

The Generation Challenge Program

-

**using advances in molecular biology
and biotechnology to make better
crops for resource-poor people**



Generation Challenge Program

- presentation
 - background CGIAR and Challenge Programs
 - issue: a program to use modern crop science including genomics to help 'the hungry world'
 - objectives
 - actors
 - organisation
 - subprogram 4 – Bioinformatics
 - activities
 - achievements

Challenge Program

- Consultative Group on International Agricultural Research (CGIAR)
 - created in 1971
 - to achieve sustainable food security and reduce poverty in developing countries
 - motor behind 'green revolution'
 - a system of 15 'Future Harvest Centers' in more than 100 countries, over 8,500 CGIAR scientists and scientific staff

Challenge Program

- Challenge Program (CP)
 - a time-bound, independently-governed program of high-impact research
 - targets the CGIAR goals in relation to complex issues of overwhelming global and/or regional significance (and global impact)
 - requires partnerships among a wide range of institutions in order to deliver its products

Challenge Program

- three pilot Challenge Program (CP)
 - HarvestPlus CP: reduce micronutrient malnutrition
 - Water and Food CP: getting more crop per drop
 - Generation Challenge Programme: apply advances of crop science and technology to resource-poor people

Generation Challenge Program

- the issue: where do we find new traits for tomorrow's crops?
 - hundreds of thousands of germplasm accessions
 - held by national and international research organizations (>500 000 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 and habitat destruction
 - harbor a wealth of interesting and useful traits in not-so-useful backgrounds
 - underutilized in breeding programs

Generation Challenge Program

- the program
 - research program uniting CGIAR centers, institutes in developing countries and advanced research institutes
 - deliverable: public platform for accessing and developing new genetic resources using advanced molecular technologies and traditional means

Generation Challenge Program

- the consortium
 - nine CGIAR centres



Generation Challenge Program

- the consortium
 - four national agricultural research systems



Generation Challenge Program

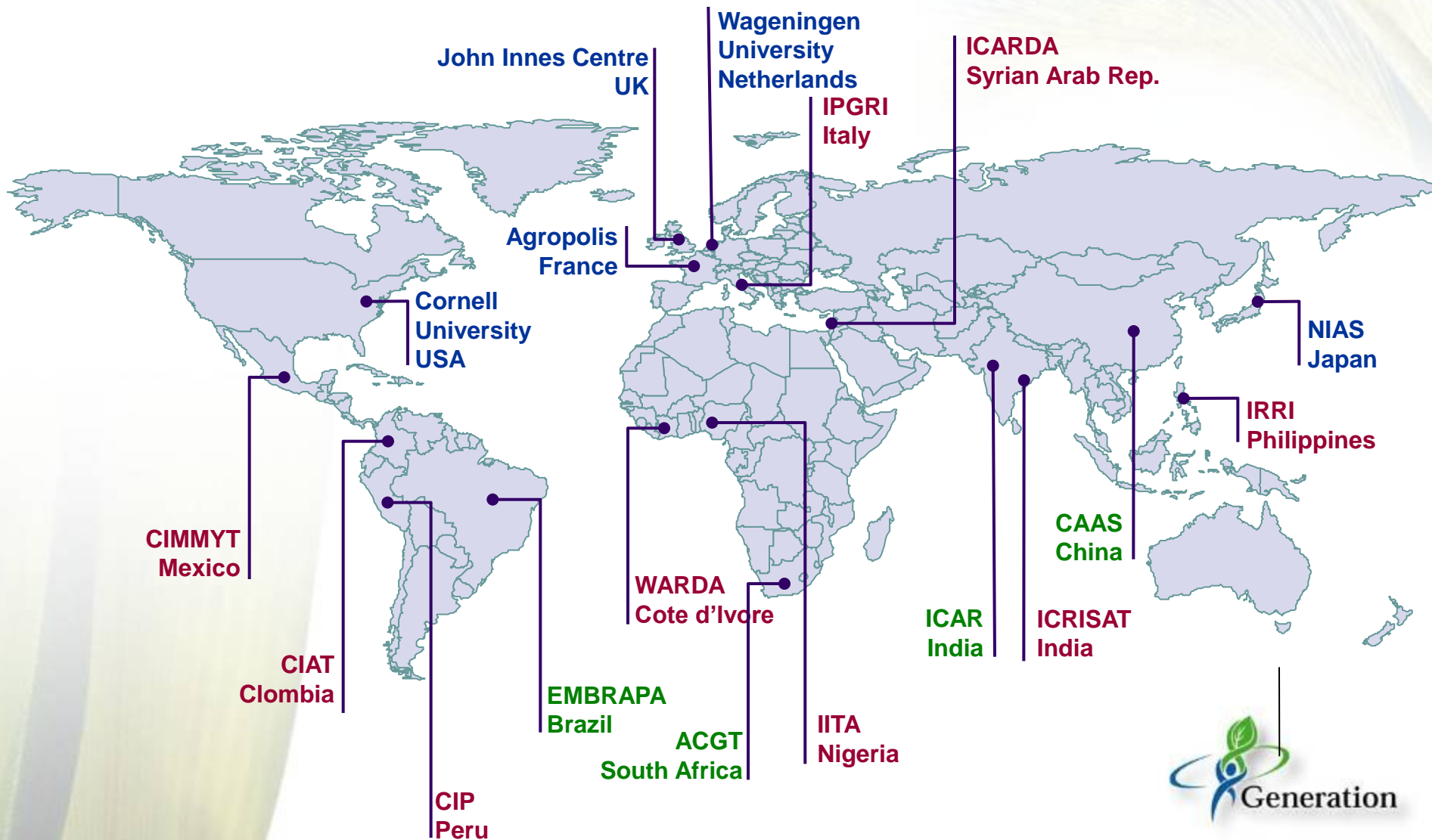
- the consortium
 - five advanced research institutes



- stakeholders committee



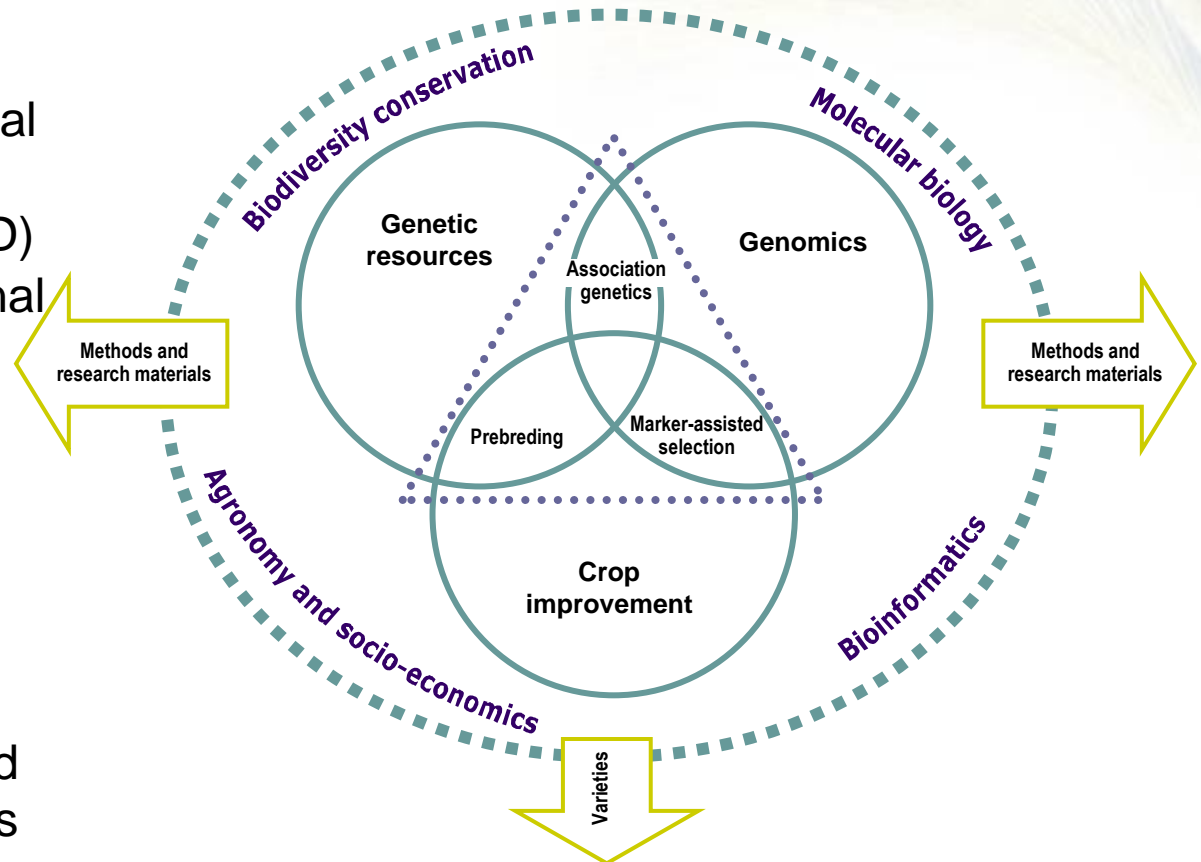
Generation Challenge Program



Generation Challenge Program

5 sub programs :

- genetic diversity of global genetic resources
J.C. Glaszmann (CIRAD)
- comparative and functional genomics for gene discovery
H. Leung (IRRI)
- gene transfer and crop improvement
J. Crouch (CIMMYT)
- germplasm and crop information systems and bioinformatics resources
T. van Hintum (WUR)
- capacity building
C. de Vicente (IPGRI)



**Address Intractable Problems
Through Comparative Biology**

Generation Challenge Program

- target trait
 - drought tolerance
- target areas
 - South Asia
 - Sub-Saharan Africa
 - Central and West Asia - North Africa
 - Northeast Brazil
 - Andean Zone
- primary target crops
 - **wheat**
 - **maize**
 - **rice**
 - common bean
 - cowpea
 - potato
 - *Musa*
 - barley
 - sorghum
 - chickpea
 - cassava

Generation Challenge Program

- example

- select core collection of 3000 accessions out of collection of 10000 accessions
- characterize core with 50 neutral markers and select a representative set of 200 accessions
- characterize this set for drought phenotype
- find quantitative trait loci (QTL) for drought tolerance in rice with promising pathway → design markers
- screen representative set with rice QTL markers
- combine the successful QTLs into one genotype with marker aided selection
- deliver material to NARS

GCP-SP4 objectives

- germplasm and crop information systems and bioinformatics resources
 - develop integrated crop genetic resources, crop improvement, and bioinformatics systems to facilitate and optimize implementation of the discoveries made in the GenerationCP

GCP-SP4 objectives

- germplasm and crop information systems and bioinformatics resources
 - facilitate the information flow of ongoing research, both in terms of data and in terms of communication between the researchers
 - create capacity and facilities to support IT applications in the GenerationCP consortium
 - support specific activities in the Generation CP in terms of software tools

GCP-SP4 strategy

- starting point
 - GenerationCP consortium
 - varying capacity
 - many local approaches and on-going programs
 - rest of the world
 - vivid bioinformatics communities
 - many tools and databases
 - standards in varying level of maturity

GCP-SP4 strategy

- approach
 - use existing capacity in the GenerationCP
 - build on local approaches and on-going programs
 - build capacity where needed
 - create ownership and consortium wide teams
 - be part of the global community
 - involve relevant actors when possible
 - use and contribute to existing standards
 - develop tools and databases and make them available to the global community

GCP-SP4 areas of activities

- determine state of the art and capacity
- create GenerationCP platform
- improvement infrastructure
- direct support to other SPs

GCP-SP4 areas of activities

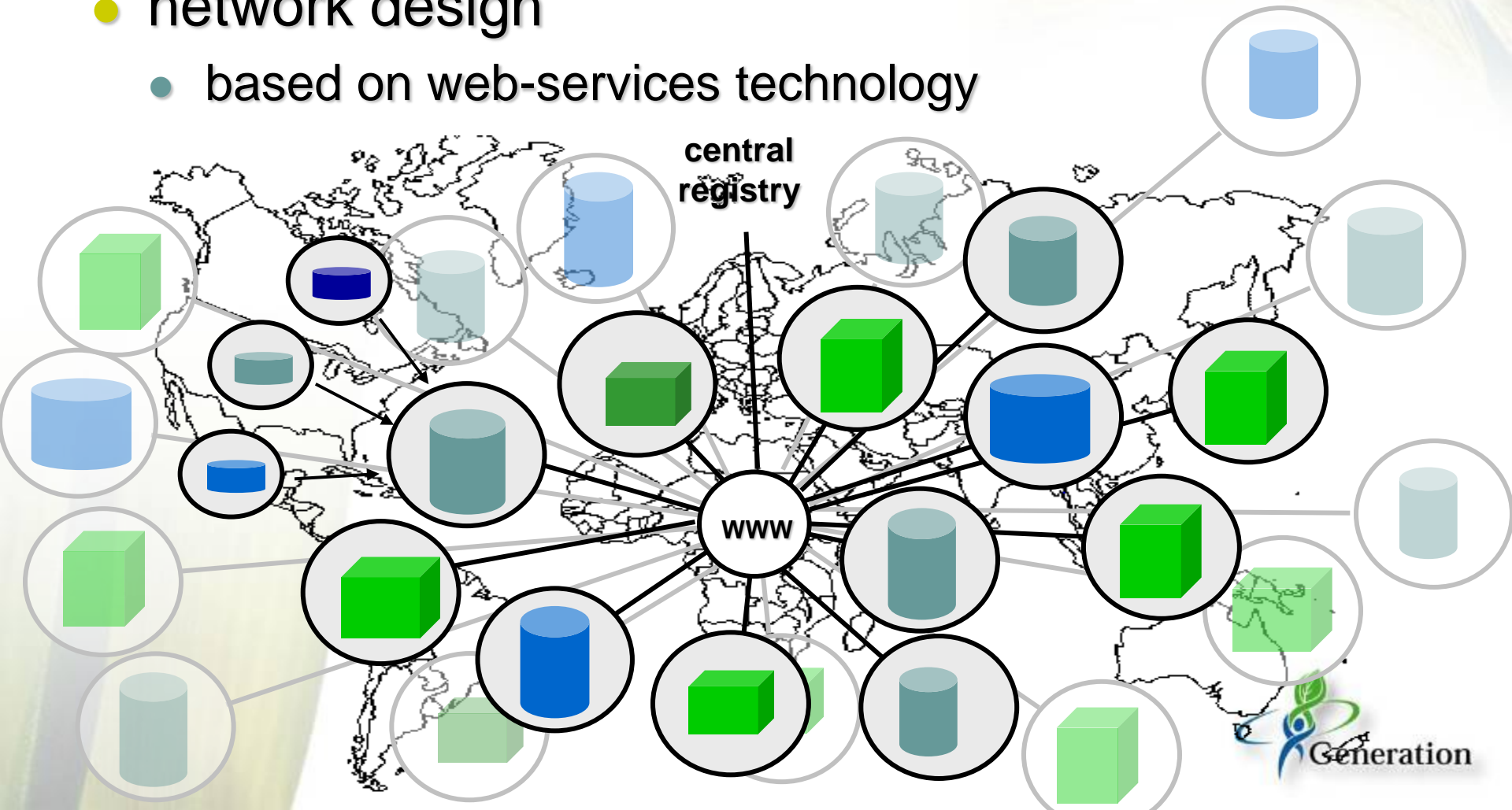
- determine state of the art and capacity
 - white papers were written
 - interoperability and infrastructure
 - germplasm information systems
 - high performance computing
 - central registry and user needs
 - fingerprinting and allele data systems
 - functional genomics information systems and tools
 - mapping data and analysis systems
 - LIMS
 - discussed at Rome, February 2004
 - some continuously updated

GCP-SP4 areas of activities

- create GenerationCP network
 - backbone of the GenerationCP
 - link to the global community
 - data sources and tools are (becoming) available in different locations and shapes
 - user needs access
 - tools and data need to be accessible
 - needs overview of the available sources and tools
 - everything needs 'fit'

GCP-SP4 areas of activities

- network design
 - based on web-services technology



GCP-SP4 areas of activities

- the GenerationCP web-services network will
 - allow integration of relevant information sources
 - give access to information generated by the GenerationCP
 - give access to analysis tools created by the GenerationCP
 - link GenerationCP products to the rest of the world

GCP-SP4 areas of activities

- implementation web services in GenerationCP consortium
 - process
 - choice design (Mexico workshop, May 2004)
 - implementation proof of concept cases (ARM, September 2004)
 - definition use-cases (continuous)
 - onthology development in global consortia (continuous)
 - training consortium members (2005)
 - implementation selected use-cases (2005)

GCP-SP4 areas of activities

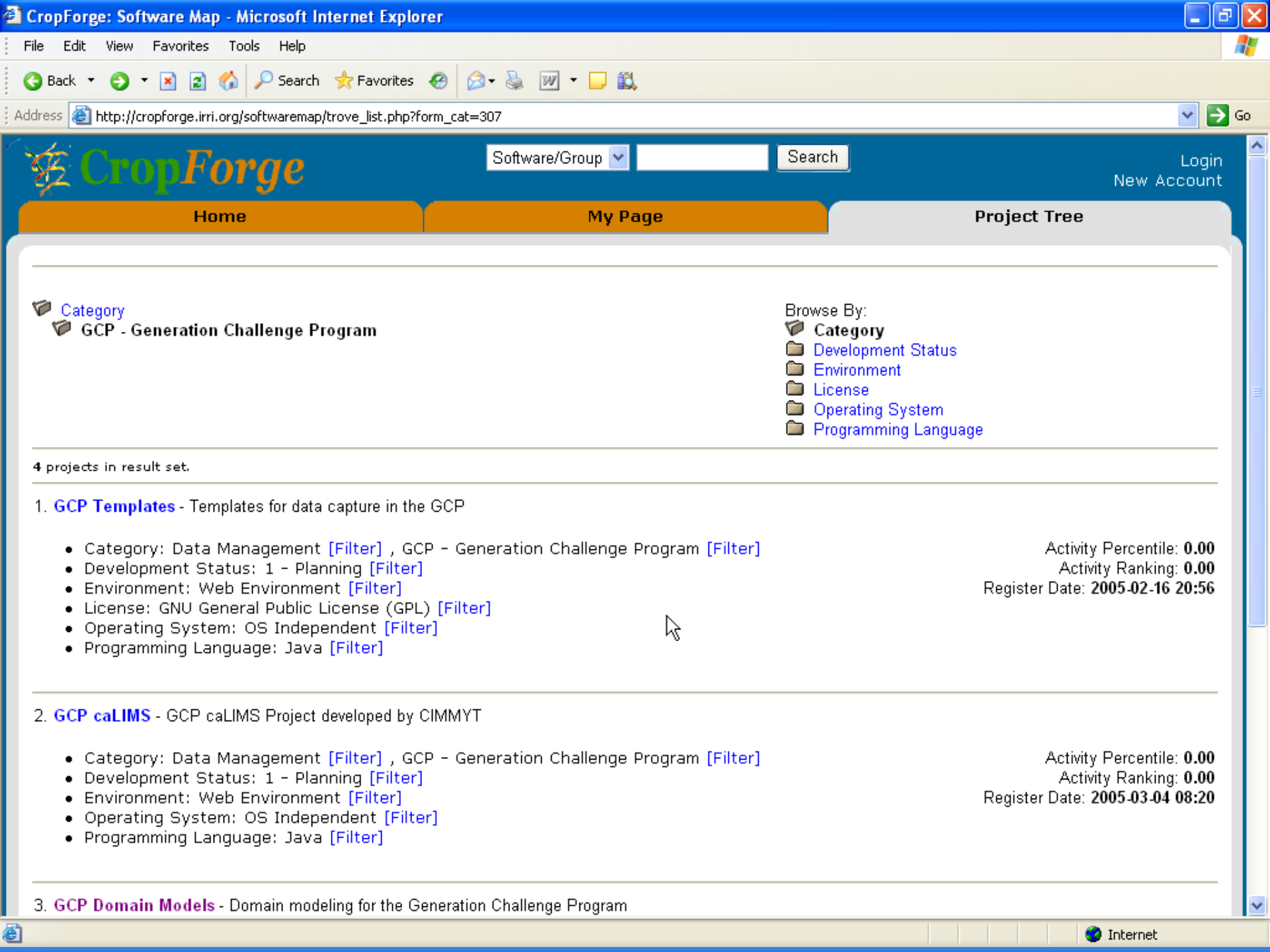
- need for short term solutions
 - templates to upload, store and exchange data
 - serve as 'minimum requirement to domain models'
 - repository for access to data

GCP-SP4 areas of activities

- improvement infrastructure
 - support implementation LIMS
 - expert network
 - improvement of quality of existing databases
 - development reference information system with strong involvement external experts
 - MaizeGDB, Germinate, MIPS, etc.
 - quality oriented activities

GCP-SP4 areas of activities

- improvement infrastructure
 - integration of the High Performance Computing (HPC)-facilities in the GenerationCP toolbox
 - HPC in 3 Generation CP centers (2004)
 - website to give access to all partners (2004)
 - one use-case for each partners (2005)
 - software and user guides (continuous)
 - host virtual environment for informatics network
 - master CP data warehouse
 - CropForge
 - list server, etc.



Category

GCP - Generation Challenge Program

Browse By:

- Category
- Development Status
- Environment
- License
- Operating System
- Programming Language

4 projects in result set.

1. GCP Templates - Templates for data capture in the GCP

- Category: Data Management [Filter] , GCP - Generation Challenge Program [Filter]
- Development Status: 1 - Planning [Filter]
- Environment: Web Environment [Filter]
- License: GNU General Public License (GPL) [Filter]
- Operating System: OS Independent [Filter]
- Programming Language: Java [Filter]

Activity Percentile: 0.00
 Activity Ranking: 0.00
 Register Date: 2005-02-16 20:56

2. GCP caLIMS - GCP caLIMS Project developed by CIMMYT

- Category: Data Management [Filter] , GCP - Generation Challenge Program [Filter]
- Development Status: 1 - Planning [Filter]
- Environment: Web Environment [Filter]
- Operating System: OS Independent [Filter]
- Programming Language: Java [Filter]

Activity Percentile: 0.00
 Activity Ranking: 0.00
 Register Date: 2005-03-04 08:20

3. GCP Domain Models - Domain modeling for the Generation Challenge Program

GCP-SP4 areas of activities

- improvement infrastructure
 - creation of institutional bioinformatics capacity
 - technical workshops and hack-a-thons
 - support for bioinformatics expertise development
 - expert networks supported by virtual workspace and GCP Wiki

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GCPWiki

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 - [3.2 SP 4 Team Member Pages](#)

Project Contacts

- [GCP Contacts](#)

2004 SP4 Commissioned projects

- [White Papers](#)

2005 SP4 Commissioned Projects

- [\(Task 22\) Development of GenerationCP data models](#)
- [\(Task 23\) Implementation of web services technology in GenerationCP Consortium](#)
- [\(Task 24\) Application of MOBY for GenerationCP Consortium.](#)
- [\(Task 25\) Creation and maintenance of templates for GenerationCP data storage in repositories](#)
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**GCPWiki**

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GCP-SP4 areas of activities

- direct support to other SPs
 - DSS for sampling germplasm (2005)
 - multi-trait QTL mapping software (2005-2007)
 - ortholog-function display tools (2005)
 - crop gene expression database and data mining tools (2005-2006)
 - DSS for MAS and MAB (2005-2006)