## *Subprogramme 3: Trait capture for crop improvement*

### Competitive Project #3: Identifying the physiological and genetic traits that make cassava one of the most drought-tolerant crops

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**Mid-year report**

*Activities accomplished*:

1. Micropropagation and hardening of drought tolerant cassava contrasting varieties at EMBRAPA/CNPMF to produce planting material (stakes) for the experiments.
2. Harvest of the field screening trial, planted in May/2006 in Petrolina (Brazil), in which 60 genotypes were tested under irrigation and water deficit condition. The data evaluated are in process of final analysis.
3. Intermediate harvests in the field experiment planted in Dec/2006 in Petrolina (Brazil), with 24 drought tolerant contrasting cassava varieties under control and water deficit. Seven blocks were planted, with five plants/plot under randomised completed block design. Three blocks were harvested: 1) After 3 months under irrigation (Control 0); 2) After 4,5 months under irrigation (Control 1); and 3) After 3 months under irrigation followed by 1,5 month without irrigation. The following data were collected: plant height and branch lenght, leaf area of the top fully expanded leaf, leaf retention, leaf conductance, leaf temperature, air temperature, air relative humidity, radiation, soil moisture at 20 and 40 cm, samples of leaf disks (for ABA and carbohydrates), samples of stems (for carbohydrates), fresh weights of shoots and storage roots, and number of storage roots.
4. Establishment (Jan/2007) of a field experiment in Petrolina (Brazil), with 10 drought tolerant contrasting cassava varieties planted in a randomised completed block design, using five plants/plot, three plots/block, and four blocks (1 and 2 for water deficit and 3 and 4 for controls) with a total of 60 plants/variety, spaced 1.5 x 1.0 m. Three months after planting, the artificial irrigation was interrupted in block 1 and 2 and the first growth parameters were measured in all blocks (plant establishment, plant height and branch lenght, leaf area of the top fully expanded leaf, and leaf retention).
5. Establishment of a field trial at Hombolo, site in Dodoma (Tanzania) in Dec/2006, using the same cassava contrasting varieties as last experiment. In 2007 cropping season, data on foliar symptoms of major cassava diseases (cassava mosaic disease and cassavabrown streak disease) and insect pest (cassava green mites and cassava mealybug) were collected at three months after planting whereas data on plant establishment was collected at one month after planting.

6. Final harvest from previous studies of 15 cassava genotypes in two field locations in Colombia and in a root-containerized study at CIAT. Samples of leaf disks and stem plugs from these studies, which were sampled periodically during their growth last year, are currently being analysed for sugars, starch, and ABA (scheduled completion is August 2007).
7. A follow up experiment was started (Jan/2007) at CIAT, Colombia, with 45 cassava genotypes. Twenty-one stakes of each genotype were plant in 3 kg plastic bag for sprout phase to assure uniformity between and within genotypes. After one month, the best plants were selected and randomly assigned to experimental pots (well watered and water stress treatments) that will be grown under field condition and evaluated for physiological and growth traits to assess their drought tolerance, and traits underlying drought tolerance.
8. Six mapping populations, 3F1s and 3S1s, have been developed (at CIAT, Colombia) for drought tolerance in cassava. The populations are being established in vitro and also micro-propagated in preparation for shipment to partners in Brazil, Ghana, Tanzania, and Nigeria. A total of 200 genotypes and 5-10 plants per genotype will be shipped to partners.
9. Ten in-vitro plantlets each of twenty-two cassava varieties with stay-green characteristics have been sent from IITA-Headquarters to Tanzania for clonal evaluation against Tanzanian local varieties. These plantlets are being hardened at Mikocheni Agriculture Research Institute, before transplanting for multiplication purposes. The same genotypes are ready for shipment to Ghana. Unfortunately the collaborator in Ghana, Cecil Osei, is on sabbatical leave, and has not handed the project over to anyone in his absence. We have therefore been unable to get an permit to import the plantlets. A further 32 genotypes are being propagated at IITA-Ibadan, and will be transferred to Tanzania (and Ghana) within the next two months.
10. Application of Dr. Geoffrey Mkamilo (collaborator from ARI, Tanzania) to a GCP Travel Grant. He was selected to spend 1 month in Brazil, Aug/2007, participating in hands-on training experiences on cassava phenotyping at EMBRAPA/CNPMF, supervised by Dr. Alfredo Alves.
11. A Kenyan PhD student, Rosemary Mutegi, on a DAAD Scholarship has been appointed by IITA to work on the project.
12. A training workshop on cassava phenotyping methods for African partners is being organised in Tanzania, in collaboration with all project partners. The training is scheduled to take place in July 2007.
13. Equipments (porometer and soil moisture meter) have been sourced for African NARS partners

**Tangible outputs delivered**

- Identification of drought tolerant contrasting cassava varieties
- Production of plant material of the drought tolerant contrasting varieties via micropropagation and hardening in the field
- Establishment and harvest of field trials to evaluate several drought tolerant contrasting cassava varieties submitted to different water status treatments in Brazil, Colombia, and Tanzania.
- Establishment of crossing blocks and development of mapping populations for drought tolerance in cassava.
- Accomplishement of parental screen on the parents of IITA mapping populations for drought tolerance in cassava

**Deviations from the workplan**

The following constraints have been faced in this project:

- Delay in receiving and establishing in vitro plants imported from Colombia (CIAT) to Brazil, Tanzania, and Ghana

- Importing cassava germplasm into USA is a problem not yet solved, although performing studies at CIAT has circumvented this problem.
- Damages occured in the imported *in vitro* plants during shipment from Colombia (CIAT) to Brazil (EMBRAPA)\
- Delay for acquisition of equipments for evaluation of physiological parameters in the field (mainly for African partners)
- Lack of planting material (stakes) of some selected contrasting genotypes to be used in the field trials.
- Problems to micropropagate some genotypes due to the varietal differences in the genotype-media interaction.
- The occurrence of a strong flooding in Colombia during Jun/2006 caused irreversible damage in the crossing block at CIAT and in the field trials planted in Colombia. A new crossing block was established in Palmira (Jul/2006), in which the flowering of the parentals has not been as expected. So, the workplans of the EMBRAPA, African NARS (inTanzania and Ghana), and IITA, have been delayed as they have not yet received the segregating populations developed at CIAT.
- Delay in training African partners in the evaluation of physiological traits related to drought tolerance. The training of African partners on phenotyping has been scheduled for Jul/2007.

These constraints have caused significant delay of the original workplan and most of them can be minimised by an extension of the project's timetable (one year no-cost extension).

**Data availability**
The project has generated data of field and screenhouse evaluation of agronomic and physiological traits in several constrasting cassava genotypes under water deficit and control conditions, as well as data from analysis of SSR markers. These data have not been published into local or public GCP database. The data can be posted into a GCP database as soon as we know the appropriate database for this kind of data, the procedures to organise them, and how to feed and update the database.

## Competitive Project #5: Unlocking the genetic diversity in peanut's wild relatives with genomic and genetic tools

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Guillermo Seijo (Co-PI), Insituto Botánica del Nordeste
Jens Stougaard (Co-PI), University of Aarhus
Charles Simpson (Consultant), Texas Agricultural Experiment Station

**Mid-year report**
BAC library construction and validation (CIRAD/EMBRAPA/UCB)
The most probable wild ancestors of cultivated peanut, *A. duranensis* and *A. ipäensis* with genome types AA and were used to construct two BAC libraries, one for each of the diploid species. The libraries are respectively 7.4 and 5.3 genome equivalents with low organelle contamination and average insert sizes of