



Participants of the 2008 project review meeting

Improving legume productivity in Africa

Background: In 2007, GCP initiated a three-year research project entitled Improving tropical legume productivity for marginal environments in Africa. The project is dubbed Tropical Legumes I (TLI) because it has a twin project—TLII—whose mandate is seed multiplication and distribution to pave the way for research results from TLI to translate into breeding materials for the benefit of resource-poor farmers.

Partners: The TLI project represents a key new initiative in GCP, as it brings together advanced molecular research labs and national research partners from:

- Burkina Faso – INERA
- Cameroon – IRAD
- Ethiopia – EIAR, SARI
- Kenya – Egerton University,
- Tanzania – ARI Naliendele, ART, LZARDI
- Niger – INRAN
- Senegal – ISRA
- Malawi – Chitedze Research Station
- Zimbabwe – Crop Breeding Institute

as well as two regional networks

- The Eastern and Central Africa Bean Research Network (ECABREN), and
- Southern Africa Bean Research Network (SABRN)

Together, TLI partners will develop molecular markers for groundnuts, cowpeas, beans and chickpeas. These markers, once validated, will be used to accelerate the development of stress-tolerant legume varieties that meet the needs of smallholder legume farmers in sub-Saharan Africa.

TLI is funded by the Bill & Melinda Gates Foundation. GCP complements this funding with support for capacity development, as well as a project to screen drought tolerance in Mozambique, in partnership with the University of Eduardo Mondlane.

Activities

Each of the four legumes above comprises a research objective. Within each objective, research activities are grouped as follows, with each activity directly linked to a GCP Subprogramme:

1. Explore diversity (SP1)
2. Generate genomic resources (SP2)
3. Identify marker development (biotic) (SP2)
4. Identify marker development (abiotic) (SP2)
5. Improve germplasm development (SP3)

In addition to the four crop objectives, TLI has two cross-cutting objectives:

- Objective 5: Develop cross-species resources for comparative biology
- Objective 6: Provide training and capacity-building for sub-Saharan Africa (SSA) scientists, including TLII scientists and students

What have we accomplished in the first year (2007–2008)?

Progress at project level

- Building a legume research community in Africa, very significantly linking the upstream researchers with those in the national programmes of the target countries.
- To reflect recommendations from the first project meeting in July 2008:
 - Activities on cowpeas, common beans and chickpeas adjusted to develop populations for marker-assisted recurrent selection (MARS).
 - Efforts made to link with TLII activities by encouraging communication between the PIs of both projects and, in particular, by encouraging TLII students to incorporate TLI research in their programme.
- TLI project website at www.generationcp.org/gcptli, plus, in collaboration with Tropical Legumes II (TLII), a common landing page for the Tropical Legumes Project overall at www.tropicallegumes.org.

Progress by objectives and key results

- Developed the first genetic map of cultivated groundnut. This map will be an important basis for groundnut marker-assisted breeding
- Introgression of disease-resistance sources in progress in several countries, using farmer- and market-preferred varieties
- Development of genetic tools to analyse drought tolerance, and
- Valuable breeding populations to mobilise drought tolerance from underutilised sources into Eastern and Southern African varieties



- High-throughput system will enable modern breeding approaches such as 'whole genome selection' to be applied to a relatively less-studied crop that, until recently, had only scant genomic resources.
- Created an active network of scientists in four African countries (Burkina Faso, Cameroon, Nigeria and Senegal) that are engaged in collecting complementary phenotypic information for important abiotic and biotic resistance traits.

Key results

- More than 1,500 SSR markers have been developed
- Preliminary progress been made to develop SNP and DArT arrays

Objective 5: Develop cross-species resources for comparative biology

Key results

- Significant progress towards developing 500 orthologous gene markers for chickpeas, common beans, cowpeas and groundnuts (A-genome diploid).
 - Because polymorphism rates vary according to the nature of the genotypes being compared,
 - 511 polymorphic genes were identified in groundnuts,
 - 656 in common beans, and
 - 684 in chickpea.
- DNA sequencing and SNP discovery are ongoing for cowpea.

Objective 6: Provide training and capacity-building for sub-Saharan Africa (SSA) scientists

Key results

Customised capacity-building:

- Identifying and fulfilling needs in capacity-building, including field and computer equipment, for developing country partners
- Course on phenotyping for drought-related traits, focused on Africa (March 2008).
- Plans underway with the Wageningen University and Research Centre on the feasibility of a training course on marker data analysis in 2009.

Collaboration and capacity-building

- Collaboration to incorporate TLI research components in studies by TLII degree students, so as to increase prospects for adoption of TLI results, and thus enhance impact.
- GCP-funded cowpea improvement project linked to TLI. Objective: to add Mozambique to the TLI network by building national capacity in drought tolerance screening. This is being achieved through training in data analysis for GxE interactions and – importantly – in the design and implementation of a MAS-based programme, in close collaboration with mentors at UC–Riverside.
- GCP also supports TLI scientists in Africa through capacity-building grants to applied research teams (ISRA, INERA)