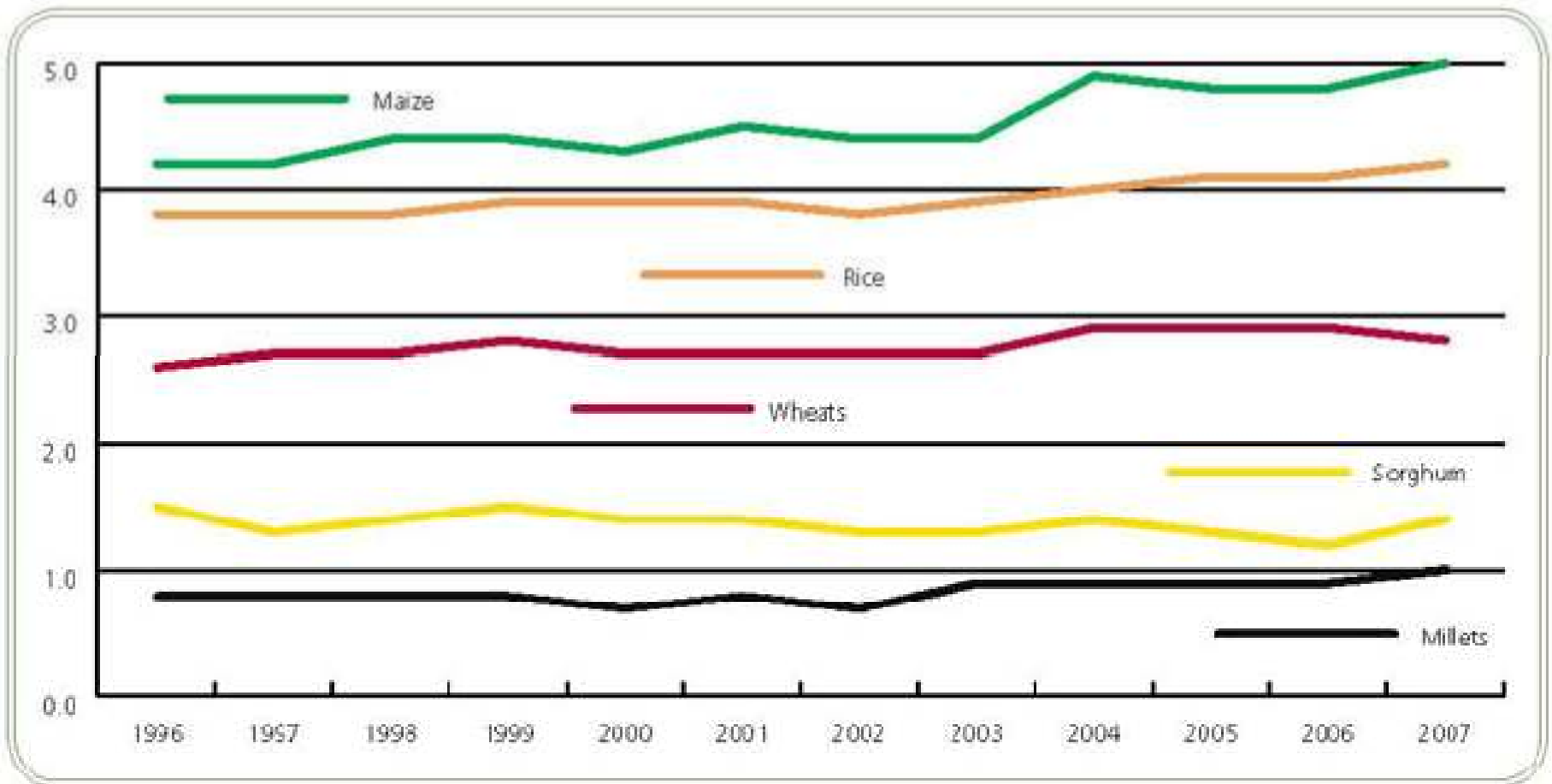


Global Cereal Yields

(Tweeten and Thompson. 2009)

Year	Percent Annual Increase
1961	3
1975	2
2000	1.4
2010	Plateaued?

FIGURE A4.1
Global yields of cereal crops (million tonnes per hectare)



Source: FAOSTAT 1996/2007

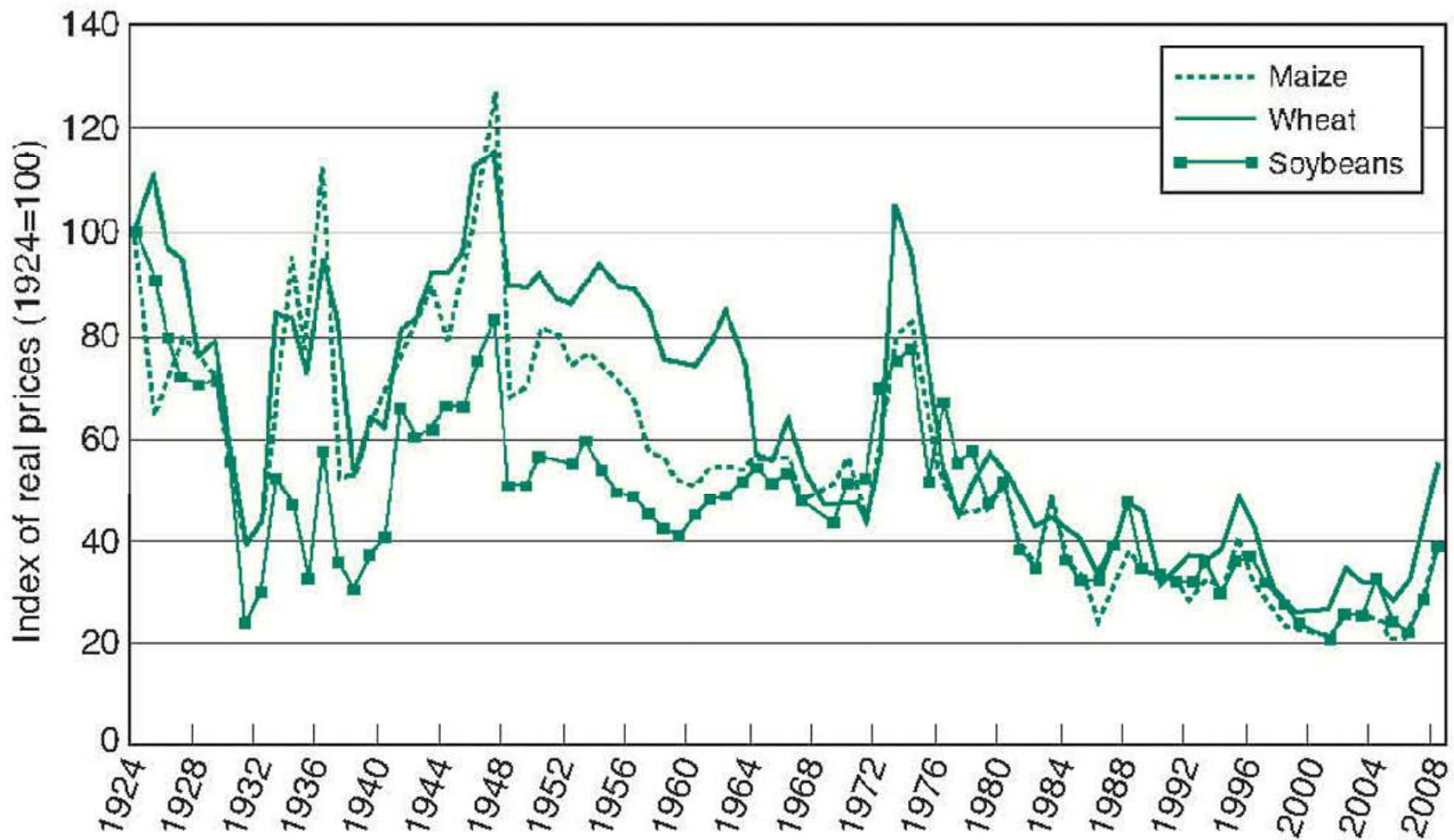


Figure 1. Real U.S. prices of maize, soybeans, and wheat, 1924–2008 (Alston, Beddow, and Pardey 2008).

World price scenario for 2005-7

Source: FAO

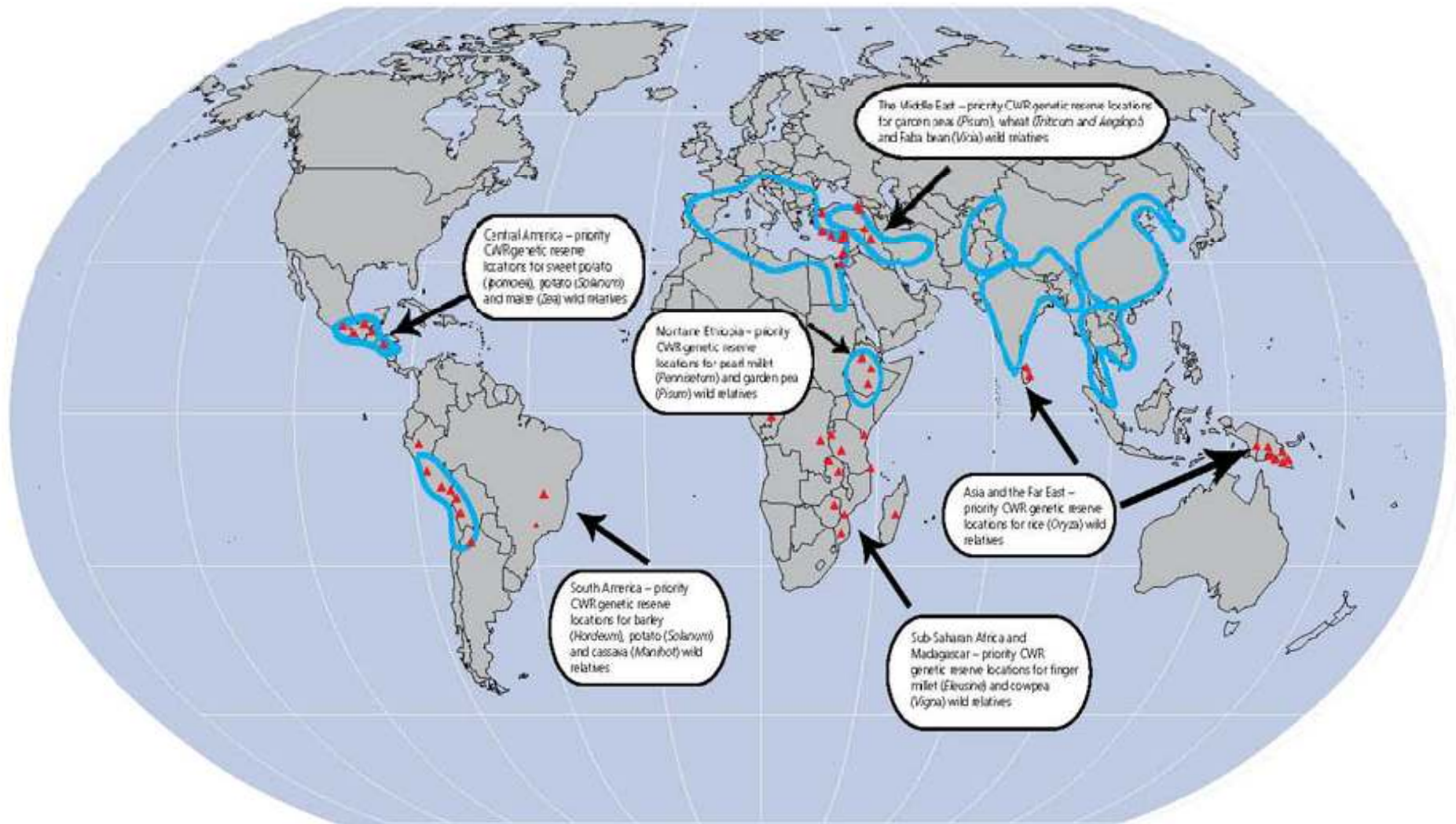
Commodity	Price change (%)
Maize ==ethanol	80
Rice == Asian production	25
Sugar	0
Wheat == offset others	70

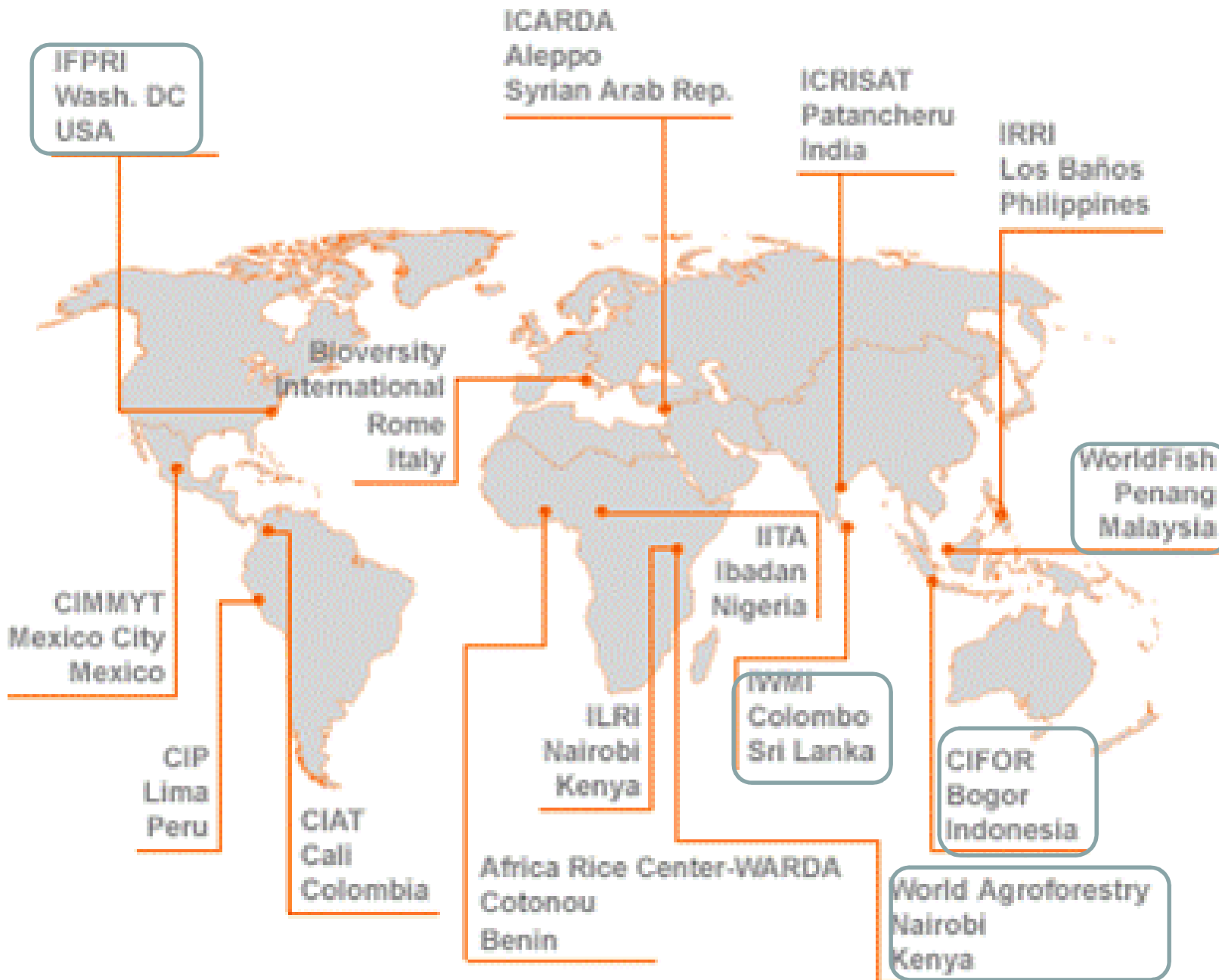


CBOT, on-line September 6, 2010

FIGURE 1.1

Global priority genetic reserve locations for wild relatives of 12 food crops





- **The Treaties**
 - **U.N. Convention on Biological Diversity (CBD) 1992 and Biosafety Protocol**
 - **FAO International Treaty on Plant Genetic Resources for Food and Agriculture 2004 (ITPGRFA)**
 - **FAO (currently discussing on domestic animal genetic resources)**
- **State of the World's Plant Genetic Resources (FAO)**
 - **National programs and Botanical Gardens**
 - **International Agricultural Research Centers (IARCS)**
 - **Consultative Group on International Agricultural Research (CGIAR)**
 - **Svalbard Global Seed Vault (SGSV)**

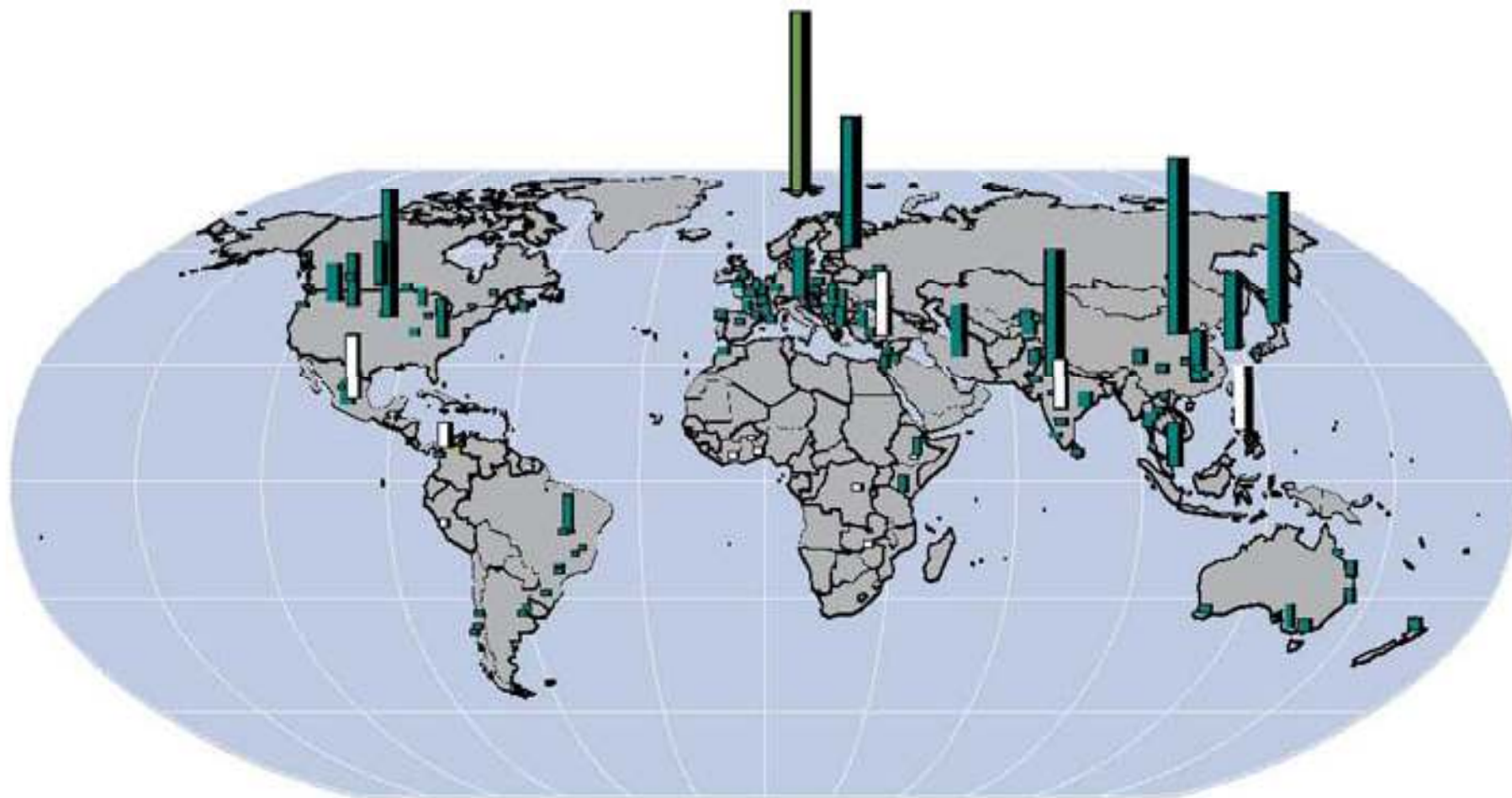
Status of Genebanks

- How many gene banks are there and what are their holdings?
- How well are the genetic resources documented (passport, characterization and evaluation)?
- How secure are the genetic resources (physically, quality and genetic drift)?
- How accessible are the genetic resources (knowledge base, requests and delivery)?
- Are the gene banks collecting new samples?
- What are the gaps and needs (knowledge base, resources)?

- How many gene banks are there and what are their holdings?
- How well are the genetic resources documented (passport, characterization and evaluation)?

FIGURE 3.1

Geographic distribution of genebanks with holdings of >10 000 accessions (national and regional genebanks (blue); CGIAR centres genebanks (beige); SGSV (dark green))⁵



Source: WIEWS 2009; Country reports; USDA-GRIN 2009

	1996	2008-9	Change
Number of gene banks	1320	1750	+430
Number of accessions	6.15 million	7.4 million	+1.4 million
Passport data	37%		
No. characterized	Variable by country	64% ¹	
No. evaluated	Variable by country	51% ²	
Excess 1 accessions	Unknown	4.6 million	
Number of species	11,500	15,900	+4,400
International gene bank accessions	5.5 million	6.6 million	+1.1 million
International % species			+60%
International % genera			+74%
CGIAR gene banks	0.600 million	0.741 million	+141,000
CGIAR species	2813	3446	23%
CGIAR genera	494	612	24%
Botanical gardens ³	1500	2500 ⁴	+1,000 ¹⁶ ?

Data compiled from FAO first and second State of the World's PGR reports

- How secure are the genetic resources (physically, quality and genetic drift)?

CGIAR Collections

Upgrading & Collective Action

- **Global Public Goods 1 (GPG1)**
 - Focus – Centre genebank upgrading to remove backlogs
 - Timeframe - 2003-2006
 - Total cost - **\$13.6 million**
- **GPG2**
 - Focus – Continue Centre genebank upgrading to remove backlogs and provide leadership in developing a global crop-based conservation and use system
 - Timeframe - 2007-2010
 - Total cost - **\$10.46 million**
 - Upgrading: \$4.8 million
 - Collective action: \$5.66 million

SVALBARD GLOBAL SEED VAULT (SGSV)



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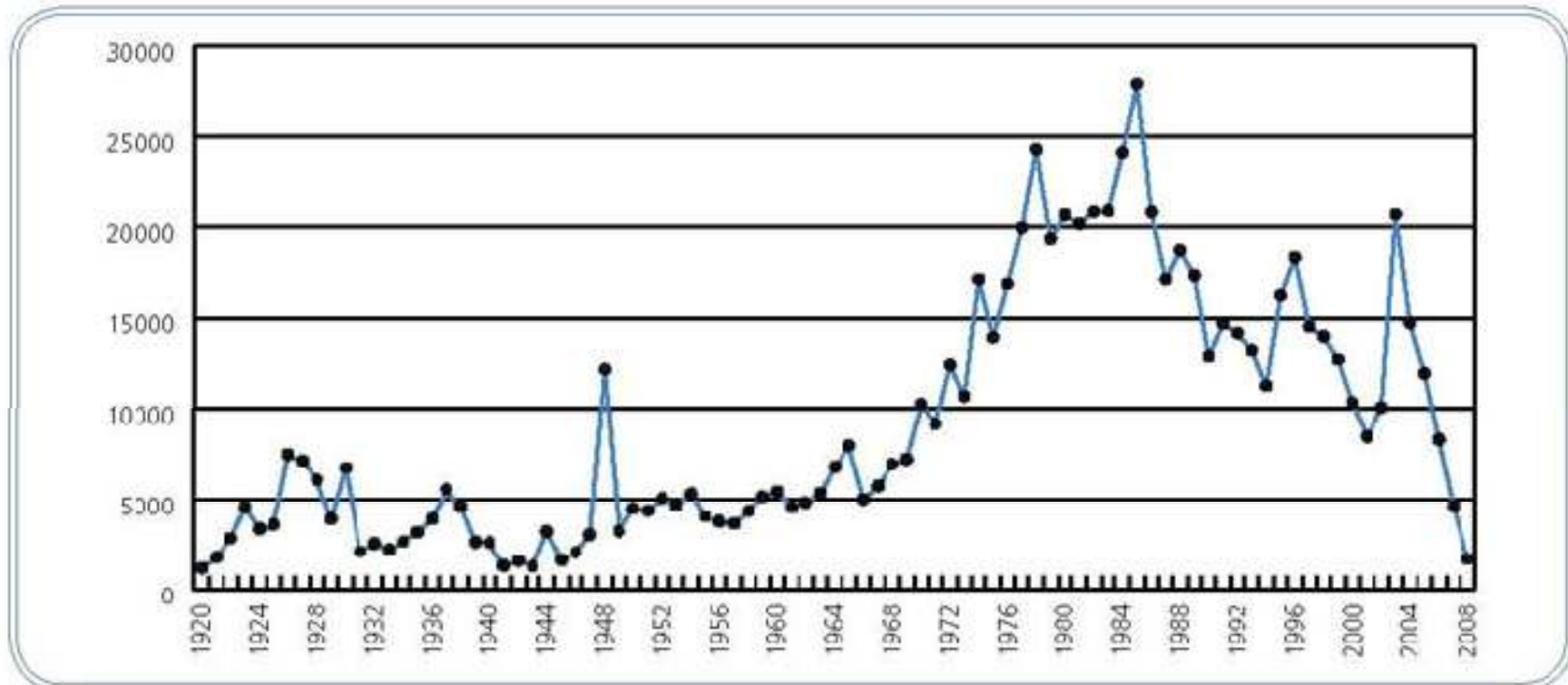
Courtesy of Global Crop Diversity Trust

- How accessible are the genetic resources (knowledge base, requests and delivery)?

- Are the gene banks collecting new samples?

FIGURE 3.2

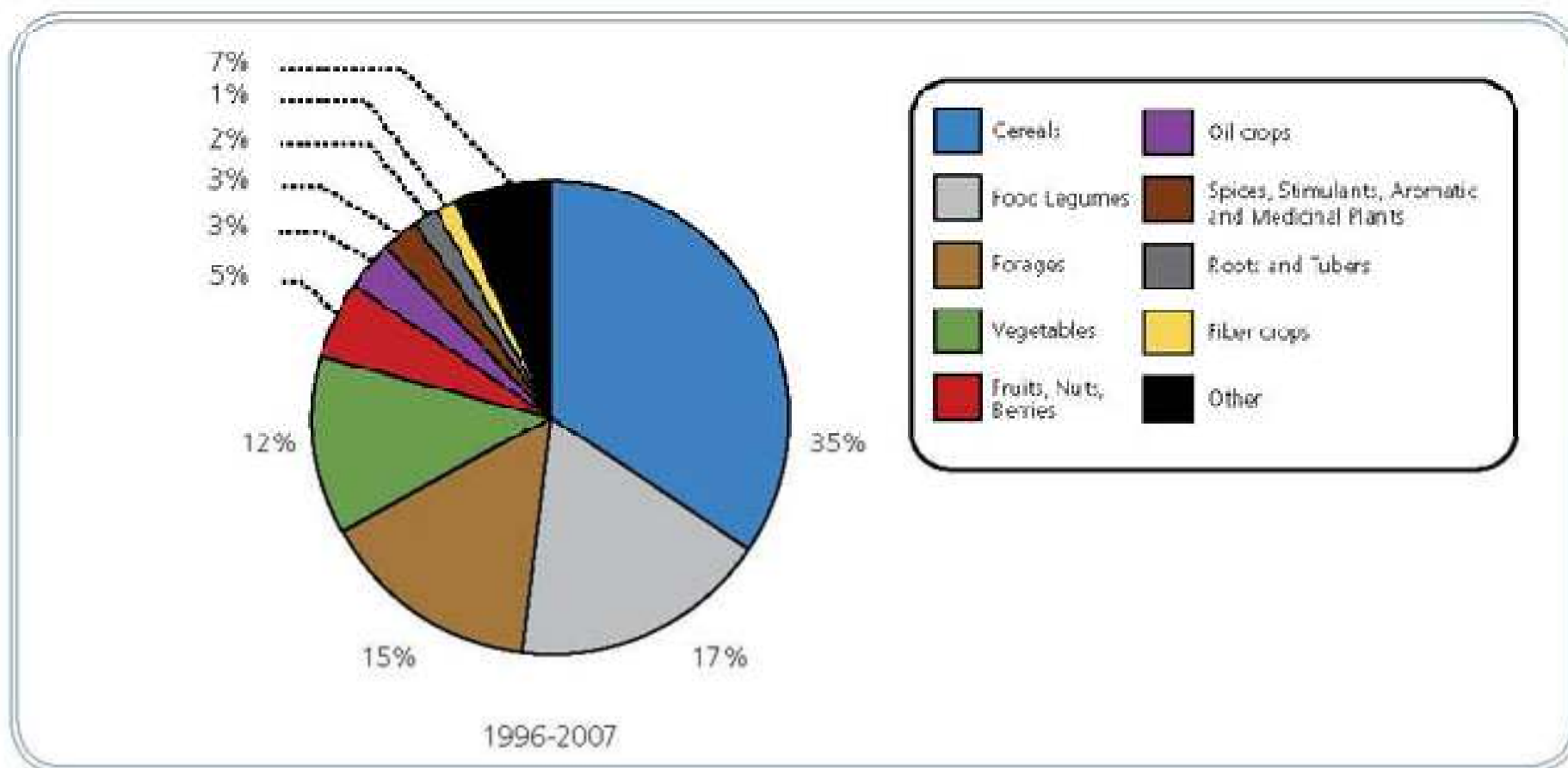
Number of accessions collected each year since 1920 and stored in selected genebanks, including those of the CGIAR centres



Source: 31 genebanks of the NPGS of USDA (source GRIN, 2008); 234 genebanks from Europe (source EURISCO, 2008); 12 genebanks from SADC (source SDIS, 2007); NGBK (Kenya) (source: dir. info., 2008); INIAP/Departamento Nacional de Recursos Fitogenéticos y Biotecnología (DENAREF) (Ecuador) (source: dir. info., 2008); NBPGR (India) (source dir. info., 2008); IRRI, ICARDA, ICFISAT and AVRDC (source: dir. info., 2008); CIP, CIMMYT, ICRAF, IITA, ILRI and WARDA (source: SINGER, 2008).

FIGURE 3.1

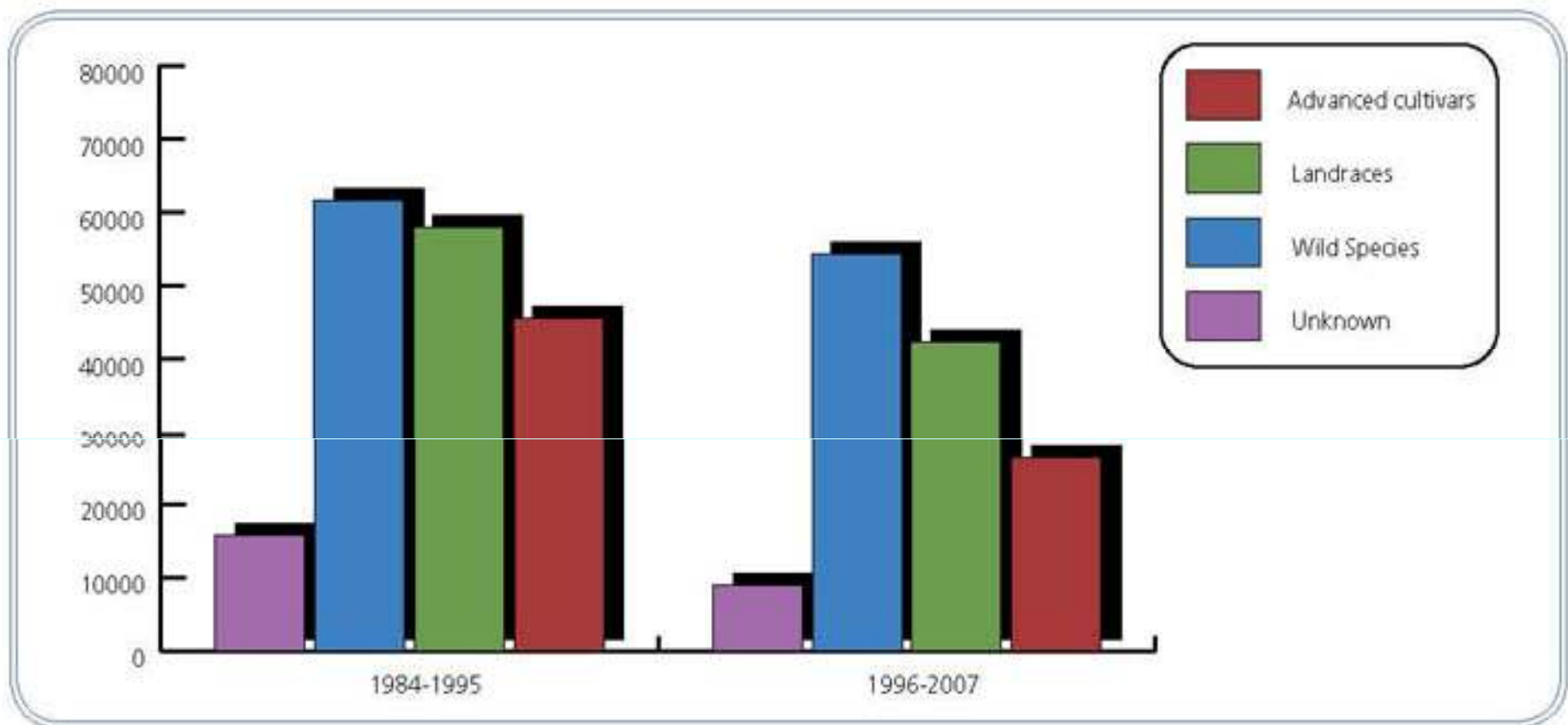
Accessions collected by selected genebanks over the period 1996-2007 according to crop group



Source: 31 genebanks of the NPGS of USDA (source: GRIN, 2008); 234 genebanks from Europe (source: EURISCO, 2008); 12 genebanks from SADC (source: SDIS, 2007); NGBK (Kenya) (source: dir. info., 2008); INIAP/DENAREF (Ecuador) (source: dir. info., 2008); NBPGR (India) (source: dir. info., 2008); IRRI, ICARDA, ICRISAT and AVRDC (source: dir. info., 2008); CIP, CIMMYT, ICRAF, IITA, ILRI and WARDA (source: SINGER, 2008)

FIGURE 3.3

Type of accessions collected by selected genebanks over two time periods, 1984-95 and 1996-2007



Source: genebanks of the NPGS of USDA (source: GRIN, 2008); 234 genebanks from Europe (source: EURISCO, 2008); 12 genebanks from SADC (source: SDIS, 2007); NGBK (Kenya) (source: dir. info., 2008); INIAP/DENAREF (Ecuador) (source: dir. info., 2008); NBPGR (India) (source: dir. info., 2008); IRRI, ICARDA, ICRIASAT and AVRDC (source: dir. info., 2008); CIP, CIMMYT, ICRAF, IITA, ILRI and WARDA (source: SINGER, 2008)

- What are the gaps and needs (knowledge base, resources)?

Summary

- More gene banks (good?) but accessibility variable
- More genera and species saved (wilds)
- More data but often difficult to access
- Treaties have helped access to PGRFA
- Considerable lack of resources going into PGR conservation
- CGIAR upgrading and Svalbard Global Seed Vault significant security advancements

The End

