The Generation Challenge Program:

Building Genetic Resources for Crop Improvement in Developing Countries

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Cultivating Plant Diversity for the Resource-Poor

World Food Supply: Must increase by 50-60% over the next 30 years

- 80-85% of future growth in food production must come from lands already in production
- Best land already under cultivation; remaining lands are fragile (e.g., *Cerrados* of Brazil and tropical forests)
- Serious competition for water for agricultural versus urban and industrial uses

More food for more people on less land with less water

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Poverty Still Haunts Parts of Asia and Africa

- Hundreds of millions of hungry and malnourished…especially South Asia and Africa
- Drought-prone rainfed areas
- Modern varieties poorly adapted to large areas

Photos courtesy of Chris Dowswell

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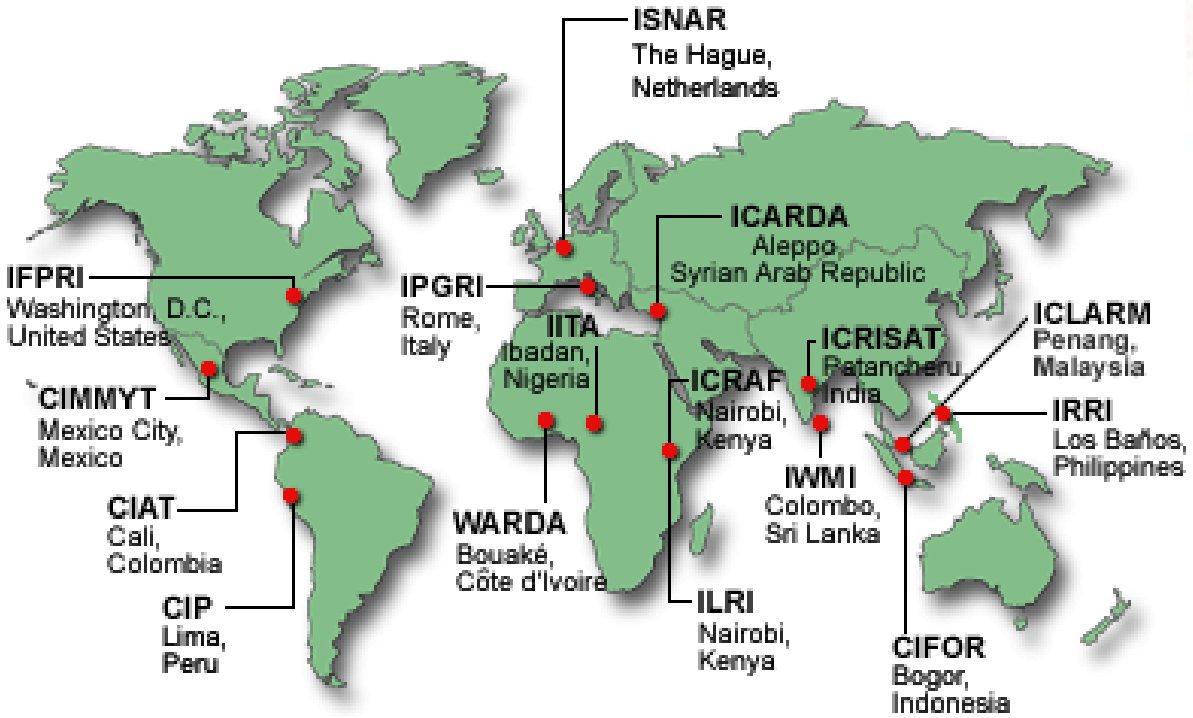
Source of the Next Green Revolution? CGIAR Centers: Sophisticated Global Partners for Industry, Government and Academia



11 of 16 International Agricultural Research Centers supported by the CGIAR work on crop improvement (six on cereals) for developing countries and are strategically located to maximize their impact

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Another Green Revolution is Needed

- Is the right international structure in place?
  - Yes: Quality labs and skilled scientists needed in target areas linked with strong and not-so-strong national research institutions
  - No: Infrastructure and personnel demands needed for next generation of crop improvement surpass available resources
- Is the existing model the best one to apply?
  - Yes: Crop improvement vital
  - No: Stand alone centers inadequate by themselves

CGIAR recognizes short comings and has created a mechanism to respond: Challenge Programmes

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What is a Challenge Program?

- Revitalize and focus the CGIAR by building problem and opportunity driven multi-institution partnerships
  - Address Intractable Problems and New Opportunities
    - Take advantage of newest innovations for crop improvement to take on old problems
    - Difficult under single stand-alone center model
  - Stimulate New Partnerships with National Systems & Advanced Research Institutions
- Stimulate new investment

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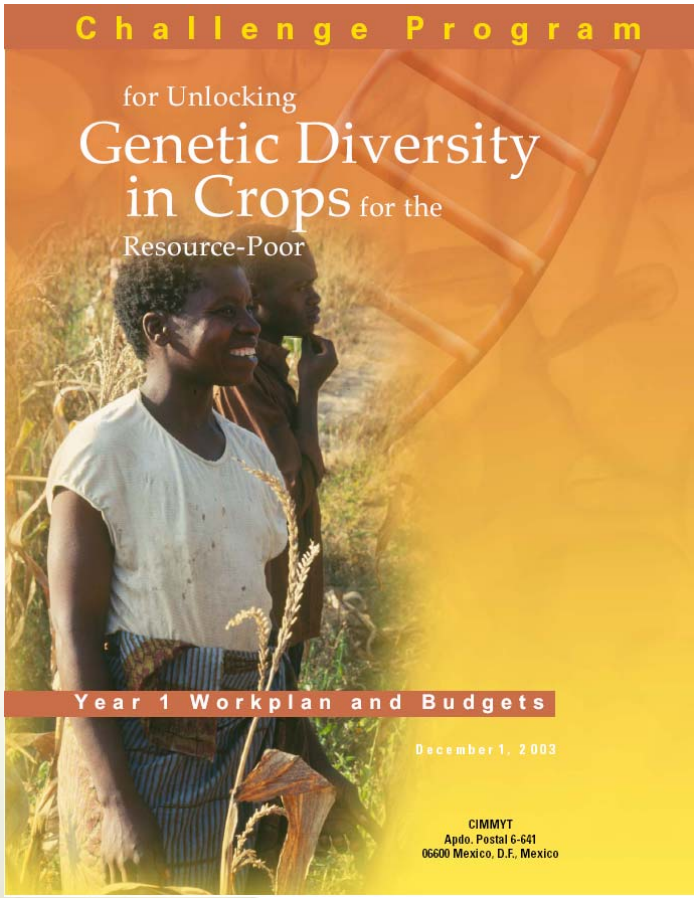
The Generation Challenge Program: Unlocking Genetic Diversity in Crops



- Apply tools of comparative biology and genomics to access the useful genetic diversity in land races and crop relatives or progenitors

- Leverage relatively large investment in crop genomics (>$120 million/yr invested in US plant genome research)

- Capture the imagination of policy makers and legislators with the potential for advanced science to help solve intractable problems that sustain abject poverty

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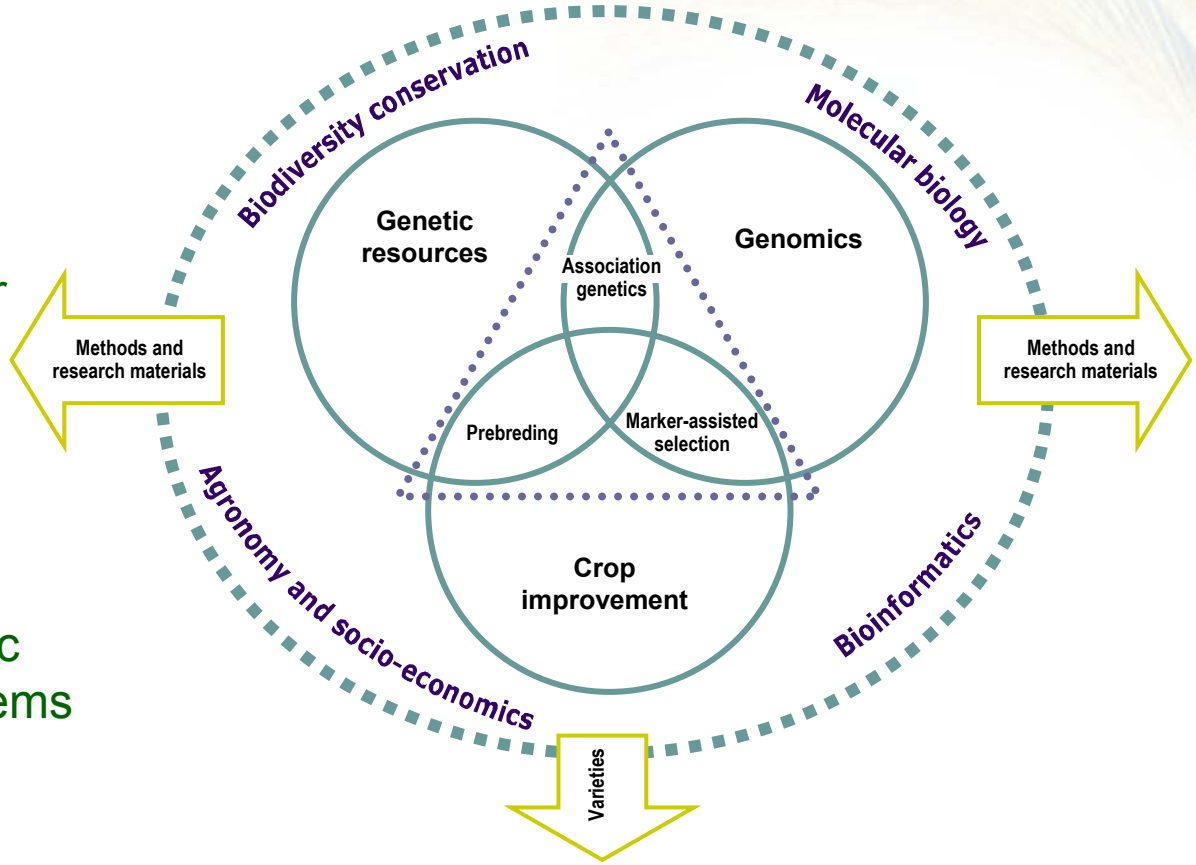
The Generation Challenge Program Conceptual Framework: Linking Advanced Genetics to Breeding Applications

Five Sub-Programs :

1. Genetic diversity of global genetic resources
   J. C. Glaszmann CIRAD
2. Comparative genomics for gene discovery
   H. Leung IRRI
3. Gene transfer and crop improvement
   J. Crouch ICRISAT
4. Genetic resource, genomic and crop information systems
   T. van Hintum WUR
5. Capacity Building
   C. de Vicente IPGRI



Address Intractable Problems Through Comparative Biology

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Generic Priorities

Scientific Theme: Using comparative biology to solve complex production problems

- Low cost technologies for germplasm genotyping, allele mining and molecular breeding
- Integrate genomics with modeling whole plant physiology and/or biology
- Capacity building

Development Focus: Build a new architecture of innovation in agricultural development based around the CGIAR and their stakeholders using teams that bridge institutions, disciplines and sectors

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What is the Generation Challenge Program?

- A mechanism to direct and adapt basic science in functional & comparative genomics to crop improvement in developing countries
- *Not only* Discovery Science
- *Not only* Breeding or Education
- *Is* a means to link the two,
  - filling the gulf between and adding value to national competitive basic research programs, international development oriented crop improvement research and the private sector

Focus on drought and other intractable abiotic/biotic stresses
This means new traits, alleles…

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Where Do We Find New Traits for Tomorrow's Crops?

- Hundreds of Thousands of Germplasm Accessions
  - Held by National and International Research Organizations (>500K accessions in CGIAR alone)
  - Collected over decades to preserve diversity of landraces and wild relatives
    - In response to anticipated wide-spread adoption of modern varieties
    - Harbor a wealth of interesting and useful traits in not-so-useful backgrounds
  - Relatively underutilized in breeding programs
- The Generation Challenge Program is an Explicit Effort to Utilize These Resources Efficiently and Massively
- *This is NOT a technically trivial undertaking…Why Now?*

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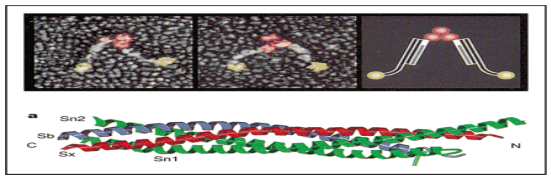
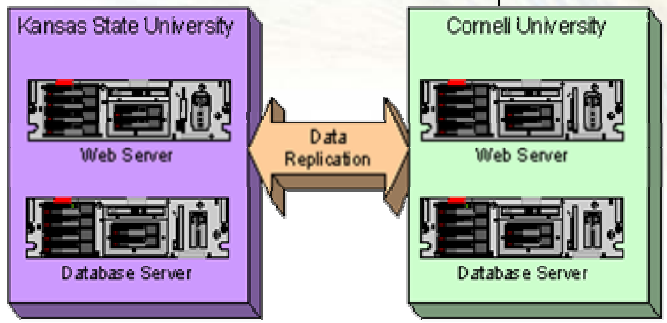
Simultaneous Revolutions in Biology, Communications, and Computational Power

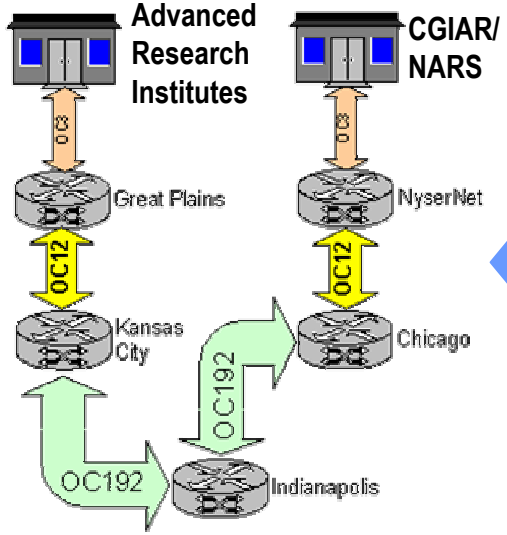


[1]

Vast arrays of data generated world-wide



Remote storage and analysis capacities universally accessible



Remote computational power generates new generation of questions and applications

Molecular biology, genetics, & physiology knowledge explosion

The GCP Will Help Link the Developing World

[1] **Molecular Biology of the Cell Cover, Dec. 00**

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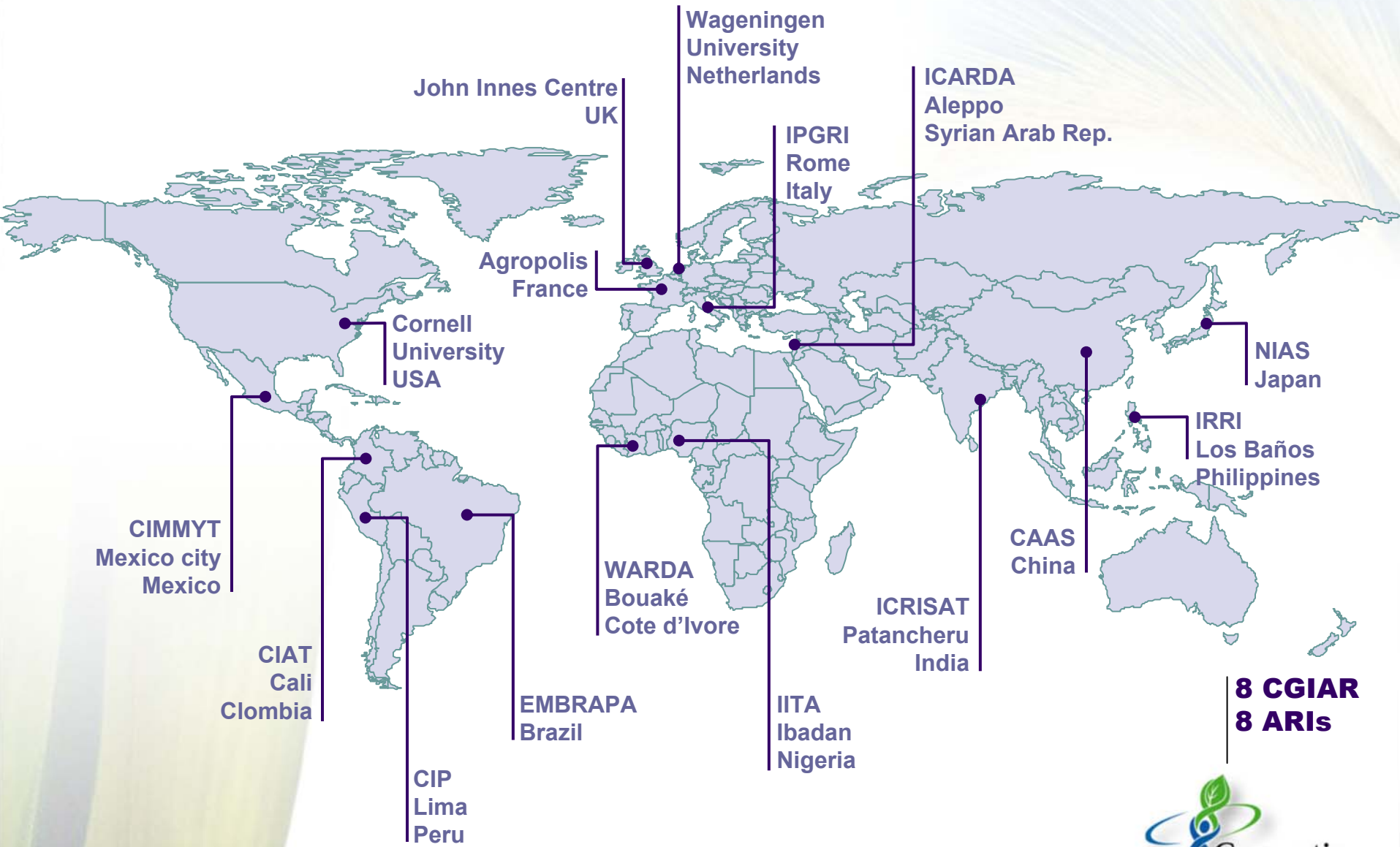
GENERATION CP Consortium members



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Support for Generation CP

- Approximately US$ 15 M per year
- Largest donors from Europe
  - European Commission
  - UK (DFID)
- Aggressively exploring partnerships with private sector
  - Financial contributions from Pioneer
  - Humanitarian donations from others

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Participation in Generation CP

- Competitive grants program
  - In partnership with a consortium member
- Commissioned Research
  - In partnership with a consortium member
- Capacity building courses and crop improvement networks

Please visit www.generationcp.org