Project Number: S-009

Project Title: Plant Genetic Resources Conservation and Utilization

Period Covered: 07/2006 through 8/2007

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Annual Meeting Dates: August 7-8, 2007

Participants: www.ars.usda.gov/Main/docs.htm?docid=9592

Minutes: www.ars.usda.gov/Main/docs.htm?docid=9592

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 86,829 accessions of 250 genera and 1,488 species. In 2006, a total of 18,826 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 628 orders to users in 46 states and 34 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, 93.6% of the collection is backed up at the National Center for Genetic Resource Preservation, Ft. Collins, CO and 86.7% 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, during 2006 prior to his retirement in early 2007. A total of 49 lines were increased in the winter, 75 lines increased in Griffin, and 49 lines increased in Puerto Rico. Digital images of flowers (311 images) and seeds (275 lines) 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.

Peanut:

Seed increases were obtained for 551 cultivated peanut accessions by Roy Pittman, Plant Genetic Resources Conservation Unit, grown for regeneration at Byron and Attapulgus, GA, and Stillwater, OK. A total of 242 accessions of cultivated peanuts were processed through quarantine to be available for researchers. Over 500 clonal peanut accessions were maintained in the greenhouse.

Disease resistance to tomato spotted wilt virus (TSWV) is a high priority for peanut breeding programs. Field evaluation trials were conducted at the Attapulgus Research Farm in Attapulgus, GA to assess TSWV resistance in peanut botanical varieties *aequatoriana, hirsuta,* and *peruviana*. Compared to the cultivar Georgia Green, 17 accessions of *aequatoriana*, 10 accessions of *peruviana*, and 17 accessions of *hirsuta* had fewer symptomatic plants. Six *hirsuta* accessions were found which had apparently better resistance than the cultivar AP3. Three accessions of the botanical variety *hirsuta* appear to contain the best resistance to TSWV. New sources of TSWV resistance were identified; thus increasing the diversity of resistance available for crop improvement.

Grasses:

A total of 99 accessions of native warm-season grasses were selected for regeneration by Melanie Harrison-Dunn, Plant Genetic Resources Conservation Unit. Descriptor data was taken on 84 accessions and seed was harvested from 70 accessions. A total of 135 accessions of clonal grasses currently maintained in the greenhouse were successfully transferred to tissue culture.

The switchgrass germplasm collection from Fort Collins, CO was sent to Griffin, GA to allow for distribution and evaluation of the material. Previously this material was not listed as available on GRIN and was not characterized. A total of 160 switchgrass accessions were germinated and transplanted to the field with descriptor data being collected for 133 of these accessions. This effort has resulted in 169 accessions now being available for distribution for research and has provided basic descriptor data for a set of germplasm previously uncharacterized.

The clonal bamboo collection was assigned a crop category on GRIN and data was uploaded onto GRIN for public access. A total of 77 plot images, 76 shoot images, and two flower images were taken and uploaded onto the GRIN website. Associated information also added to GRIN included previously reported maximum height, maximum culm diameter, cold hardiness, growth habit, historical data, and basic plant descriptions for each accession along with information on the history of the collection and bamboo culture. Separation of the bamboo

into its own crop allows GRIN users easier access to this collection and the new data available provides information for use in selecting germplasm for research activities.

Two workdays were conducted 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.

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

A total of 205 misc. legumes, new crops, and other misc. crops were regenerated at Griffin by Brad Morris, Plant Genetic Resources Conservation Unit. Drought and poor seedling vigor suppressed many accessions and several were determined to be photoperiod sensitive. A total of 136 annual clover accessions were regenerated in the field in Byron, GA, and 21 African annual clover accessions were regenerated in the greenhouse by Gary Pederson, Plant Genetic Resources Conservation Unit. Regeneration of additional short-day African clover accessions continued in the greenhouse during the fall.

High amounts of the isoflavones, kaempferol and quercetin, were found in *Corchorus olitorius, Hibiscus sabdariffa*, and *Clitoria ternatea*. The isoflavones kaempferol and quercetin were identified using high performance liquid chromatography. These compounds are antioxidant and shown to be anticancerous as well. This discovery will allow producers to isolate or use these compounds and species in product development.

Sorghum:

Regeneration of sorghum accessions in St. Croix and Puerto Rico continued in coordination with the sorghum curator, John Erpelding. Over 1.680 accessions were sent to St. Croix for regeneration in 2006 and seed from regenerations of 1,644 of those accessions has been sent to Griffin. A total of 455 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.

All MN accessions (1,166 distinct accessions) from the Meridian, MS, sweet sorghum collection have been removed from the glass jars in which they were obtained from Meridian in 1983 and have been placed in -18C storage. Along with other MN accessions previously in GRIN, currently there are 1,851 MN sweet sorghum accessions in GRIN. Merrelyn Spinks, Plant Genetic Resources Conservation Unit, cross-referenced the MN passport data with other sorghum references and identified over 70 sorghum plant introductions that were thought to be lost but were rediscovered in the MN accessions.

Vegetable Crops:

Bob Jarret, Plant Genetic Resources Conservation Unit, characterized and/or regenerated 500 accessions of the *Capsicum* spp. (chile pepper) germplasm collection grown in the field. Over 500 digital images and descriptor data were uploaded onto the GRIN database. This effort has improved the efficiency of utilization of the collection and fostered research utilizing these genetic resources. In the greenhouse, 12 *Capsicum* sp. accessions and 30 *Ipomoea* sp. accessions were regenerated. Additionally 8 watermelon and other cucurbit accessions were regenerated in the field and other cucurbits were regenerated in Parlier, CA, and Mayzguez, PR. More than 750 accessions of sweetpotato were maintained in tissue culture.

Seed lots from 4,369 accessions in the *Capsicum* collection were assayed for infection with pepper mild mottle virus (PMMoV). Approximately 31% of the accessions evaluated were

found to be infected with PMMoV. This information has resulted in a modification of *Capsicum* germplasm regeneration and distribution procedures.

Although the fruit of *Capsicum chinense* are generally considered to be the most pungent of all cultivated pepper species, the germplasm within the U.S. *Capsicum* collection has not been evaluated for this characteristic. The fruit from 320 accessions of *Capsicum chinense* were evaluated for pungency. Also, little information is available on the variability within *Capsicum chinense* for components such as simple sugars and organic acids that contribute to fruit sweetness and sourness. The fruit of 200 accessions of *Capsicum chinense* were evaluated for concentrations of these compounds. These data and plant genetic resources will provide the basis for further research in the area of fruit quality and crop improvement.

Molecular Evaluations:

Genetic variability of Lespedeza species and accessions is very limited. Variability for 44 Lespedeza accessions was determined using EST-SSR technology and morphological analysis. Lespedeza accessions were grown in the greenhouse and field, phenotypically characterized and analyzed by EST-SSR resulting in three groups identified. Similarities were determined among accessions to improve breeding efficiency.

Limited information is available on flavonoid content in legume germplasm in the U.S. germplasm collection. Flavonoid (including daidzein, genisten, kaempferol, myricetin and quercetin) content in peanut, cowpea, mung bean and lablab was determined by high performance liquid chromotography and compared with soybean. Cowpea and peanut seeds contained a significant higher amount of quercetin than other legumes. Peanut accessions containing a high amount of quercetin were identified, and quercetin content appeared to be related to the presence of a white seed-coat color. If this relationship holds true in other accessions, peanut breeders may be able to use white seed-coat color as an initial selection for improved quercetin content.

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) and 25 accessions from the mung bean 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.

Germplasm Maintenance:

Prior to 2002, seed samples of over 84,000 accessions of plant genetic resources maintained at the Griffin location had not been tested for germination and the quality of seed distributed to researchers was not known. A concentrated effort was made to conduct germination tests on this large collection. In the last year, germination tests were conducted on 8,793 accessions. Since 2002 germination tests have now been completed for over 41,000 accessions (48.8% of entire collection) including almost all accessions of pepper, watermelon, eggplant, and castor bean and over 50% of all accessions of sorghum, mung bean, okra, annual clovers, and sesame. This germination testing enables curators to properly identify accessions with poor quality seed that need to be regenerated resulting in high quality seed being distributed to researchers upon request.

Over 3,400 accessions were sent to Ft. Collins for new safety 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, over 65% (over 55,000 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 and sericea lespedeza 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. Sericea lespedeza is being evaluated for control of gastrointestinal parasites in ruminants and for condensed tannin content. Evaluations are being done in cooperation with colleagues at Auburn, GA, LA, AR, and USDA at several locations.

Upland cotton

We have completed the evaluation of the wild *G. hirsutum* collection for resistance to reniform nematode (*Rotylenchulus reniformis*). No accessions were found to have high levels of resistance, but seven were identified as moderately resistant. Populations of adapted by moderately resistant accessions are in various stages of development.

Florida

Records received from S-9 indicate that 636 accessions of various plant species maintained at the PGRC Unit at Griffin, GA were distributed during 2006 to 27 individuals or organizations with addresses in Florida. Comparable numbers from 2001, 2002, 2003, 2004, and 2005 were 406, 609, 840, 418, and 532, respectively. These numbers suggest a steady trend of 400 to 600 accessions distributed per year in Florida

In the calendar year 2006 UF/IFAS plant breeders released 38 new crop cultivars, breeding lines or germplasms. Included in these releases were 14 Coleus cultivars developed by David Clark, 3 Peanut cultivars developed by Daniel Gorbet and Barry Tillman, 1 White clover cultivar developed by David Wofford, 1 Mandarin citrus cultivar developed by Fred Gmitter, 1 Muscadine grape cultivar developed by Dennis Gray, 3 Stonefruit cultivars developed by Jose Chaparro, 1 Turfgrass cultivar developed by Russell Nagata, 6 ryegrasses developed by Gordon Prine, 1 red clover developed by Ken Quesenberry, 6 tomatoes developed by Jay Scott, and 1 Centipedegrass developed by Brian Scully.

Dr. Ken Quesenberry, forage breeder in the Agronomy Department, reports that he and colleagues have used limpograss (*Hemarthria altissima*) PIs 299995 (Bigalta) and 364888 (Floralta) as parents for a group of 51 new limpograss hybrids. These hybrids are being evaluated for forage DM yield and persistence at three locations in Florida (Marianna, Gainesville, and Ona) as well as for nutritive value (IVOMD and Cp) at 4, 6, and 8-weeks regrowth under controlled greenhouse conditions and at 6-weeks regrowth in the field. Preliminary results show transgressive segregation for IVOMD. Preliminary field DM yield of the top yielding lines were equal or superior to the released cultivar parents. Dr. Quesenberry is also evaluating new perennial *Arachis* germplasm from recent NPGS sponsored germplasm

collection trips to Paraguay, and is continuing evaluation of *Adesmia*, *Desmodium*, and *Lotononis* forage legume germplasm.

Dr. Kevin Kenworthy, turfgrass breeder in the Agronomy Department, and colleagues have collected carpetgrass germplasm across the Southeastern USA. This germplasm has been evaluated for turf characteristics in the greenhouse and in field trials at the UF/IFAS turfgrass research plots at the Plant Science Research and Education Unit at Citra, FL.

Dr. Ann Blount, forage breeder in the Agronomy Department located at the North Florida Research and Education Center (NFREC) at Marianna, FL, reports that she is continuing evaluation of a collection of *Paspalum* spp. germplasm PIs at the NFREC at Marianna. The PIs are being evaluated for various agronomic forage traits including yield and persistence.

Dr. Eileen Kabelka, cucurbit breeder in the Horticulture Science Department, reports that she is using several different PGRCU PIs in her cucurbit improvement program. 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.

Georgia

More than 40 different requests for plant germplasm are made annually to the S-9 Unit by scientists and educators of Georgia. As a result of these requests, hundreds of plant accessions are supplied yearly to University scientists, USDA scientists, consultants, seed companies, educators, and numerous individuals. The most requested crops are peanut, pepper, various legumes, bamboo, and warm season grasses.

The University of Georgia maintains 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 plant materials maintained within the S-9 Unit. UGA currently has active cultivar development programs in soybean, peanut, small grains, turfgrasses, forages, blueberries, 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

A total of 77 hot pepper (*Capsicum* spp.) germlines were evaluated at the Guam Agricultural Experiment Station from July 2006 to March 2007. Twenty six germlines were obtained from USDA-ARS, PGRCU, sixteen from Asian Vegetable Research Development Center, twenty from US and Taiwan commercial seed companies, and fifteen from local collection. The plant growth and fruit morphology of these accessions were recorded. Because of planting in the rainy season, seedlings of some germlines did not survive after transplanting to the field. Bacterial leaf spot was a major pest. Currently data of plant stand and fruit characteristics are being

analyzed. The level of capsaicinoids will be analyzed for selected lines.

Four commercial cultivars of sweet pepper (*Capsicum annuum*) were evaluated at a farmer's field from November 2006 to April 2007. Due to a heavy infestation of mites, yield data were not collected. Fruits of each cultivar were compared for their fruit size and color. The average fruit weight of cvs. Big Bertha PS Hybrid, Peto Wonder Hybrid, Bounty hybrid, and Corno di Toro Yellow were 182g, 201g, 48.2g, and 122.8g, respectively. All four cultivars appeared to be suitable for Guam and yield sufficiently if mites can be controlled. Bounty hybrid seemed less susceptible to mites. Earlier trials of sweet peppers at the same farmer's field indicated that two cultivars were not recommended for Guam's humid, high temperature climate. They had poor yields and susceptible to diseases.

In an aquaponic system, various leafy vegetables were grown to test their adaptability to Guam's agroclimate. The general observation of the preliminary trial is listed in the Table below.

Cultivar:	Observation:
A. Lettuce (*Lactuca sativa*) -Green Cultivar	
1. Royal Oak Leaf	Good; no pest; nice overall green color
2. Butte Crunch	Bolted quickly; yellow color (young leaves)
3. Salad Bowl	Good; light color
4. Green Ice	Good; light color
5. Tango	Good; light color
6. Two Star MTO	Good; light color
7. Anuenue	Low germination
8. SlowBolt	Ok; light color
B. Lettuce (*Lactuca sativa*)-Red Cultivar	
1. Red Fire	Ok; show minor nutrient deficiency
2. Red Salad Bowl	Ok;
3. Red Sails	Good
C. Others	
1. Swiss Chard (*Beta vulgaris*)	Good
2. Cilantro (*Coriandrum sativum*)	Pest damages
3. Arugula (*Eruca vesicaria*)	Pest damages
4. Basil (*Ocimum basilicum*)	Yellow
5. Mint (*Mentha* sp)	Good: pest damage
6. Spinach (*Spinacia oleracea*)	Low germination; pest damages
7. Pakchoi (*Brassica rapa* var. *chinensis*)	Pest damages

USDA-Natural Resources Conservation Service, Pacific Island Area obtained eight accessions of *Mucuna pruriens* var. *utilis* for cover crop studies from USDA-ARS, Plant Genetic Resources Conservation Unit in 2005 and a farmer tried to use as cover crop for tomato field in Guam. Mucuna seemed to be a potential cover crop, however some concerned invasive nature of the plant. According to NRCS, the project was terminated and no seeds had been distributed.

Hawaii

Germplasm requested in 2006 include: Legumes-special purpose (Lablab), Pearl Millet (Pennisetum) and Peppers (Capsicum).

Information received from the cooperators: All accessions were grown in a trial to determine their adaptation to Hawaii environments. Lablab was evaluated as a vegetable snap pod. Lablab PI 219696 failed to emerge. PI 509114 was successfully grown as a vegetable pod type, was not better than previously observed accessions, but was not a bush as in its description. The pearl millet is the largest in USDA's collection, and it does well when sown midsummer. Two accessions of *Capsicum pubescens* were tested for performance under Hawaiian conditions, and if well-suited, will be used for future breeding projects. Both germinated, however all except one of the seedlings were killed by pests. The surviving seedling, a plant of Grif 9342, grew well until its second set of true leaves but also succumbed to pests. The plan is to repeat the experiment after relocating to Maryland in August 2007. Seeds of Grif 9342 are not presently available; it is hoped that this non-availability is temporary.

Macadamia (*Macadamia integrifolia*): Performance of selections planted at the Captain Cook Experiment Station (elevation 610 m) in Kona were evaluated during the 15th, 16th and 17th year after the trees were top-worked. The test plot consisted of the following HAES selections, 294 (Purvis), 344 (Kau), 741 (Mauka), 788 (Pahala), 816, 835, 856 and 857) planted in a 4.6 x 9.14 m spacing. By the 14th season trees were mature and the orchard was fully closed-in. Nut and kernel quality obtained during the 3 seasons showed that % recovery of Grade 1 kernel was highest for the 294, 788, 835, and 856 selections. Based on kernel quality these selections tended to perform better at this location compared to the other selections in the test plot. Stinkbug damage and presence of a darkened area toward the base of the kernel were also least prevalent in the 294, 788 and 856 selections. Estimated yield of No. 1 kernel which was calculated from the percentage recovery of No. 1 kernels showed that 294, 344, 788, 835 and 856 were better performing selections at this site. The estimated Grade 1 kernel yield of 294, 344, 788, 835 and 856 were comparable to yields obtained with similarly aged 344 and 508 trees growing in favorable environments at lower elevations.

Lychee (*Litchi chinensis*): 'Kaimana' is the cultivar commercially grown in Hawaii in large quantities due to its ability to flower consistently under mild temperatures. Initial steps to determining nutrient requirements for 'Kaimana' trees are to determine the range of adequate leaf mineral nutrient concentrations associated with productive trees and to determine the amount of mineral nutrients depleted from the soil due to the removal of mature fruits at harvest. Nutrient analyses were conducted on recently matured leaves at the onset of panicle emergence when leaf nutrient concentrations were stable. Leaf nutrient concentrations ranged from 1.59-1.87% N, 0.21-0.28% P, 0.76-0.96% K, 0.57-0.60% Ca, and 0.31-0.33% Mg. Concentrations of N, P, K Ca and Mg were generally in the ranges reported from other growing locations. Concentrations of N, P, K, Ca and Mg based on the dry weight of mature fruits were 0.79%, 0.14%, 1.01%, 0.15% and 0.17%, respectively. Nutrient concentrations in the fruits expressed on a fresh weight basis showed that the relative order of nutrient concentration in mature 'Kaimana' fruit was K > N > Mg > Ca ≥ P. Based on fresh weight of whole fruits, about 219.9 g K, 169.8 g N, 39.9 g Mg, 29.9 g Ca, and 29.9 g P were contained in 100 kg of harvested fruits. Leaf analyses and nutrient composition of the harvested fruit are only two factors involved nutrient management of bearing 'Kaimana' trees, but they can provide insight into the nutrient requirements for this crop.

Rambutan (*Nephelium lappacium*): Data on fruit development for rambutan cultivated under Hawaii's stable climatic conditions showed that 'Binjai' fruits followed a simple sigmoid growth pattern. Fruit development and harvest in Hawaii lagged by 2 to 4 weeks when compared to fruit grown in Thailand. Seed development began before the 6th week after anthesis, and seed filling and the hardening of the cotyledons began in the 8th to 10th week. During early development, fruits increased slowly in size and weight, and increased exponentially during seed filling and aril development. Aril development began 10 to 12 weeks after anthesis and coloration of the pericarp occurred in the 14th to 16th week. Dry weather during this period can result in under-sized fruits. The fruits reached maturity 16 to 20 weeks after anthesis. Mature fruits were 42.5 mm x 33.7 mm in size, weighed 31 g, and had brix readings of 18% to 19.1 %. Cooler temperatures contributed to a longer maturation period since 'Binjai' fruits grown at higher elevations (elev. 250 m) required about 2 weeks longer to reach maturity compared to fruits produced at lower elevations (elev. 110 m). Rambutans are non-climacteric and harvesting must be done at peak ripeness for overall color, texture, and flavor appeal. The principal harvest season crop occurred in December and January, with a smaller crop maturing in August and September. During the principal harvest season, fruits matured faster and were harvested 2-4 weeks sooner compared to the minor season crop. Generally the harvest season extended over a 2-3 month period. Following an extended dry season, fruit harvest could be extended by 3 to 6 months due to a longer flowering period.

Pac Basin Tropical Plant Genetic Resources Management Program, Hilo, Hawaii
The mission of the unit is to collect, maintain, preserve, evaluate, distribute and secure the integrity and diversity of designated tropical fruit, nut and beverage germplasm, with the focus on evaluation, enhancement and utilization of germplasm resources for Hawaii and the U.S. Pacific Basin islands. The MU is composed of a single CRIS, “Assuring Long-Term Preservation of Tropical Crops via Genetic Resource Management” which supports National Program 301 “Plant Genetic Resources, Genomics & Genetic Improvement, Component I – Plant and Microbial Genetic Resource Management. OSQR completed in 2003, and the 2008 OSQR is being reviewed.

Germplasm: The unit provides long-term maintenance of 14 designated tropical fruit & nut crops totaling 957 accessions in 33 acres of field plantings, in greenhouses, tissue culture and as seed storage. For the period covering the past twelve months, distribution was 102 orders for 505 items and 14 introductions (all domestic).

GRIN (Germplasm Resource Information Network): Photo, observation and morphological records were collected for 388 accessions of pineapple, breadfruit, carambola, peach palm, pili nut, papaya, longan, lychee, rambutan, guava and cacao. Flowering data are being collected for 83 accessions of lychee and 67 accessions of guava. Total accessions in GRIN are 682. A total of 2534 GRIN records were loaded including 43 cooperators, 95 orders, 352 items, 1948 observations, 2 accession records and 94 vouchers.

Distribution: Good quality papaya seeds have been harvested from Paauilo since April 2007. Challenges for papaya increase in Hilo including PRSV and land availability. In Paauilo, challenges are land preparation, nursery set up, irrigation system, planting, pest control, weed control, and now is how to control pigs in a continuous effort. In the same field, we identified

guava as the best potential crop for the area even under high wind and drought conditions. We are able to successfully produce a selected guava accession of high qualities. The recent guava information also helped us in the preparation of OSQR. Preparation of OSQR 2008 draft took priority over all other activities over the last 6 months.

Plant Pathology: Etiology information is being compiled to optimize care at the unit. In lychee, a *Phomopsis* sp. was isolated and identified from shoot tip dieback, while a *Pestalotiopsis* sp. was identified from an from twelve accessions. In macadamia, several *Phytophthora* species were collected from branch and nut samples, along with a *Nectria* sp. from trunk samples in trees infected with Macadamia Nut Quick Decline (MQD). Detailed studies will be conducted to fulfill Koch's postulates. Leaf bioassays on eight macadamia accessions identified preliminarily cultivar resistance to a *Phytopthora* sp. associated with MQD; and we will investigate potential management strategies including chemical control.

Plant Physiology: Studies to identify factors affecting flowering and fruiting of "Kaimana" lychee were set up in three different climate and soil types in Hilo, Kona and Hamakua. Timing of pruning and fertilizer application affected flowering response of "Kaimana" lychee in rocky lava in Hilo. For longan, commercial bleach on the market was identified as an alternative to potassium chlorate for flower induction.

Our preliminary study report on producing low chill blueberry varieties at mid elevation in Waimea created great interests in the potential of blueberry as a high value alternative crop for Hawaii. The University has proceeded to expand blueberry variety evaluations. One of our early participants in the tea project is marketing his high quality Hawaii grown and processed tea at a local coffee outlet. Although the quantity is small, the quality is good and received positive comments and encouragement from a well known tea merchant in S.F.

Kentucky

Norman Taylor continues to work on red, white, and kura clover breeding projects. He recently acquired collections of buffalo clover from Davidson County, NC and from a white-flowered population in Perry County, Indiana. He is increasing seed of a tetraploid red clover, among others, for release in the near future. Todd Pfeiffer and Morris Bitzer continue to work on sweet sorghum breeding and seed production. Pfeiffer has screened the PI collection and is evaluating the top lines at several locations in KY this year. Bitzer has been involved with sweet sorghum for many years, having worked with it before retiring as a grain crop extension specialist. In 2006 a hybrid sweet sorghum was released jointly by the University of Kentucky and the University of Nebraska ('KN-Morris'). A genetic study of castor oil profile is underway by a graduate student in David Hildebrand's lab. Tim Phillips has planted a trial to evaluate the winter hardiness of some of the warm season grasses in the S9 collection.

Louisiana

Bamboo collection (Alan Flexer, Bamboo Farms Nursery). A number of genotypes were requested for suitability in the landscape. Mr. Flexer noted that the collection in Byron, GA is well maintained now in comparison to past visits he has made to the site. He was complimentary towards the staff. He found them helpful and knowledgeable.

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 *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.

Sweetpotato Collection (Drs. Don La Bonte and Chris Clark): Clones were requested in 2004-2006 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

Brian Baldwin has completed cycle 6 in lowland-type switchgrass selecting for reduced seed dormancy and increased velocity of germination. The same investigator is also working with Charles Webber (USDA-ARS) in Oklahoma and Dick Auld from TTU to determine appropriate isolation distance for castor germplasm developed in Mississippi. Bioenergy oilseed work was initiated on winter annual oilseeds including development of winter hardiness of crambe. Paul Williams and others from the USDA-ARS Corn Host Plant Resistance Research Unit located at Mississippi State University are actively engaged in identifying and developing maize germplasm with resistance to several insects and to *Aspergillus flavus* infection/aflatoxin accumulation. Germplasm accessions obtained through the GEM project have shown promise as useful sources of resistance to aflatoxin contamination in multi-year trials and have been incorporated into the breeding program. The best of these germplasm lines are currently undergoing evaluation in test crosses at Tifton, GA and Raleigh, NC. Ted Wallace continues a long term effort to develop high yielding cotton cultivars with superior fiber quality traits. Genetic diversity, selection for reduced micronaire, increased fiber strength, fiber length and uniformity, lint yield, and yield stability are key components of the program. A more recent concentration is development and identification of nectarless breeding lines resistant to the tarnished plant bug.

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 are 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, and NCSU scientists make use of germplasm maintained in the

National Plant Germplasm System (NPGS). 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, sweetpotato and other crop species. Propagules of 1661 accessions from the NPGS were sent to public- and private-sector researchers and an additional 270 to private individuals in North Carolina in 2006. Twenty-four cultivars, parental and germplasm lines were released, and 39 germplasm-related articles were published with NCARS personnel and USDA-ARS personnel stationed at the NCSU campus in Raleigh as authors.

Germplasm requested for distribution to North Carolina from the Southern Regional PI Station, 2002-2006 (provided by M. Spinks of PGRCU, Griffin, GA).

Total.....3886
To SAES and USDA-ARS personnel 3771
Watermelon (*Citrullus*) 3512
Watermelon (*Praecitrullus*).....72
Sweet potato (*Ipomoea*).....59
Peanut (*Arachis*).....39
Legumes (*Senna*).....30
Clover (*Trifolium*) 15
Hibiscus (*Hibiscus*) 13
Legumes (*Strophostyles*) 5
Peppers (*Capsicum*).....4
Cucurbits (*Cucurbita*).....3
Sorghum (*Sorghum*) 2
Mung bean (*Vigna*).....1
Miscellaneous (*Thespesia*) 1
Grasses, warm season (*Paspalum*) 1
Eggplant (*Nicandra*).....1
Okra (*Abelmoschus*) 1
Legumes (*Mucuna*).....12
To commercial companies.....21
Peppers (*Capsicum*).....11
Sorghum (*Sorghum*) 8
Grass (*Melinis*) 2
To individuals.....94
Peppers (*Capsicum*).....65
Sorghum (*Sorghum*) 14
Bamboo (Phyllostachys).....5
Watermelon (*Citrullus*) 5
Cucurbits (*Cucurbita*).....2
Bamboo (*Semiarundinaria*).....1
Bamboo (*Pseudosasa*).....1
Bamboo (*Bambusa*).....1

Germplasm requested for distribution to North Carolina from all National Plant Germplasm System plant introduction stations, germplasm repositories, plant genetic resource units, and collections in 2006.

	Total		Commercial		Individuals		State AES		USDA-ARS	
Source of Germplasm	No. of acces-sions	No. of genera	No. of acces-sions	No. of genera	No. of acces-sions	No. of genera	No. of acces-sions	No. of genera	No. of acces-sions	No. of genera
All NPGS centers	**1937**	**50**	**728**	**12**	**270**	**28**	**850**	**23**	**83**	**3**
North Central Region	**725**	**10**	**216**	**3**	**36**	**5**	**386**	**8**	**81**	**2**

North Central Regional PI Station, Ames, IA (NC7)	350	9	143	2	36	5	158	7	13	1
Soybean Collection, Urbana, IL	375	1	73	1	0	0	228	1	68	1
North Eastern Region	**180**	**4**	**39**	**1**	**141**	**4**	**0**	**0**	**0**	**0**
National Germplasm Repository (Grape, Apple, Cherry), Geneva, NY	44	4	39	1	5	2	0	0	0	0
Plant Genetic Resources Unit, Geneva, NY (NE9)	136	2	0	0	136	2	0	0	0	0
Southern Region	**412**	**13**	**3**	**2**	**9**	**6**	**400**	**7**	**0**	**0**
Cotton Collection, College Station, TX	2	1	0	0	0	0	2	1	0	0
Tropical Agriculture Research Station, Mayaguez, PR	1	1	0	0	1	1	0	0	0	0
Plant Genetic Resources Cons. Unit, Griffin, GA (S9)	394	10	2	1	8	5	384	5	0	0
Nicotiana (tobacco) Collection, Raleigh, NC (NCARS)	15	1	1	1	0	0	14	1	0	0
Western Region	**620**	**25**	**470**	**7**	**84**	**14**	**64**	**9**	**2**	**1**
National Germplasm Repository, Corvallis, OR	6	3	0	0	1	1	5	3	0	0
National Germplasm Repository, Davis, CA	59	6	16	2	10	2	33	2	0	0
National Small Grains Collection, Aberdeen, ID	162	5	134	3	4	2	22	3	2	1
National Germplasm Repository, Riverside, CA	50	5	0	0	50	5	0	0	0	0
Western Regional PI Station, Pullman, WA	343	6	320	2	19	4	4	1	0	0

Cultivar and Germplasm Releases since June, 2006

'NC-Sparta' oriental crisp-flesh melon hybrid, released 2006 by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Parentage: F1 hybrid of NC-301 x NC-304 inbreds, which were developed from the intercross of Sprite F1. Characteristics: hybrid with andromonoecious flowering habit; indeterminate plant type, vines with palmate leaves having serrated margin, moderate fruit yield, early maturity; round or oval fruit shape, smooth white rind, crisp flesh texture, white flesh color, high sugar content, small seed cavity, freedom from defects; vines have typical palmate leaves with serrated margins. The fruit are uniform, with medium size and elongate shape, and a tough and thin rind. Fruit have a length:diameter ratio of 1.2, a brix of 12, and weight of 0.7 kg; the fruit develop brown cracks that occur radially around the blossom scar at fruit maturity; radial cracks are an indicator of maturity. Similar: Sprite F1. Adaptation: southern U.S. 2006.

'NC-Sapphire' oriental crisp-flesh melon hybrid, released 2006 by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Parentage: F1 hybrid of NC-303 x NC-309 inbreds, which were developed from the intercross of Sprite F1. Characteristics: hybrid with andromonoecious flowering habit; indeterminate plant type, vines with palmate leaves having serrated margin, moderate fruit yield, early maturity; round or oval fruit shape, smooth white rind, crisp flesh texture, white flesh color, high sugar content, small seed cavity, freedom from defects; vines have typical palmate leaves with serrated margins. The fruit are uniform, with large size and elongate shape, and a tough and thin rind. Fruit have a length:diameter ratio of 1.2, a brix of 12, and weight of 0.8 kg; the fruit develop brown cracks that occur radially around the blossom scar

at fruit maturity; radial cracks are an indicator of maturity. Similar: Sprite F1. Adaptation: southern U.S. 2006.

'NC-Star' oriental crisp-flesh melon hybrid, released 2006 by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Parentage: F1 hybrid of NC-302 x NC-305 inbreds, which were developed from the intercross of Sprite F1. Characteristics: hybrid with andromonoecious flowering habit; indeterminate plant type, vines with palmate leaves having serrated margin, moderate fruit yield, early maturity; round or oval fruit shape, smooth white rind, crisp flesh texture, white flesh color, high sugar content, small seed cavity, freedom from defects; vines have typical palmate leaves with serrated margins. The fruit are uniform, with small size and elongate shape, and a tough and thin rind. Fruit have a length:diameter ratio of 1.2, a brix of 13, and weight of 0.6 kg; the fruit develop brown cracks that occur radially around the blossom scar at fruit maturity; radial cracks are an indicator of maturity. Similar: Sprite F1. Adaptation: southern U.S. 2006.

'NC-Stella' oriental crisp-flesh melon hybrid, released 2006 by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Parentage: F1 hybrid of NC-302 x NC-306 inbreds, which were developed from the intercross of Sprite F1. Characteristics: hybrid with andromonoecious flowering habit; indeterminate plant type, vines with palmate leaves having serrated margin, moderate fruit yield, early maturity; round or oval fruit shape, smooth white rind, crisp flesh texture, white flesh color, high sugar content, small seed cavity, freedom from defects; vines have typical palmate leaves with serrated margins. The fruit are uniform, with small size and round shape, and a tough and thin rind. Fruit have a length:diameter ratio of 1.1, a brix of 13, and weight of 0.6 kg; the fruit develop brown cracks that occur radially around the blossom scar at fruit maturity; radial cracks are an indicator of maturity. Similar: Sprite F1. Adaptation: southern U.S. 2006.

'RMUP-C5' random-mated cotton population released 2007 by J.N. Jenkins, J.C. McCarty Jr., O.A. Gutierrez, R.W. Hayes, D.T. Bowman, C.E. Watson, and D. Jones. A population of upland cotton that has been random mated for 6 cycles beginning with a half diallel of 11 diverse upland parents. The 11 lines were crossed in a one-half diallel to produce 55 half-sib families that were random mated to produce Cycle 0 (C0). These 55 half sib families were kept separate in the mating process. The half diallel crosses, the C1, C3, and C5 cycles were made at Mississippi State, MS, where 80 plants per half sib family were grown. The C0, C2, and C5 cycles were made at the winter nursery in Mexico where 15 hills (60 plants) of each half sib family were grown. Random mating was accomplished in each cycle by mixing pollen from an equal number (2-5) of blooms, bagged as candles the previous day, from each of the 55 half sib families each day of pollination and using this bulked pollen to pollinate 10 emasculated and protected flowers per day on each of the 55 half sib lines. This process was repeated until approximately 100 emasculated flowers were pollinated on each half sib family. Each cycle of random mating thus resulted in about 75 crossed bolls harvested per half sib family. About 2 weeks were involved in pollination for each cycle. After each cycle of random mating, a random sample of crossed seed within each half sib family was planted in individual plots (15 hills in Mexico and 80 plants in Mississippi) and the next cycle of random mating was made. Following each cycle of random mating a random sample of seed from each of the 55 families was planted and self pollinated to represent that cycle of random mating and to produce enough seed for field evaluations.

Random mated seed and S1 seed from each cycle or random mating were kept in storage. The seed being released (RMUP-C5) are C5S1 bulked seed. These are a bulk sample of equal number (1000) of seed from each of the 55 half sib families in the C5S1 generation. Because of the importance of this random mating population and its expected usefulness to the cotton breeding community, three sets of reference data are provided for the seed being released.

'NC-Skyland' oriental banana melon hybrid released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet. F1 of NC-304 x NC-309.

'NC-Sunnyside' oriental banana melon hybrid released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet. F1 of NC-305 x NC-307.

'NC-Sylva' oriental banana melon hybrid released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet. F1 of NC-305 x NC-308.

'NC-Sunburst' oriental banana melon hybrid released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet, with banana flavor. F1 of NC-310 x NC-311.

'NC-Sunbury' oriental banana melon hybrid released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet, with banana flavor. F1 of NC-311 x NC-312.

'NC-301' oriental crisp-flesh melon inbred released in 2006 by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Small, oval fruit with white skin and white flesh; flesh crisp and sweet; 'Sprite' type (originally W09). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

'NC-302' oriental crisp-flesh melon inbred released in 2006by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Small, oval fruit with white skin and white flesh; flesh crisp and sweet; 'Sprite' type (originally W01). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

'NC-303' oriental crisp-flesh melon inbred released in 2006by T.C. Wehner, T.L. Ellington, W.R. Jester III, and J.R. Schultheis. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally W13). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

'NC-304' oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y07). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-305’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y05). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-306’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y01). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-307’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y15). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-308’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y11). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-309’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet (originally Y18). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-310’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet, with banana flavor (originally B02). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-311’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet, with banana flavor (originally B03). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘NC-312’ oriental banana melon inbred released in 2007 by T.C. Wehner and T.L. Ellington. Small, oval fruit with yellow skin and white flesh; flesh crisp and sweet, with banana flavor (originally B05). Intercross of Sprite F1, self-pollinated and selected, past S10 generation.

‘N7002’ soybean cultivar released 2007 by T.E. Carter, Jr., J.W. Burton, M.O. Fountain, P.E. Rzewnicki, M.R. Villagarcia, and D.T. Bowman. It is a determinate group VII maturity soybean. [*Glycine max* L. Merr.] cultivar that has excellent yield potential. Twenty-five percent of its parentage is exotic germplasm. Few soybean cultivars produced in USA have this level of genetic diversity, and thus, its release broadens the genetic base of soybean cultivars. N7002 is adapted to the southern USA (30º to 37º N latitude) or wherever cultivars of group VII maturity are produced.

‘N8001’ soybean cultivar released 2007 by T.E. Carter, Jr., J.W. Burton, M.O. Fountain, P.E. Rzewnicki, M.R. Villagarcia, and D.T. Bowman. It is a determinate group VIII maturity soybean cultivar that has excellent yield potential. Twenty-five percent of its parentage is exotic germplasm. Few soybean cultivars produced in USA have this level of genetic diversity, and thus, its release broadens the genetic base of soybean cultivars. N7002 is adapted to the southern USA (30° to 35º N latitude) or wherever cultivars of group VIII maturity are produced.

Current Germplasm Research Projects at NCSU:

The U.S. *Nicotiana* Germplasm Collection is maintained by North Carolina State University, funded by the N.C. Agricultural Research Service and private industry sources. The collection is an invaluable resource for researchers in tobacco genetics, plant pathology, plant biology and biotechnology. Its holdings include 1900 tobacco introductions and cultivars, 60 *Nicotiana* species, and 46 interspecific hybrids. Seed samples are provided free of charge to researchers throughout the world. A portion of the collection is regenerated every year to maintain the viability of seed stocks. Curator Dr. J.S. Nicholson recently resigned her faculty position at NCSU; curation of the collection will be performed in the short term by Dr. Ramsey Lewis.

Characterization of the morphological and genetic diversity in 87 accessions of a *Nicotiana rustica* collection.

Characterization of the genetic diversity in 950 accessions representing a wide range of tobacco introductions and tobacco cultivars.

Of 536 advanced and preliminary breeding lines in Dr. T.G. Isleib's peanut cultivar development program, 124 (23.6%) have no direct PI ancestry, an additional 229 (43.5%) have zero to one eighth, 54 (10.3%) have more than one eighth and up to one quarter, an additional 7 (1.3%) have more than one quarter and up to one half. There are 102 lines (19.4%) based entirely upon recent PI ancestry. Among 1472 families still undergoing single-plant selection, 396 (26.9%) have no PI ancestry, 571 (38.8%) zero to one eighth, 35 (2.4%) one eighth to one quarter, 250 (17.0%) one quarter to one half, 23 (1.6%) between one half and all, and 197 (13.4%) entirely based on PI ancestry. Several plant introductions were used as parents in establishment of new breeding populations in 2007: *Arachis hypogaea* PI 196655, PI 196660, PI 196673, PI 196832, PI 259606, PI 290626, and PI 590325 and *A. monticola* PI 468196 (GKBSPSc 30062), PI 468199 (GKBSPSc 30063), PI 497260 (ScVa 21768), PI 497261 (ScVa 21769) and *A. monticola* GKP 7264.

In the USDA-ARS soybean breeding program of Dr. T.E. Carter, Jr., all but 5% of breeding populations and lines entered in replicated trials have 25% or more direct PI ancestry.

Seed Distributions from the US Nicotiana Collection held by the N.C. Agricultural Research Service, Raleigh, NC, 2003-2006

	2003		2004		2005		2006		Total	
Requesting Agency Classification	# of Requests	# of Accessions	# of Requests	# of Accessions	# of Requests	# of Accessions	# of Requests	# of Accessions	# of Requests	# of Accessions
U.S. Agricultural Research Service	7	76	4	8	3	52	6	89	20	225
U.S. state agencies and universities	39	172	31	269	32	194	30	288	132	923
U.S. commercial company	22	604	25	343	23	995	20	491	90	2433

U.S. non-profit organization	3	8	4	10	3	4	3	5	13	27
U.S. individuals (no affiliation)	12	74	15	116	8	25	7	13	42	228
Foreign genetic resources unit	0	0	0	0	0	0	1	17	1	17
Foreign commercial company	3	112	1	1	1	1	6	800	11	914
Foreign non-commercial organization	14	193	14	161	12	30	14	132	54	516
Foreign indvidual (no affiliation)	3	6	1	1	0	0	0	0	4	7
Total	103	1245	95	909	82	1301	87	1835	367	5290

Puerto Rico

Eighteen quenepa (*Melicoccus bijugatus*) cultivars are in the second year of evaluation at Juana Diaz and Lajas. Significant differences were observed among cultivars for tree height, trunk diameter, and canopy volume on all three sampling dates, and between locations for the second and third sampling dates. A replicated guava planting consisting of 14 accessions was maintained and evaluated at Juana Díaz. Yield and natural reaction to yellow Sigatoka (*Mycosphaerella musicola*) of the banana cultivars 'Yangambii', 'Grand Nain', 'Johnson', 'Ziv' and 'Hybrid 2390' were evaluated. Germplasm consisting of 28 yam, 22 cassava, 16 sweet potato and 75 tanier clones were field maintained. Excellent yield was obtained with the cultivar of yam 'Mapuey' (*Dioscorea trifida*) evaluated at Corozal. A maximum yield of 11,250 kg/ha was obtained using planting material of 112 g compared with 6,704 kg/ha using planting material of 56 g. Foliage damage caused by *Colletotrichum* and *Xanthomonas* was isolated on 'Mapuey' yam. 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. Several clones of 'Cabezona' pineapple were evaluated in the field at Lajas. Four orange cultivars (7 years old) were evaluated on four citrus roostocks at Isabela, Corozal and Adjuntas. Data show that at Isabela, 'Hamlin' grafted on 'Swingle' citrumelo rootstock had the greatest number of fruits per tree. At Corozal the highest yielders were 'Carrizo', 'Cleopatra' and 'Sun Chu Sha'. Adjuntas had the lowest yields. The evaluation of mandarin cultivars on five rootstocks at Corozal and Isabela are in the second year of growth. Four new fresh market tomato cultivars ('Florida 47 R', 'Sebring', 'Solar Fire' and 'Amelia VR') were evaluated last winter season at Juana Díaz and Lajas. They were evaluated together with the three best performing cultivars from the previous evaluation under this research project ('Linda', 'Florida 91' and 'Pik Ripe 461'). Two cultivars were among the four highest commercial yielders this year in both locations: 'Solar Fire' and 'Sebring'. One hundred half-sib lines of the 'Mayorbela' maize O.P. population were planted at Isabela in November 2005. Mean grain yield of the 'Mayorbela' population was 6494 kg ha-1. In general, the maize population had few disease or pest problems. The O.P. maize population, which has undergone two cycles of mass selection, is being considered for release as 'Mayorbela 05'. The second cycle of mass selection was initiated for the 'Suresweet' sweet corn population. Fifteen quality protein maize (QPM) hybrids from CIMMYT were planted at Isabela in November 2006. The mean seed yields of the hybrids

ranged from 4,425 to 7,916 kg/ha. 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 sixty seven sorghum accessions and four *Vigna* accessions were requested by USDA-TARS, Mayaguez, in 2006.

South Carolina

Germplasm Distribution: A total of 2,397 germplasm accessions were distributed by the Plant Genetic Resources Conservation Unit at Griffin, GA to the following individuals in South Carolina in 2006: Dr. H. Harrison, USDA Vegetable Laboratory, Charleston, SC, 44 *Ipomoea* spp. (sweetpotato) accessions; L. Kantor, Total Agriculture, 1 *Arachis* (peanut) accession; Dr. C. Kousik, USDA Vegetable Laboratory, Charleston, SC, 1,674 *Citrullus* (watermelon), 30 *Praecitrullus* (watermelon), and 237 *Lagenaria* (gourd) accessions; Dr. Amnon Levi, USDA Vegetable Laboratory, Charleston, SC, 151 *Citrullus* spp. accessions and 212 *Lagenaria* accessions; Dr. K. Ling, USDA Vegetable Laboratory, Charleston, SC, 16 *Ipomoea batatas* (sweet potato) accessions; R. Morris, 1 *Hibanobambusa* (bamboo) and 4 *Phyllostachys* (bamboo) accessions; Dr. Judy Thies, USDA Vegetable Laboratory, Charleston, SC, 17 *Vigna* (cowpea) accessions; G. Walker, 10 bamboo accessions to include 1 *Sasa*, 1 *Bambusa*, 2 *Pseudosasa*, 2 *Arundinaria*, 1 *Indocalamus*, 1 *Sinobambusa*, and 2 *Phyllostachys* spp..

Soybean Evaluation: Plants were selected from a 2006 F3 population resulting from the hybridization of PI594651-L2, resistant to peanut root-knot nematode (*Meloidogyne arenaria*), with the adapted S.C. cultivar, Dillon. The objective is to develop germplasm and/or cultivars with an improved level of *M. arenaria* resistance, high seed yield, and acceptable agronomic traits. F2 progeny are now being screened for resistance to *M. arenaria* in a greenhouse.

In 2006 twenty-eight elite soybean breeding lines from Clemson University 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. The S.C. line, SC98-1930, had reproductive indices no different than the resistant control cultivar, Hartwig. The S.C. lines SC03-9153, SC03-045, SC01-783A, SC01-819, SC03-9438, SC03-9383, SC03-9093, and SC02-208 showed reproductive indices no different than resistant control cultivar Forrest. These lines were also evaluated for seed yield and agronomic traits in fields not infested with nematodes and six of the resistant S.C. lines were selected for continued evaluation in 2007.

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, PI 416937, 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. F6, F7 and F8 generation lines have been (are) being evaluated via sap-flow instrumentation to determine the water use and water use efficiency of the above trait combination lines.
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 Curator, 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(PI 297515xPI 290126B) x LG88 3146(PI 427099xPI 445830)
2) LG00 6293 x K1599, where LG00-6293 was developed from:
PI 574480 x PI 574477
3) LG00 6293 x TN02 134RR, where LG00-6293 was developed from:
PI 574480 x PI 574477
4) LG00 6313 x TN03 105RR, where LG00-6313 was developed from:
PI 574480B x PI 574477
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. Several experimental hybrids derived from the GEM project are in yield trials in Tennessee in 2007. In addition to the yield trials there are several nursery rows of GEM material for inbreeding and selection purposes.

Biofuel Alternatives
Corn

Personnel: Dennis West and Fred Allen.
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. BC2F1 hybrids are being backcrossed to adapted corn lines during the 2007 growing season. The hybrids have survived three fairly mild winters in TN.
Switchgrass
Personnel: Fred Allen, Janice Zale, Dennis West.
Project Title: Breeding improved synthetic varieties of Switchgrass
Objective: Development of improved varieties of Switchgrass
Approach: Three PI's are being intercrossed with two experimental lines and two released cultivars to develop a C1 synthetic. The polycross nursery was established in spring 2007. Some C1 seed should be harvested in fall 2007.

Texas
There are active plant breeding efforts in the Texas A&M University System in cotton, soybean, cowpea, lablab, corn, rice, sorghum, wheat, oats, melons, clovers, sugarcane, ryegrass, several turfgrass genera, potato, several small fruits and ornamentals. Approximately 2000 sorghum accessions were requested and are under evaluation for anthracnose and downy mildew resistance in Texas environments. Any sources with resistance will be incorporated into the sorghum breeding program. Much research is in progress in the TAMU sorghum improvement program related to biofuel feedstocks. Both lablab and cowpea accessions are being evaluated and used as parents in the forage legume breeding program. The lablab cultivar 'Rio Verde' was developed as a new forage crop for the US southern region through selection in the PI line 388018. This new cultivar has the value-added component of US southern region seed production. Crosses have been made using G12293 lablab to investigate inheritance of pod type and purple coloration. Numerous lablab accessions have also been evaluated for resistance to root-knot nematode. Progeny testing for hard seed production and forage potential continues on 60 half-sib lines of crimson clover derived from two PI accessions in 2004.

Kerri Crawford, Rice University, requested and received plant material for the following species: *Schizachyrium scoparium, Calamovilfa longifolia, Panicum virgatum, Elymus canadensis, Solidago nemoralis, Artemisia campestris, Lathyrus japonicus, Monarda punctata, Cornus sericea,* and *Vitis riparia*. This material was used during preliminary investigation for a project that seeks to understand the relative importance of genetic diversity within populations of plant species and species diversity in communities for healthy ecosystem functioning. This research included development of propagation techniques and molecular markers.

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. New peanut cultivars were released through the Tidewater Agricultural Research & Extension Center. 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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