Overcoming Abiotic and Biotic Constraints to Yield, and Production of High-Quality Peanuts in West Africa and Texas.

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IMPROVED EDIBLE SEED QUALITY

Needs:

•1. Fresh seed dormancy (SEN) – to prevent crop loss from early germination in the field if harvest is delayed due to rains.
•2. Early maturity (TX) – to prevent off-flavors due to immaturity of peanuts in West Texas.
•3. High oleic oil content (TX) – to reduce rancidity in storage and promote better coronary health.
•4. Combine large seed size with high oleic content (GH).

Results:

•1. Identification of two breeding lines to release as varieties (SEN), reducing early germination by 90%.
•2. Release of early-maturing, high oleic runner peanut (TX).
•3. Release of early, high-oleic Spanish peanut (TX).

Germination Test of Breeding Lines (L#) and Varieties.

Early-maturing, High-oleic Tamrun OL12 Runner Variety.

RESISTANCE TO LEAFSPOT

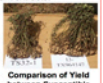
Needs:

•1. Leafspot-resistant varieties to reduce yield losses.
•2. Testing of fungicides and herbicides to assess usefulness in control of disease and weeds.
3. Identification of indigenous plant extracts capable of serving as inexpensive fungicides.

Results:

•1. Pending release of leafspot-resistant erect (Spanish) peanut variety (Burkina Faso).
•2. Testing of chlorothalonil (in collaboration with UF157) and verifying its effectiveness in disease control.
•3. Beginning of testing of native plant extracts.

Leafspot-Resistant Spanish Variety to be Released in Burkina Faso



Comparison of Yield between Susceptible and Resistant Lines

Increase of Newly-Developed Breeding Lines in Ghana

SEED MULTIPLICATION

Needs:

•1. Multiply seeds of new varieties to provide farmers with high quality seed for planting.
•2. Train personnel in methods of seed multiplication and quality assurance.

Results:

•1. Multiplication of breeders seed by the ISRA breeding program, and transfer to farmers in collaboration with the NGO ASPRODEB, funded by the private Suneor corporation.
•2. Release of new, early-maturing varieties by ISRA.
•3. Identification of candidates in Senegal and Burkina Faso for training in Texas.

Shelling of Breeders Seed

Multiplication of Seed On Farm near Bambey, Senegal

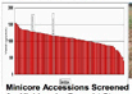
DROUGHT TOLERANCE

Needs:

•1. Identify drought-tolerant germplasm that can be used as parents for developing new varieties combining drought tolerance and other traits.
•2. Make crosses to develop new populations to screen for lines that can be developed into new varieties.

Results:

•1. Identified germplasm in the US peanut minicore collection with superior yield or adaptive traits under water deficit stress.
•2. Began screening ICRISAT lines for yield at the Sahel Pobe station in Burkina Faso.
•3. Began making crosses to develop new populations to screen.



Minicore Accessions Screened for Yield under Drought Stress, Showing Some Higher Yielding Accessions than Current Varieties

Screening for Drought Tolerance at Pobe Station In Burkina Faso

BENEFITS

•1. Greater sustainability of production through reduced yield losses from disease and drought.
•2. Potential for reduced mycotoxin contamination through improved tolerance to drought.
•3. Improved farm income through higher yields.
•4. Improved farm income through sale of higher value peanuts.
•5. Improved availability of high-quality seed for farmers.
•6. Greater income for women through sale of higher-value peanuts.

HIGH OIL PEANUT

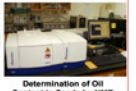
Needs:

•1. High-oil varieties for production of more oil for cooking on the same acreage.
•2. Identification of high-oil peanut germplasm to use as parents to develop these high-oil varieties.

Results:

•1. Identification of peanut species with 60-65% seed oil content.
•2. Successful crosses between wild species, and a bridge cross to bring genes into section Arachis.
•3. Identification of other materials with ca. 55% seed oil content to use as parents in crosses to develop adapted high oil cultivars.

High-oil Content wild Species of Peanut



Determination of Oil Content in Seeds by NMR

BIOTECHNOLOGY

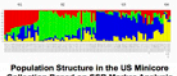
Needs:

•1. Development of DNA-based markers to use for breeding for tolerance to drought and leafspot.

Results:

•1. Identification of markers in the minicore collection for drought response by association mapping.
•2. Development of SSR-based maps for introgression populations to use in identifying markers for leafspot resistance.

Minicore line tested at 25% ET Replacement



Population Structure in the US Minicore Collection Based on SSR Marker Analysis

OUTREACH

Needs:

•1. Dissemination of field results to local farmers.
•2. Listening to needs of farmers.

Results:

•1. Field days attended by local farmers in Burkina Faso and Texas.

Farmers' Association visiting Peanut CRSP trials At Farakoba, Burkina Faso

Demonstration of plots at Gampela, Burkina Faso

CAPACITY BUILDING

Needs:

•1. Training of a peanut breeder for Ghana, graduate students in plant pathology in Burkina Faso, and of personnel in seed multiplication.
•2. Provision of equipment and facilities for the program in Burkina Faso.

Results:

•1. Graduation of Nicholas Denwar from the PhD program at Texas Tech, and return to SARI to assume the position of peanut breeder.
•2. Construction of a greenhouse and purchase of a truck for research in Burkina Faso.

Dr. Nicholas Denwar, Ph.D., Texas Tech 2011; Savannah Agricultural Research Institute, Tamale, Ghana

M.S. Students taking Defoliation ratings in Burkina Faso.

New Greenhouse at the Université de Ouagadougou

FUTURE NEEDS

•1. Leafspot resistance – improved yield in resistant varieties (Spanish for Africa, runner and Spanish for US).
•2. Screening of new populations and release of drought-tolerant varieties, and testing for reduced mycotoxin contamination.
•3. Edible seed quality – combine seed dormancy, high oleic, and larger seed size traits. Add also leafspot resistance.
•4. High oil peanut - crossing high oil trait into the cultivated species, and development of high oil varieties.
•5. Seed multiplication – improved system of seed multiplication and provision of high quality seed to farmers.
•6. Biotechnology – further development of markers for drought tolerance and leafspot resistance, and integration into the breeding programs.
•7. Capacity building – MS training in breeding, seed multiplication and development of suitable harvesting equipment, and marker analysis; construction of a greenhouse for the Ghana program.
•8. Expand regional testing – include Senegal, Burkina Faso, Ghana, and perhaps Mali; continued collaboration with UFL and NCS programs.