Project Number: S-009

Project Title: Plant Genetic Resources Conservation and Utilization

Period Covered: 08/2005 through 6/2006

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Annual Meeting Dates: June 6, 2006

Participants: www.ars-grin.gov/ars/SoAtlantic/Griffin/pgrcu/s9report.html

Minutes: www.ars-grin.gov/ars/SoAtlantic/Griffin/pgrcu/s9report.html

Accomplishments and Impacts:

USDA – Plant Genetic Resources Conservation Unit

Plant genetic resources collected or obtained from throughout the world are valuable sources of genetic diversity for use in agronomic and horticultural crop improvement programs in the U.S. This project forms part of a comprehensive nationwide program, National Plant Germplasm System, to preserve plant genetic resources for use today and for use by future generations. The primary objectives of this project are 1). To conserve genetic resources and associated information for a broad spectrum of crops and related species; 2). To develop and apply new or improved evaluation procedures and marker-based approaches to assess diversity of genetic resources in the collections and evaluate materials for useful traits; and 3). To transfer technology to researchers and plant breeders in the Southern Region and worldwide in the form of plant genetic resources and associated information. Seed and clonal genetic resources acquired, maintained, characterized, evaluated, documented, and distributed by this project will provide researchers with a broad range of clearly-identified crop genetic diversity to utilize. This broad genetic diversity enables research programs to efficiently produce new cultivars, develop new knowledge, discover value-added uses, and preserve food security for the general public.

The germplasm collection at Griffin, Georgia has increased to 85,483 accessions of 246 genera and 1,473 species. In 2005, a total of 16,846 seed, tissue culture, and clonal accessions were distributed to researchers and educators at universities, private companies, agricultural and medical research foundations, seed conservatories, federal agencies, farmer-owned cooperatives, and foreign universities and companies. All accessions were requested from the Griffin location directly by researchers and distributed in 592 orders to users in 44 states and 38 foreign countries. Genetic resources maintained at the Griffin location are in great demand by the research community and provide a valuable resource for crop improvement research. The quantity and quality of plant genetic resources maintained at Griffin makes this location one of the leaders in the National Plant Germplasm System.

Biosecurity and availability of plant genetic resources are of major concern to the U.S. agricultural research community. Backing up germplasm by maintaining accessions at two sites reduces the risk of losing valuable germplasm. In the last year, 92% of the collection is backed up at the National Center for Genetic Resource Preservation, Ft. Collins, CO and 85% of the accessions are available for use by the research community. Backing up safely secures these

plant genetic resources for future use by researchers and good availability provides users with a wide array of currently available germplasm.

Vigna:

Cowpea regeneration was conducted by Graves Gillaspie, Plant Genetic Resources Conservation Unit, with 30 lines increased in the winter, 185 lines increased in Griffin, and 51 lines increased in Puerto Rico. Digital images of flowers (482 images), seeds (538 lines), and some leaves and pods were taken on regeneration plants and other lines in the cowpea core collection. These images are posted on GRIN for use by breeders and other researchers. An additional 200 lines of cowpea were screened for CMV resistance. Seedborne viruses were detected and eliminated from 15 cowpea lines that were being regenerated for the first time.

Peanut:

One hundred forty one peanut accessions which include the mini core collection, known botanical varieties and near relatives of cultivated peanut were assessed for genetic diversity and identification to botanical variety. Currently, many accessions in the cultivated peanut collection are only identified to species. Thirty-five peanut genomic SSR markers with M13 tails were used to assess the genetic diversity and classify the 141 peanut accessions. These 35 SSR markers can be used on other cultivated peanuts to assess for genetic diversity and classification to botanical variety.

A total of 700 cultivated peanut accessions were selected by Roy Pittman, Plant Genetic Resources Conservation Unit, for seed increase at the Bledsoe Research Farm with most of the accessions having very good germination. Seed increases were obtained for 695 cultivated peanut accessions. A total of 75 accessions of cultivated peanuts were processed through quarantine to be available for researchers. Over 400 clonal peanut accessions were maintained in the greenhouse and screenhouse.

Grasses:

Regeneration of the entire bahiagrass collection (178 accessions) was initiated at Byron, GA, by Melanie Harrison-Dunn, Plant Genetic Resources Conservation Unit, with seed harvested from 106 accessions. A total of 69 accessions of minor grasses were transplanted to the field with seed successfully harvested from 53 accessions. Descriptor data were collected for 210 clonally maintained *Cynodon* accessions which currently had no descriptor data available in GRIN. A total of 841 images were entered in GRIN for 77 bamboo accessions, herbarium specimens for 143 accessions, photographs of 413 accessions, and whole plant images of 131 clonally maintained *Cynodon* accessions.

A workday was initiated with members of the Southeastern Chapter of the American Bamboo Society to thin out the plots and remove dead canes from the bamboo collection maintained at Byron, GA. The workday was very successful and plans were made to make this a semiannual event.

Clovers, New Crops, Misc. Legumes, and Misc. Crops:

A total 227 misc. legumes, new crops, and other misc. crops were regenerated in 2005 at Griffin by Brad Morris, Plant Genetic Resources Conservation Unit. Seed was harvested from an additional 25 accessions planted in 2004 that required two years to produce seed. In collaboration with David Knauft, University of Georgia, seed was produced of 78 accessions of

Centrosema plumieri, C. pubescens, C. virginianum, C. species, *Chamaecrista fasciculate, Clitoria laurifolia, C. ternatea, Crotalaria verrucosa, Desmodium cuspidatum, Eriosema floribundum, Indigofera miniata, Lespedeza bicolor, L. bicolor* var. *bicolor, L. Cyrtobotrya, L. maximowiczii, L. thunbergii, Lotononis bainesii, Senna marilandica, S. septemtrionalis, Sesbania exasperate,* and *S. sesban*. A total of 48 self-pollinated annual clover accessions were regenerated in the greenhouse, and 38 annual clover accessions were regenerated in the field. Regeneration of short-day African clover accessions continued in the greenhouse during the fall.

Sorghum:

Regeneration of sorghum accessions in St. Croix and Puerto Rico continued in coordination with the sorghum curator, John Erpelding. Over 1,480 accessions were sent to St. Croix for regeneration in 2005 and seed from regenerations of over 1,455 of those accessions has been sent to Griffin. A total of 460 accessions of sorghum and wild sorghum species with critically low germination or seed amounts were sent to Puerto Rico and seed of those will be returned to Griffin if regeneration is successful.

Cleve Frank, ARS, at Lubbock, TX conducted a photoperiod sensitivity evaluation of over 8,500 sorghum accessions maintained only at Ft. Collins. A total of 2,121 sorghum accessions were identified as insensitive to photoperiod and seed were sent to Griffin to become part of the active collection. Accessions insensitive to photoperiod are in most demand by sorghum researchers interested in U.S. grain sorghum production.

Vegetable Crops:

Bob Jarret, Plant Genetic Resources Conservation Unit, characterized 800 accessions of the *Capsicum annuum* (chile pepper) germplasm collection grown in the field and greenhouse via digital images and descriptors and uploaded the information onto the GRIN database. This effort has improved the efficiency of utilization of the collection and fostered research utilizing these genetic resources.

Regeneration of vegetable crop genetic resources has continued in order to ensure their viability and availability to the research community. Regenerations were conducted on 62 accessions of *Capsicum* sp., *Citrillus*, *Cucurbita moschata*, and misc. cucurbits. Additional accessions of *Abelmoschus* sp., *Citrillus*, recalcitrant *Capsicum* spp., and misc. cucurbits were regenerated in the greenhouse and in Parlier, CA, and Mayzguez, PR. More than 750 accessions of sweetpotato were maintained in tissue culture (sweetpotato) or grown in the field for seed regeneration.

Seed lots from the *Capsicum* core collection and random samples from the entire Capsicum collection were assayed for infection with pepper mild mottle virus (PMMoV). Approximately 15-20% of the accessions evaluated were found to be infected with PMMoV. This information prompted a screening of the entire *Capsicum* collection for this virus and resulted in a modification of *Capsicum* germplasm distribution policies.

Molecular Evaluations:

Molecular evaluations to determine phylogenetic relationships and/or genetic diversity present within plant genetic resource collections were conducted on 141 accessions from the peanut mini-core collection and additional botanical varieties and wild relatives of peanut (reported above), 94 accessions from the pepper germplasm collection, and 26 accessions from the *Crotalaria* germplasm collection. The peanut mini-core and wild relatives were assessed

with 31 SSR markers. The marker data allowed the examination of phylogenetic relationships among accessions in the mini-core and provided clarification on misclassified accessions. Pepper germplasm has been evaluated for morphologic characters but genetic diversity has not been assessed at the molecular level. Molecular genetic analysis helped assign botanic names to ambiguous accessions and helped breeders utilize divergent accessions in cultivar development programs. Species identity was determined by DNA markers in *Crotalaria* accessions known to differ in biochemical traits such as fiber, protein, and oil content. Genetic variability and similarities among *Crotalaria* accessions were determined to improve breeding efficiency.

A novel strain of alfalfa mosaic virus was detected in *Crotalaria* germplasm. The symptoms were characterized and the strain was isolated, partially sequenced, and compared to others on Genbank. This work will allow breeders and researchers to test infected plants for this virus and recognize possible infection through wilting and necrosis symptoms.

Germplasm Maintenance:

In the last year, germination tests were conducted on over 8,690 accessions. Since 2002, when a germination testing program was initiated at Griffin, germination tests have been conducted on 38.7% of the entire collection. Over 3,300 accessions were sent to Ft. Collins for new back up samples or replacement of other back up samples. The program continued to split seed samples of all accessions at Griffin with a small distribution sample maintained at 5 C and the bulk of each sample maintained at -18 C to maximize seed longevity. Currently, almost 59% (over 49,800 accessions) of the entire collection has at least one sample in -18 C storage.

Alabama

Legumes: Forage and Cover Crops
Current work focuses on evaluation of sunn hemp, sericea lespedeza, clovers and *Vicia* species. Sunn hemp germplasm is being used for development of cultivars for the continental US. The objective is to develop cultivars that can be used as fodder and as cover crops. Evaluations are being done in cooperation with colleagues at Auburn, GA, LS, AR, and USDA at several locations.

Upland cotton
Current work focuses on evaluation of the TX collection of upland cotton (*G. hirsutum*) for resistance to reniform nematode, and tolerance or resistance to heat and drought stress. The objective is to find resistance and incorporate it into adapted cotton germplasm. Evaluations are being done in cooperation with colleagues at Auburn.

Arkansas
No Report

Florida
Records received from S-9 indicate that 532 accessions of various plant species maintained at the PGRC Unit at Griffin, GA were distributed during 2005 to individuals or organizations with addresses in Florida. Comparable numbers from 2001, 2002, 2003, and 2004 were 406, 609, 840, and 418, respectively. These numbers are comparable with previous years except for 2003 that included a shipment of over 450 items to one location. Eleven cooperators from the public

and private sectors provided individual reports on specific uses of germplasm during 2005 and these are included below.

Dr. Scott Adkins, Research Plant Pathologist (Virology), USDA-ARS-USHRL, 2001 South Rock Road, Fort Pierce, FL 34945 reports that he has used Papaya ringspot virus (PRSV-W) resistant S-9 germplasm provided by Bob Jarrett in an attempt to separate an unknown and novel virus from PRSV-W in mixed field infections. We have met with some success in this approach but ultimately got lucky and found a single field infection of the unknown virus. He is currently working with Chandrasekar Kousik at the Charleston, SC ARS lab to screen some of this same and additional germplasm for resistance to cucurbit viruses.

Mr. Richard C. Batty, Environmental Scientist, Florida Environmental Protection Commission, Wetlands Management Division, reports that he received *Hibiscus* germplasm that was used to augment the living *Malvaceae* collection located at the University of South Florida Botanical Garden. The material has also been used in a related *Hibiscus* breeding program at USF.

Dr. Ann Blount, North Florida Research and Education Center, Marianna reports that materials currently in early evaluation include numerous plant introductions obtained from NPGS-GRIN S-9 and from several scientists working with *Paspalum* species in Australia, Uruguay and Argentina. Evaluations of several new species have shown superior winter growth and better seasonal forage distribution compared to bahiagrass. Selection criteria includes winter survival, frost tolerance, forage yield, forage quality, seasonal forage distribution, turf characteristics, seed production, and persistence under grazing. Approximately 300 mainly *P. notatum* and a few other closely related species accessions will be planted at the NFREC-Marianna in 2006 from seed obtained from S-9. Multi-location evaluations from previous seed obtained from S-9 still continues with *P. nicorae*, *P. quadrifarium* and *P. guaraniticum* (*P. nicorae* - PIs 202044, 209983, 276248, 276249, 283020, 284171, 304004, 310131, 404469, 404471, 404859, 462273, 477103, 490363, 490364, 508818, 508819, 508820, 508821; *P. quadrifarium* - 404880, 404881, 404882, 462302, 462295, 462298, 508942, 508947; *P. guaraniticum* – 404449).
All available vegetative materials of Hemarthria from S-9 have been planted and established in 2005 at the NFREC-Marianna. Plans are to increase the planting material and establish replicated trials at several locations in north Florida. The focus of this effort is to identify cold tolerance, forage quality and nutrient removal efficiency in the PI collection for use in developing a Hemarthria breeding program.

Mr. Allen Boatman Vocational Horticulture Instructor at the Falkenburg Road Jail in Tampa Florida reports that his adult education horticulture program has grown out over 400 pepper accessions from S9 for evaluation for flavor and heat. Some appear to be very good for culinary uses. He has recorded hundreds of those accessions and heirloom varieties on "digital film" and they were offered to the S-9 lab for reference and could be used as comparison to the images that Bob Jarret is making in the fields at S9. A link to the photos is www.linuxis.net/gallery/allen. He reports that the only accession received in 2005-06 out of the three requested was PI 590507 *Capsicum cardenasii*. Germination was very poor and only one seedling has become a 2 inch three leaved weak plant after three months. His group has provided seed (largely non-isolated) to 100's of hobbyists around the world and in the United States, per a discussion with Dr. Pederson at the 2004 International Chile Conference in Naples, Florida. Both Dr. Pederson and

Dr. Alan Stoner agreed this would provide new growing material for hobbyists who wanted something different, and it would also relieve the pressure of hobbyist requests submitted to the USDA. Secondly, he attempts to isolate what accessions that he can and supply that isolated increased seed to the USDA. This year he sent a large amount of pure/isolated seed for *Witheringia (Capsicum) ciliatum* http://www.ars-grin.gov/cgi-bin/npgs/html/tax_site_acc.pl?S9%20Capsicum%20ciliatum. Future varieties/species are planned for donation to the USDA S-9 and other labs. A large amount of seed and information for two wild species and one commercial variety were supplied for testing and possible storage by David Brenner at the Plant Introduction Station at Ames Iowa.

Dr. Jose Chaparro, Horticulture Sciences Department, University of Florida, reports that hybrid cherry seed from Australia was cleared through quarantine and received in 2005. The seedlings are being grown out to evaluate them for breeding purposes.

Dr. Eilene Kabelka, Horticulture Sciences Department, reports the following on use of Cucurbit germplasm. The *Cucurbita* and *Citrullus* PI material obtained from S-9 during 2005 is being utilized as sources of beneficial genes for introgression into squash and watermelon. Beneficial genes that may be obtained from this material include resistance to several potyviruses, phytophthora blight, and powdery mildew. Crossing this material with domestic squash and watermelon germplasm is being performed for the introgression of these beneficial genes into advanced material using both traditional and molecular methods. Molecular markers linked to beneficial genes from the S-9 PI material will be of direct use to public and private breeding programs and the scientific community.

Dr. Ken Quesenberry, Agronomy Department, reports the following on his programs use of *Desmodium* and *Paspalum* germplasm. *Desmodium incanum* germplasm is being used in conjunction with a 2003 TSTAR grant evaluating the morphological, agronomic, and chemical characteristics of *Desmodium incanum* accessions. Six accessions have been selected for superior agronomic performance. Specific characteristics that are under evaluation include: growth habit and spread, dry matter yield, tannin content, crude protein and IVOMD. New sexual tetraploid bahiagrass clones [derived from in vitro chromosome doubling of Tifton 9 (PI 531086)] and two sexual germplasm releases (PIs 619631 and 619632) have been hybridized with Argentine bahiagrass (PI 148996), three other narrow leaf apomictic cold hardy tetraploid bahiagrass accessions (PI 315732, 315733, and 315734) and an apomictic tetraploid breeding line selection from Tifton known as Tifton7. Over 900 progeny form these crosses were evaluated as spaced plants in summer 2005 and selections for superior apomictic and sexual lines were made.

Ms. Emily Ruff, Florida School of Herbal Studies reports that the *Cymbopogon* and *Capsicum* germplasm obtained by the Florida School of Herbal Studies was used in their continued education and research projects on herbs and plant material that have historical use for health related purposes. All germplasm was germinated and cultivated through its growth cycle. She was pleased with the germination rate, although a few specimens did not germinate.

Dr. Tom Sinclair, Agronomy Department, University of Florida, reports that four common peanut accessions (PIs 537112, 546372, 561917, and PI 628529), plus the cultivar Georgia

Green were evaluated in a nitrogen fixation experiment. The objective was to conduct an experiment in parallel with research being done at ICRISAT in India on drought tolerance among peanut genotypes. The experiment performed at Gainesville was to investigate the nitrogen fixation response of different peanut lines to drought. The results of the experiment confirmed our earlier results showing that overall peanut nitrogen fixation is relatively insensitive to soil drying. Genotypic differences in the degree of tolerance were identified, however.

Ms. Gigi Swagle, C & G Nursery, reports that the bamboo accessions received in 2005 grew nicely but were susceptible to rabbit feeding damage as young shoots although now are recovering nicely.

Dr. Barry Tillman, North Florida Research and Education Center, Marianna, reports that the University of Florida Peanut Breeding Program has 733 active breeding lines with at least one PI as a direct parent. A total of eight PI's were used to create these 733 breeding lines by crossing with various cultivars and other breeding lines (PIs 540866, 512249, 540867, 497358, 512249, 536059, 530671, and 536076). The program continues to bring in germplasm from Bolivia through a CRSP project, but has not made any direct crosses with PI's in the last year. Three new cultivars were released in 2006 and two of them trace their parentage to at least one PI. Our primary focus in using PIs is disease resistance.

Georgia

Thirty-five requests for plant germplasm were made to the S-9 unit by the citizens of Georgia during 2005. As a result of these requests, a total of 554 plant accessions were supplied to University scientists, USDA scientists, consultants, seed companies, gardeners, and numerous individuals. The most requested crops were cultivated and wild peanut, cowpeas, warm season grasses, bamboo and various legumes.

The University of Georgia has maintained a strong emphasis on plant breeding and continues to expand its advanced molecular biology programs. These programs supply new crop cultivars and associated technologies to our agricultural sector and rely heavily upon the plant materials maintained within the S-9 unit. UGA currently has active cultivar development programs in soybean, peanut, small grains, cotton, turfgrasses, forages, blueberries, pecans, fruits, vegetables, and numerous ornamental crops that frequently utilize the plant genetic resource collections. In addition, research programs in crop science, horticulture, plant pathology, entomology and other disciplines utilize the genetic resources of the S-9 unit in both basic and applied research projects designed to address the needs of Georgia agriculture. The S-9 unit remains a critical component of our research and cultivar development programs.

Guam

During 2005-2006, the main activity of the project was to collect germplasm of hot peppers (*Capsicum annuum* and *C. frutescens*) for the field trials. Nearly 100 lines were obtained from commercial seed companies, Asian Vegetable Research Development Center, USDA-ARS, Plant Genetic Resources Conservation Unit, and local collection. These hot pepper accessions will be evaluated in the 2006 field trial for general screening of tropical climate adaptation in Guam, marketable yield and fruit pungency.

Three large-fruited heat tolerant tomatoes (*Lycopersicon esculentum*) were studied for their total soluble sugar content and dry matter (%). Two cultivars, 'Solar Set' (mean=6.73%; sd=0.69, N=9) and 'Sun Chaser'(mean = 6.68%; sd=0.73, N=9) had higher %DM than 'Solar Fire' ((5.87%; sd=0.39, N=9). The % Brix was the lowest for 'Solar Set' (mean=4.12%; sd=0.76, N=9) followed by 'Sun Chaser' (mean=4.45%; sd=0.20, N=9) and 'Solar Fire' (mean=4.72%; sd=0.39, N=9). The antioxidant property of 'Solar Fire' was examined and it was found the fruit had the average of EC50 = 46.0 ml/g DPPH (sd=3.8, N=5).

USDA-Natural Resources Conservation Service, Pacific Island Area obtained eight accessions of *Mucuna pruriens* var. *utilis* for future cover crop studies from USDA-ARS, Plant Genetic Resources Conservation Unit. Currently the plant materials are being propagated. With sufficient quantities of seed, farm-scale trials will be conducted on multiple Pacific islands.

Hawaii

Germplasm Requests and Utilization

The following list describes the germplasm requests from Hawaii in 2005.

Gourds	*Lagenaria*	10
Eggplant	*Solanum*	1
Grasses, warm season	*Eleusine*	1
Legumes	*Desmodium*	1
Legumes	*Indigofera*	1
Legumes	*Lablab*	9
Legumes	*Sesbania*	1
Peanuts, cultivated	*Arachis*	2
Pearl millet	*Pennisetum*	1
Peanuts, wilds	*Arachis*	6
Vigna, cowpeas	*Vigna*	1
Eggplant	*Solanum*	1
Okra	*Abelmoschus*	2

Contact with several cooperators revealed the following information.

Cooperator 1

Solanum sessiliflorum, the Cocono/Cubiu, not Eggplant; no luck yet growing it.

Eleusine coracana, the fingermillet, a high yielding accession from Pakistan, impressive here.

Desmodium nicaraguense, does not appear to be the giant that I have seen in previous accession.

Indigofera, no luck

Lablab purpurea, accessions from India for evaluation as perennial flowering and as vegetable quality pods vs. the commoner grain type. Several failed, two perennial flowering.

Sesbania speciosa, a species which does well in its role as a green manure. It was promoted in India 50 years ago to be grown with paddy rice to provide on site N. Impressed.

Arachis hypogaea, the two largest peanuts in the collection observed with the idea of a garden sort for Hawaii, as some grow peanuts here in home gardens. Yield of the one was good and one was ho hum.

Pennisetum stated to be the quickest accession to flower. Not quite so but the land race variation is interesting.

All accessions were obtained to observe performance here. Nothing is yet being utilized.

Cooperator 2
We haven't yet done anything with the *Arachis pintoi* germplasm. A lab assistant has been hired as a part-time, and we have collected the Al-toxic soil, but we are still in the process of getting ready for the first trial to establish the best liming levels for screening of the germplasm.

Cooperator 3
Received two Okra varieties and one eggplant, but was a bit late in planting them. The eggplants are about 6 inches tall and the okra are doing well. One good thing found was that the germination rates were above 90%.

Macadamia (Macadamia integrifolia)

Evaluations of selections planted at the Captain Cook Experiment Station (elevation 610 m) in Kona are in progress. The trees were planted at a 4.5 x 9.2 m spacing and were top-worked. The test plot consisted of 6 trees of the following HAES selections, 294 (Purvis), 344 (Kau), 741 (Mauka), 788 (Pahala), 816, 835, 856 and 857) planted in 2 replicates. Nut and kernel quality data were obtained in the 15th year after top-working and showed that recovery of sound (No. 1) kernels ranged from 39% to 25%. Based on the recovery of No. 1 kernel the data showed that selections 788 (39%), 835 (36%) and 294 (36%) tended to perform better at this location. The 835, 788 and 294 had the highest wet-in-shell yields and the highest estimated yield of No. 1 kernels per tree. The poorest yielding selections were 857 and 344.

Evaluation of the newest Hawaii Agricultural Experiment Station (HAES) macadamia (*Macadamia integrifolia*) selections (862, 879, 887, 896, 900, and 932) is still ongoing at the University of Hawaii (UH) Waiakea Research Station in Hilo and the UH Kona Research Station in Kainaliu. The selections were planted in May and July 2001 in a cultivar evaluation trial which includes standard HAES selections 800 and 344.

Longan (*Dimocarpus longan*)

An initial consideration in the development of a fertilizer nutrient program for producing longan (*Dimocarpus longan*) trees is to determine the amount of fertilizer nutrients contained in the harvested fruits. This amount represents the amount of nutrient elements removed from the soil, which will need replenishment. Nutrient composition of the harvested fruit is only one important factor involved nutrient management of bearing longan trees, but it can provide insight into the nutrient requirements for this crop.

Data presented in Table 1 and 2 show the nutrient content of fruits for two longan cultivars (‘Biew Khiew’ and ‘Sri Chompoo’) growing at 3 different locations in East Hawaii on the island of Hawaii. All trees were treated with potassium chlorate to stimulate flowering, but tree age and field management practices varied between the 3 growing locations. Data shown in Table 1 are dry weight values from whole fruits that were analyzed for nutrient content and were obtained from 3 trees for each variety. Values shown in Table 2 are expressed as the percentage of each nutrient element contained within the fresh fruits.

Results obtained from the two cultivars were somewhat similar and showed that P levels for the two varieties were nearly identical but showed some variation between the sampling periods. ‘Biew Khiew’ and ‘Sri Chompoo’ fruits contain relatively high amounts of nitrogen and potassium with N levels exhibiting the largest variation within each cultivar. Profuse flowering

occurs after treatment with potassium chlorate and fruit thinning is recommended as setting of too many fruits can impact upon fruit quality. Although panicles were thinned by the growers, no attempt was made in this study to regulate the amount of fruit production/tree from the three sites, and the variation in N, K and Ca between the sampling dates may have been due to different levels of fruit thinning practiced at each site. There have been reports suggesting that heavy fruit production on 'Sri Chompoo' trees after stimulating flowering with potassium chlorate is sometimes associated with increased splitting of the pericarp after harvesting. Presently it is not known whether this observation is related to over production by the tree or inadequate amounts of nutrient elements such as calcium within the affected fruits.

Table 1. Nutrient element composition of 'Sri Chompoo' and 'Biew Khiew' longan fruits on a dry weight basis.

'Sri Chompoo'	Percent of Dry Weight						ppm	
	N	P	K	Ca	Mg	S	Zn	B
Farm A								
Jan 03	.83 + .05	.15 + .01	1.51 + .14	.17	.08	.06 + .01	13	12
Farm B								
May 03	.82 + .02	.13 + .01	0.97 + .02	.38 + .03	.16 + .01	.06 + .01	16	12
Farm C								
Jan 02	.49 + .02	.16 + .01	1.40 + .04	.24 + .41	.15 + .01	.06 + .01	19	11
Mean	.71 + .16	.15 + .01	1.29 + .23	.26 + .09	.13 + .04	.06 + .003	16	12

'Biew Khiew'	Percent of Dry Weight						ppm	
	N	P	K	Ca	Mg	S	Zn	B
Farm A								
Jan 03	1.22 + .09	.14 + .01	1.43 + .07	.40 + .12	.14 + .01	.09	16	11
Farm B								
May 03	1.07 + .08	.17 + .01	1.25 + .11	.34 + .02	.13 + .01	.08 + .01	17	16
Farm C								
Jan 02	.68 + .07	.16 + .01	1.35 + .10	.30 + .03	.13 + .01	.09 + .01	24	14
Mean	.99 + .23	.16 + .01	1.35 + .08	.34 + .04	.13 + .01	.09 + .004	19	14

Table 2. Nutrient element composition of fresh longan fruits.

'Sri Chompoo'	Percent of Fresh Weight					
	N	P	K	Ca	Mg	S
Farm A						
Jan 03	.233	.042	.423	.048	.023	.018
Farm B						
May 03	.250	.040	.295	.115	.049	.017
Farm C						
Jan 02	.137	.044	.393	.067	.041	.018
Mean	.207 + .049	.042 + .002	.370 + .055	.077 + .029	.037 + .011	.018 + .002

'Biew Khiew'	Percent of Fresh Weight					
	N	P	K	Ca	Mg	S
Farm A						

Jan 03	.316	.036	.371	.119	.037	.023
Farm B						
May 03	.302	.048	.354	.096	.038	.023
Farm C						
Jan 02	.180	.042	.356	.078	.033	.023
Mean	.266 + .061	.042 + .005	.360 + .008	.098 + .017	.036 + .002	.023

Rambutan (*Nephelium lappacium*)

A phenological study to characterize the flowering pattern of trees was completed on rambutan cultivars grown on the eastern coast of the Island of Hawaii. Rambutan flowering is stimulated by water stress, and symptoms of water stress in trees could be observed when leaves curled inward along the margins. Instead of a single prolonged dry season as in Chanthaburi, Thailand or Cairns, Australia, Hawaii tends to have two short periods of drier weather during the winter and spring. As a result, two flowering periods can occur in Hawaii. One period is usually heavier than the other, but in some years, the dry seasons are not intense enough to elicit flowering during the two periods. Three flowering cycles sometimes occur, however, the duration of water stress is usually too brief to induce heavy flowering and poor fruit set and development are often the result.

Flowering occurs 1-2 months following a dry period, but the amount and duration of flowering is dependant on the intensity of the drought stress, the maturity of the terminals, flushing activity and tree health. Heavy flowering usually follows a long drought period but is affected by tree health and vigor, maturity of the terminals, amount of flushing and fruit load. Flower initiation may be hindered by heavy fruit set even in the presence of dry weather. Anthesis within an orchard usually occurs over a 2-3 month period, but can extend over 5 months during prolonged dry periods. Anthesis of a single panicle occurs over 3-7 weeks for many cultivars, however, panicles on the "Silengkeng" cultivar can take up to 23 weeks to complete anthesis. "Silengkeng" trees produce large panicles and can take up to 9 months to complete its flowering cycle.

Three types of flowers are observed on rambutan trees during flowering. They include staminate true male (TM) flowers, hermaphroditic functionally female (HF) flowers, and hermaphroditic functionally male (HM) flowers. Panicles on grafted rambutan cultivars possess HF flowers intermingled with a very small percentage (<1.0%) of HM flowers, and most of the cultivars that have been planted in Hawaii possess a high percentage of HF flowers and low percentages of HM flowers. The HM flowers usually are first to open on panicles that have a combination of HM and HF flowers. The HM flowers are found in highest frequency during the first 3 weeks during anthesis, but as anthesis progresses nearly all of the remaining flowers are HF flowers. If seeds are planted, some of the seedlings (25-50%) will develop into male trees that never fruit and possess only staminate true male (TM) flowers. Panicles on male trees take approximately 24 to 46 days to complete anthesis. Anthers on the TM flowers release pollen, which are dispersed for pollination. The HF flowers, which develop into fruits and number between 200 and 800 on each panicle, do not shed pollen. HM flowers are less common during cooler months. The TM and HM flowers are the pollen sources during pollination and for fruit set. Deformed, undersized fruits that lack a fleshy aril are a common occurrence without pollination. In Hawaii the 'Silengkeng' cultivar naturally produces more HM flowers than other cultivars and makes it an excellent pollinator tree. Grafted or air layered male trees planted

within or around the perimeter of an orchard will also increase availability of pollen during flowering.

As reported earlier naphthalene acetic acid (NAA) or NAA in the potassium salt form (K+NAA) or sodium salt form can be used to stimulate production of HM flowers with viable pollen male when it is applied to hermaphroditic female panicles during early stages of flower opening. Aqueous sprays of the potassium salt of NAA (K+NAA) at 90 ppm stimulate HM development within 5 to 12 days after treatment. Re-treatment of additional panicles will continue production of HM over the entire flowering season. Maximum numbers of male flowers are produced at 6 to 8 days after treatment and induction ceases after about 12 days. 'Rongrien' and 'Jitlee' are examples of very responsive cultivars and consistently produce male flowers after NAA treatment. Although 'Binjai', 'R162', and 'R156 Red' are very responsive to K+NAA, low numbers of male flowers are produced if panicles are not treated during the peak flowering period. Climate influences the effectiveness of K+NAA treatments. Rambutan trees grown in higher elevations did not respond as well as those at lower elevations, probably due to cooler conditions. Panicles with a more robust appearance are more responsive to NAA. Individual flowers respond to K+NAA treatment when they are at a stage of development where the white tip of the pistil is barely visible at the end of the flower. Since maximum production of male flowers occurs about 7 days after treatment, multiple applications on different panicles within an orchard will be necessary to insure that male flowers are present throughout the flowering season.

Kentucky

Norman Taylor continues to work on red, white, and kura clover breeding. Two new red clover cultivars were released ('Kenton' and 'Kenway'). Other work involves selection for low phenolic level and powdery mildew resistance in red clover.

Todd Pfeiffer and Morris Bitzer are working on sweet sorghum breeding and seed production. Bitzer has been involved with sweet sorghum for many years, having worked with it before retiring as a grain crop extension specialist.

Said Ghabrial has evaluated *Desmodium* species in the S9 collection as reservoirs of viruses, mainly of soybean.

The USDA-ARS-FAPRU (Forage Animal Production Research Unit) at the University of Kentucky continues to grow. We are hopeful that forage legume geneticist will be hired in the near future.

Tim Phillips has begun work to evaluate the winter hardiness of some of the warm season grasses in the S9 collection.

Louisiana

Ipomoea (Rick Miller, Southeastern Louisiana University)

Research on Ipomoea species includes evolutionary ecology, molecular evolution and population genetics of genes involved in flower color, as well as the phylogenetic systematics of morning glories (species of the tribe *Ipomoeae*). The past request was made for morning glory seeds that are part of a population genetics study of *Ipomoea nil* and its close relatives. We are developing a

program where we are obtaining DNA sequence data from populations of *I. nil*, *I. hedereacea*, and *I. indica* throughout its range for regulatory genes in the anthocyanin biosynthetic pathway.

Vigna collection (Dr. Blair Buckley, Louisiana State University Agricultural Center)
The accessions obtained represent the majority of accessions in the *Vigna* germplasm core collection. The accessions were screened for reaction to the bacterial blight pathogen *Xanthomonas axonopodis* pv. *vignicola*. Screening is complete and data is being analyzed. Ratings will be submitted to the GRIN data base and a manuscript prepared.

Medicago collection (Dr. Wink Alison, Louisiana State University Agricultural Center)
We were setting up an alfalfa variety test and requested a small amount of seed of different varieties. The test was done at the Southeast Station. It was quite beneficial to be able to obtain small quantities of seed to use in different tests.

Sorghum collection (Dr. John Veremis, USDA/ARS team at Houma, LA)
Acquire and select exotic relatives and making crosses with *Saccharum* species to improve sugarcane. I received seeds from the core collection of Sorghum via Federal Express on Tuesday, February 19, 2002 from Lee Ann Chalkley after requesting from Dr. John Erpelding. Dr. Tew is the leader of our CRIS and he had suggested to me to cross Sugarcane with Sorghum. We tried to hybridize Sorghum with *Erianthus* and *Saccharum*, but the crossing was not successful the past two year, because we did not get any hybrids from our attempts. However, we planted in spring of 2002 the core collection of sorghum greater than 2000 accessions and evaluated as sugarcane under our field conditions, in order to provide yield-component data to potential growers who may wish to become involved in sorghum as a crop. I still have interest in the collinearity of the grass species and would like to receive some of the ancestral species of sorghum if possible to try addition hybridizations this fall.

Clover-legume collection (Dr. Stephen Boue, Southern Regional Research Center, USDA New Orleans)
I have been working on soybean isoflavones and their effects on animal systems. I have been working with Tulane University analyzing estrogenic effects on breast cancer. We wanted to look at legumes other than soy as sources of isoflavones. I have not explored clover and kudzu as much as I would like, but from the literature am aware of their isoflavone composition. I appreciate the samples that were sent. We are setting up a HPLC-mass spectrometry lab and would like to start screening samples soon for unique estrogenic compounds in legumes and other plants.

Sweetpotato Collection (Drs. Don La Bonte and Chris Clark)
Clones were requested in 2004/2005 to determine genetic variability in uptake of micronutrients Fe and Zn. The goal is to enhance the levels of these micronutrients in sweetpotato to lessen nutritional deficiencies found in developing countries. Other germplasm requests are related to virus resistance research, particularly towards resistance to Sweet Potato Virus Disease.

Mississippi

North Carolina

Faculty in the Crop Science and Horticultural Science Departments at NC State University conduct research on strawberry, blueberry, brambles, tree crops, ornamentals, maize, soybean, peanut, cotton, tobacco, small grains, turfgrasses, sweet potato, cucurbits, and other crops. Priorities have concentrated on incorporating disease and insect resistance, abiotic stress resistance, and quality factors into improved breeding lines and cultivars. Plant introductions are critical components of plant improvement programs. Germplasm collections are maintained for the U.S. *Nicotiana* cultivated and species collection, *Arachis* species, South American maize germplasm, and many accessions of soybean, blueberries, sweet potato and other crop species. The following represent a few of the research results from the past year.

Germplasm requested for distribution to North Carolina from the Plant Genetic Resources Conservation Unit, Griffin, GA, 2002-2005 (provided by M. Spinks, USDA, ARS, PGRCU).

Total 4094	
To SAES and USDA-ARS personnel	3979
Watermelon (*Citrullus*)	3226
Sweetpotato (*Ipomoea batatas*)	563
Watermelon (*Praecitrullus*)	65
Legumes (*Senna*)	32
Ipomoea spp.	27
Clover, annual (*Trifolium*)	15
Hibiscus (*Hibiscus*)	13
Legumes (*Mucuna*)	12
Legumes (*Strophostyles*)	5
Peanuts, wilds (*Arachis*)	5
Peanuts, cultivated (*Arachis*)	4
Peppers (*Capsicum*)	4
Sorghum (*Sorghum*)	2
Cucurbits (*Cucurbita*)	1
Eggplant (*Nicandra*)	1
Grasses, warm season (*Paspalum*)	1
Miscellaneous (*Thespesia*)	1
Okra (*Abelmoschus*)	1
Mung bean (*Vigna*)	1
To commercial companies	23
Peppers (*Capsicum*)	15
Sorghum (*Sorghum*)	8
To individuals	92
Peppers (*Capsicum*)	65
Sorghum (*Sorghum*)	14
Watermelon (*Citrullus*)	5
Wingbean (*Psophocarpus*)	3
Castor (*Ricinus*)	2
Cucurbits (*Cucurbita*)	2
Legumes (*Sphenostylis*)	1

Seed requests (Requests and no. of accessions) filled by the curator of the United States Nicotiana Germplasm Collection held at North Carolina State University: 2000-2005.

	2000		2001		2002		2003	
	Req.	Acc.	Req.	Acc.	Req.	Acc.	Req.	Acc.
U.S. Agricultural Research Service	0	0	1	1	3	12	7	76
U.S. state agencies and universities	27	89	32	203	39	283	39	172
U.S. commercial company	12	50	22	163	13	144	22	604
U.S. non-profit organization	1	1	4	7	3	4	3	8
U.S. individuals (no affiliation)	6	38	5	14	5	36	12	74
Foreign genetic resources unit	2	2	0	0	3	72	0	0
Foreign commercial company	1	34	6	18	4	13	3	112
Foreign non-commercial org.	13	51	20	153	9	20	14	193
Foreign individuals (no affiliation)	3	6	0	0	1	2	3	6
Total	65	271	90	559	80	586	103	1245

	2004		2005		Total	
	Req.	Acc.	Req.	Acc.	Req.	Acc.
U.S. Agricultural Research Service	4	8	3	52	18	149
U.S. state agencies and universities	31	269	32	194	200	1210
U.S. commercial company	25	343	23	995	117	2299
U.S. non-profit organization	4	10	3	4	18	34
U.S. individuals (no affiliation)	15	116	8	25	51	303
Foreign genetic resources unit	0	0	0	0	5	74
Foreign commercial company	1	1	1	1	16	179
Foreign non-commercial organization	14	161	12	30	82	608
Foreign individuals (no affiliation)	1	1	0	0	8	15
Total	95	909	82	1301	515	4871

Cultivars, parental lines, and germplasm released:

Cucumbers: Pickling hybrids NC-Davie (NC-54 x NC-55) and NC-Duplin (NC-56 x NC-57), slicing hybrids NC-Stratford (NC-58 x NC-59) and NC-Sunshine (NC-62 x NC-63) (Breeder: T.C. Wehner)

Maize: Inbred lines NC498, NC500, NC502, NC504, NC506, NC508, and NC510 (Breeder: M.M. Goodman)

Oat: Hull-less line NC98-197N (Breeder: J.P. Murphy, line to be named)

Peanut: Germplasm line N96076L; boiling-type peanut lines N97053J, N99080J, and N99085J (Breeder: T.G. Isleib)

Soybean: Non-nodulating nitrogen receiver Nitrasoy, (Breeder: J.W. Burton); oilseed lines N7002 and N8001 (Breeder: T.E. Carter, Jr., lines to be named)

Sweet potato: Tablestock clone Covington; ornamental clones Sweet Caroline Green Yellow, Sweet Caroline Bewitched Purple, Sweet Caroline Sweetheart Light Green, Sweet Caroline Sweetheart Purple, and Sweet Caroline Sweetheart Red (Breeder: G.C. Yencho and K.V. Pecota)

Tomato: Parental lines NC1, NC2, NC3, NC EBR-7, NC EBR-8, NC111F, NC123S, and NC1 rin (Breeder: R.G. Gardner)

Intellectual property protection on germplasm

N.C. Agricultural Research Service. Plant Variety Protection Certificate 200400303, Feb. 4, 2005. NC-Neuse wheat.

N.C. Agricultural Research Service. Plant Variety Protection Certificate 200500327, June 5, 2006. 06/05/2006. SS 76-40 oat.

N.C. State Univ.; U.S. Government as represented by the Secretary of Agriculture. Plant Variety Protection Certificate 200600070 (application pending). Phillips peanut.

N.C. State Univ.; U.S. Government as represented by the Secretary of Agriculture. Plant Variety Protection Certificate 200600071 (application pending). Brantley peanut.

N.C. State Univ.; U.S. Government as represented by the Secretary of Agriculture. Plant Variety Protection Certificate 200600174 (application pending). Goliath peanut.

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Pecota, K.; Yencho, C.; Pierce, C. 2004. Ornamental sweetpotato plant named 'Sweet Caroline Green'. United States Plant Patent, Patent No.: US PP15,056 P2, Aug 3, 2004.

Pecota, K.; Yencho, C.; Pierce, C. 2004. Ornamental sweetpotato plant named 'Sweet Caroline Bronze'. United States Plant Patent, Patent No.: US PP15,437 P3, Dec. 21, 2004.

Pecota, K.; Yencho, C.; Pierce, C. 2005. Grant of Community Plant Variety Rights for the variety 'Sweet Caroline Light Green' of the species *Ipomoea batatas* (L.) Lam. European Union Community Plant Variety Rights, Decision No. 15709, July 18, 2005.

Pecota, K.; Yencho, C.; Pierce, C. 2005. Grant of Community Plant Variety Rights for the variety 'Sweet Caroline Bronze' of the species *Ipomoea batatas* (L.) Lam. European Union Community Plant Variety Rights, Decision No. 15710, July 18, 2005.

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Pecota, K.; Yencho, C.; Pierce, C. 2006. Ornamental sweetpotato plant named 'Sweet Caroline Bronze'. Japanese Plant Variety Protection Certificate No. 13745, Feb. 27, 2006.

Pecota, K.; Yencho, C.; Pierce, C. 2006. Ornamental sweetpotato plant named 'Sweet Caroline Purple'. Japanese Plant Variety Protection Certificate No. 13746, Feb. 27, 2006.

Personnel issues

Dr. Niels Nielsen, formerly of the USDA-ARS at West Lafayette, IN, joined the Crop Science faculty as an associate member. He will work primarily with allergenic proteins in soybeans and peanuts.

Oklahoma

No report

Puerto Rico

University of Puerto Rico

Eighteen quenepa (*Melicoccus bijugatus*) cultivars are being evaluated at Juana Diaz and Lajas. A replicated guava planting consisting of 14 accessions was maintained and evaluated at Juana Díaz. Evaluation of six banana clones with no fungicide application for control of yellow sigatoka (*Mycosphaerella musicola*) showed that 'Yamgambii' produced the highest cumulative bunch weight over a three harvest cycle, with 56.4 kg. 'Grand Nain', 'Johnson', 'Ziv' and Hybrid 2390 produced an average cumulative bunch weight of 50 kg. 'Niño Alto' produced the lowest cumulative bunch weight, with 16.4 kg. Average yield for 'Estela' tanier (*Xanthosoma* spp.) was 9621 kg/ha, while 'Florida White' had a yield of 6306 kg/ha under humid upland conditions of Puerto Rico. No significant difference was found for yield between the use of 56 and 112 g tanier propagules. Twelve "Mayagüezano" type mango clones are being evaluated at Lajas. They are grafted on 'Banilejo' dwarfing rootstocks. Sweet cherry pepper (*Capsicum chinense*) was evaluated in the field at Lajas. A higher incidence of pepper weevil (*Anthonomus eugenii*) was found in 'Trompo' and 'Chato-D' than in 'Estrella' and 'Jorge Colón'. An experiment at two localities is evaluating the mandarin orange cultivars 'Fallglo', 'Encore' and 'Murcott' on the rootstocks 'Swingle', (H-802)Sunki x Benecke trifoliate hybrids, 'Cleopatra', 'Sun Chu Sha' and 'Carrizo'. Another experiment is evaluation the orange cultivars 'Hamlin', 'Cara Cara', 'Ambersweet' and 'Rhode Red Valencia' on the rootstocks 'Swingle', 'Cleopatra', 'Sun Chu Sha' and 'Carrizo'. Fresh market tomato germplasm (eight cultivars) was evaluated at Juana Díaz. Preliminary results for the percent of fruits damaged by the tomato fruitworm (*Helicoverpa zea*), showed the lowest values observed in cultivars 'Pik Ripe 461', 'Florida 91'and 'STM-0231' (5.8%, 7.5% and 8.0%, respectively), and the other five showed values from 16.0% to 17.7%. The highest percent of plants showing *Sclerotium rolfsii* infection was observed in 'BHN 543' (62.5%). All cultivars, except 'Pik Ripe 461', showed visible virus symptoms but the ones with the highest percent of plants with symptoms were 'Sunbeam', 'Mountain Fresh', 'STM 0227' and 'STM 0231'. The highest total marketable yield was achieved by cultivar 'STM 0227' and the lowest by cultivar 'Pik Ripe 747'. Average marketable fruit weight ranged from 8.3 oz. in 'Florida 91' to 6.6 oz. in 'Mountain fresh'. The percentage of culls (non-commercial) fruits, by number, ranged from 15.5% ('STM 0231') to 39.8% ('Pik Ripe 747'). 'Mayorbela', 'Chulo' and 'Suresweet' open pollinated maize populations were grown in the field at Isabela and selected for superior horticultural traits, including yield and insect resistance, in a recurrent selection breeding program. Pigeonpea germplasm is being evaluated at Isabela. Genetic improvement of three ornamental crops, *Caesalpinia pulcherrima*, *Leandra krugii* and ornamental *Musa* sp., is being done at Lajas. *Caesalpinia pulcherrima* is being bred for triploidy, *Leandra krugii* is being characterized and selected in the wild, and seven ornamental *Musa* species are being hybridized. Three hundred twenty four sorghum accessions were requested by Dr. J. Erpelding, USDA-TARS, Mayaguez, in 2005.

South Carolina

Germplasm Distribution

A total of 2,950 germplasm accessions were distributed by the Plant Genetic Resources Conservation Unit at Griffin, GA to the following individuals in South Carolina in 2005: Dr. Judy Thies, USDA Vegetable Laboratory, Charleston, SC, 27 *Citrullus* spp. (watermelon) accessions, 490 *Capsicum* (pepper) accessions, and 520 *Vigna* (cowpea) accessions; Dr. K. Ling, USDA Vegetable Laboratory, Charleston, SC, 81 *Ipomoea* spp. (sweet potato) accessions; Dr. Amnon Levi, USDA Vegetable Laboratory, Charleston, SC, 93 *Citrullus* spp. accessions and 1

Praecitrullus accession; Dr. C. Kousik, USDA Vegetable Laboratory, Charleston, SC, 1,697 *Citrullus* and 31 *Praecitrullus* accessions; T. Bishop, Atlantis Research, Inc., 1 *Curcurbita* accession, 3 *Zoysia* (warm season grass) accessions, and 1 *Hibiscus* accession; M. Czako, University of South Carolina, 1 *Miscanthus* (warm season grass) accession; B. Murdock, Murdock Farms, 2 *Citrullus* accessions; and Dr. B. Rhodes, 2 *Ipomoea* accessions.

Soybean Evaluation
Two-hundred eight soybean plant introductions (PIs) in maturity groups VI, VII, and VIII were obtained from Dr. Randall Nelson, USDA Soybean Curator at Urbana, Illinois, and planted at the Edisto Research and Education Center, Clemson University, Blackville, SC in 2005. The PIs had previously shown some level of resistance to Asian soybean rust disease (ASR), *Phakopsora pachyrhizi*, in USDA preliminary greenhouse evaluations and were planted in anticipation of naturally occurring rust disease in 2005. The objective of the experiment was to evaluate the response of the PI lines to ASR in a field environment and identify resistant PIs. The experiment failed due to reduced germination and emergence resulting in very poor plant stands. Additional field screening of soybean germplasm for rust resistance will be conducted in 2006 since ASR was identified at several locations in South Carolina during the 2005 soybean growing season.

In 2005 twenty-four elite soybean breeding lines from the soybean breeding program were tested in a greenhouse to determine their suitability as hosts for reniform nematode, *Rotylenchulus reniformis*. Tests were conducted by Dr. R.T. Robbins at the University of Arkansas. Five SC lines, SC01-819, SC02-208, SC02-210, SC02-211, and SC02-212, had reproductive indices no different than the resistant control cultivar, Anand. Two lines, SC01-819 and SC02-208, will continue to be evaluated in 2006 USDA regional tests as potential candidates for cultivar release.

Tennessee
The following projects are being conducted at the University of Tennessee in which novel or exotic germplasm lines are being utilized in research projects.

SOYBEAN
Project Title: Effects of Root/Leaflet Orientation Trait Combinations on Water-Use Efficiency in Soybean
Personnel: Fred Allen, Professor; Richard Johnson, Res. Associate, Dept. of Plant Sciences, Univ. of Tennessee
Objective: Determine the effects of combinations of fibrous root and leaflet orientation on water-use efficiency in soybeans.
Approach: Recombinant inbred lines (RIL) are being developed from a cross between a prolific rooting line, PI416.937, and a high leaflet orienting cultivar, USG 5601T. The goal is to develop near-isogenic lines that have lo-orientation/normal root; lo-orientation/prolific root; hi-orientation/normal root; and hi-orientation/prolific rooting trait combinations and compare their water-use relative to seed yield. F5 through F8 populations are being evaluated in the field during the 2006 growing season.

Project Title: Expanding the Genetic Diversity of Elite Soybean Germplasm
Personnel: Vincent Pantalone, Associate Professor, Dept. of Plant Sciences, Univ. of TN
Grover Shannon, Univ. of Missouri, Delta Station, Portageville, MO.

Randy Nelson, USDA-ARS Germplasm Currator, Univ. of Illinois, Urbana-Champaign
Objective: Develop new soybean populations with enhanced genetic diversity.
Approach: Four new cross hybridizations have being initiated by our TN program to expand diversity for applied variety development:
1) TN04 042 x S99 11986, where S99-11986 was developed from: LG87 1782(PI297515xPI290126B) x LG88 3146(PI427099xPI445830)
2) LG00 6293 x K1599, where LG00-6293 was developed from:
PI 574.480 x PI 574.477
3) LG00 6293 x TN02 134RR, where LG00-6293 was developed from:
PI 574.480 x PI 574.477
4) LG00 6313 x TN03 105RR, where LG00-6313 was developed from:
PI 574.480B x PI 574.477
Several populations are being grown by soybean breeders in different parts of the U.S. with the goal of selecting adapted lines for local conditions that can be used directly as potential new cultivars, or use the lines as parents in crosses in order to introgress new germplasm into breeding programs.

CORN
Project Title: Cereal Breeding
Subtitle: Breeding maize lines with exotic germplasm
Personnel: Dennis West, Univ Tenn
Collaborators: Major Goodman, NCSU
Objective: Incorporate genes from exotic maize germplasm into adapted U.S. maize germplasm.
Approach: Early generation lines from the Germplasm Enhancement of Maize (GEM) project, coordinated through the USDA Maize project at Iowa State University, are crossed with elite adapted lines. The resulting hybrids are grown regionally in the Southern U.S. to evaluate field performance. The best lines from these hybrid trials are entered in breeding programs, using traditional breeding methods, to develop new maize parental lines. In 2004 we have 891 experimental hybrids from the GEM project in yield trials in Tennessee. In addition to the yield trials we have 377 nursery rows of GEM material for inbreeding and selection.

Biomass/Biofuel alternative: Personnel: Dennis West and Janice Zale
Three accessions of teosente were obtained from NCRPIS at Ames, Iowa in 2004. This germplasm has been planted in Knoxville and crossed with adapted corn. BC1F1 hybrids are being backcrossed to adapted corn lines during the 2006 growing season. The hybrids have survived two fairly mild winters in TN.

Texas
No report

Virgin Islands
No report

Virginia
Several accessions from the USDA plant germplasm collection were used for studies of systematics and genetic diversity at Virginia Polytechnic Institute & State University. Vegetable

soybean cultivars have been released through Virginia State University. Transformation experiments were conducted on a set of diverse eggplant cultivars to determine efficiency of transformation at Virginia Polytechnic Institute & State University. A regional farmer acquired some watermelon accessions to determine their suitability for making watermelon rind pickle. Pepper germplasm was requested by teachers at Virginia schools to use in classroom exercises to teach elementary school students about seed germination and seedling growth. These activities document the distribution and utilization of plant genetic resources, a primary objective of the regional project, the study of genetic relationships among crop plants and their wild relatives, and the release of new cultivars of crop plants, the cornerstone of agriculture.

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