The basis for Florida’s multi-billion dollar plant agricultural industry is new cultivars of the various species that are well adapted to Florida growing conditions. UF/IFAS plant breeders have been involved in crop improvement research since the very inception of the Florida Agricultural Experiment Station (FAES). The first named cultivar released by the FAES was ‘Florida’ velvetbean released in 1895 (Quesenberry, 1999). Numerous other UF/IFAS commodity breeding programs have long histories of development of outstanding cultivars. Examples include the tomato improvement program whose first release was ‘Marglobe’ in 1925 (Scott, 1999). The first successful man-made cross of peanut was reported by Dr. Fred Hull in 1928 and the first interspecific cross in peanut was made by Dr. Hull in 1929 (Gorbet, 1999). The first UF/IFAS peanut cultivar resulting from breeding efforts was Dixie Runner released in 1943 which was an industry standard for many years. Many other valuable Florida fruit, vegetable, and agronomic commodities are successful today because of superior cultivars developed over many years of UF/IFAS plant breeding research. Past and current research achievements in plant cultivar development across the spectrum of commodities was recently chronicled in a UF/IFAS publication entitled New Plants for Florida - Varieties Produced by Florida Agricultural Experiment Station Research (IFAS, 2003). This publication can be accessed electronically at [http://edis.ifas.ufl.edu/TOPIC_BOOK_New_Plants_for_Florida](http://edis.ifas.ufl.edu/TOPIC_BOOK_New_Plants_for_Florida).

During the period of rapid growth in numbers of students and faculty at the University of Florida (ca. 1960 to1985) several additional plant breeding programs were initiated or existing programs were expanded. Support for such programs came primarily from state budgets and limited federal project funding. Dramatic progress was made in adapting plants to the Florida environment and in improving yield and pest resistance of important crops. Beginning in the late 1980s, competition for limited support dollars and retirements of many post-WWII faculty resulted in reductions in number and scope of some breeding programs.

The UF/IFAS Plant Breeders Workgroup organized and began meeting annually in August 1993 with the goal of coordinating statewide plant breeding efforts. Initial efforts focused on two areas, recruitment and training of graduate students, and efforts to increase base support of breeding programs. One of the early accomplishments of the Workgroup was development and implementation in1995 of a uniform UF/IFAS policy for release of new cultivars under appropriate intellectual property protection agreements. This policy was developed with the intention of providing incentive for new cultivar development by maximizing cultivar royalty returns to individual breeding programs. Figure 1 shows the increase in number of cultivars released by UF/IFAS by decade and Figure 2 shows the yearly releases for the period 1995 to 2006. Major increases in cultivar development occurred in the decades of the 1980s, 90s and projection suggest a further increase in the 2000s. Figure 3 shows the growth in cultivar royalties and funds generated by plant licensing intellectual property contracts since 1985.
Royalty collections for the period 1978 to 1984 averaged approximately $75,000 per year. For the period 1985 to 1994 royalties averaged approximately $150,000 annually. Since the implementation of the new cultivar incentive policy, total royalty collections have grown from about $250,000 in 1995 to almost 2.0 million in 2005, indicating the success of recently developed cultivars. A linear regression analysis of this growth shows an average increase in royalties of about $163,000 per year (Figure 4).

**COMMODITY PLANT BREEDING IMPACTS**

**Strawberry:** This program directed by Dr. Craig Chandler at the Gulf Coast Research and Education Center (REC) at Balm, FL focuses on the identification of strawberry clones that produce fruit with one or more of the following characteristics: high sugar levels, high antioxidant levels, anthracnose resistance, botrytis resistance, enhanced early season fruiting pattern. Beginning with the release of 'Sweet Charlie' in 1992, cultivars from this program have had a major impact on the 200 million dollar per year strawberry production environment in Florida. 'Strawberry Festival', released in 2002, is currently grown on over 80% of the acreage in Florida and is being licensed for use in Spain and other important winter/early spring production areas around the world.

**Tomato:** Dr. Jay Scott directs the tomato improvement program located at the Gulf Coast REC at Balm, FL. The major research objectives of this program are: development of tomato varieties with high lycopene, superior color and flavor, development of advanced breeding lines with resistance to the geminiviruses: development of varieties resistant to the four races of the bacterial spot pathogen. ‘Solar-Set’ released in 1989 is the industry standard for heat tolerant tomatoes and ‘Solar Fire’ released in 2003 has improved disease resistance and heat tolerance. Parental lines from this program are used by numerous private tomato breeding programs directly in varieties such as ‘Sebring’ and ‘Sun Guard’ or indirectly to produce commercial hybrids that dominate the fresh market tomato industry in Florida and other eastern states. The value of University of Florida germplasm to the Florida tomato industry could be conservatively estimated at $50 million per year for the last 15 years.

**Blueberry:** The blueberry improvement program is located in the Horticultural Sciences Department at the University of Florida under the direction of Dr. Paul Lyrene. This program has used interspecific hybridization of native blueberry species from the southeastern United States with highbush blueberry to incorporate desired traits for the Florida environment. The program focuses on recurrent selection to improve multiple traits in low-chill highbush blueberries. New cultivars must exhibit tolerance to numerous disease, insect, and soil problems that limit survival and productivity of blueberries in the southeastern U.S. This program has released 19 blueberry cultivars since 1985, which account for more than 90% of all blueberries harvested worldwide during the months of April and October. Among the most successful cultivars are ‘Star’, ‘Emerald’, and ‘Jewel’.

**Small Grains:** Dr. Ron Barnett at the North Florida REC at Quincy, FL directs the small grain improvement program. This program has focused on development of wheat, oats, rye, and
triticale cultivars with improved grain and forage yield by incorporating new and unique disease and insect resistance genetic factors. In wheat the major emphasis is on Hessian Fly, leaf rust, and powdery mildew resistance along with high grain yield and test weight and good soft wheat quality characteristics. With oat the emphasis is on crown rust, stem rust, and barley yellow dwarf virus resistance with high forage and grain yielding ability and good grain quality. The rye breeding program has emphasized forage production with good disease resistance and seed yield. This program has released 32 cultivars since 1980. Cultivars released during the past three years include: AGS 2485 Wheat, USG 3592 Wheat, McIntosh Wheat, Horizon 474 Oats, Horizon 321 Oats, AGS 104 Rye, Boss Rye, Monarch Triticale and Trical 342 Triticale. Varieties from this program dominate the small grain acreage in the Southern US.

**Peanut:** The UF/IFAS peanut improvement program has been directed by Dr. Dan Gorbet at the North Florida REC at Marianna, FL. Dr. Barry Tillman has recently been employed to overlap and continue the program as Dr. Gorbet approaches retirement. The peanut breeding program has focused on developing cultivars with improved yield, grade, disease resistance, nematode resistance, processing characteristics, and seed chemistry. Major diseases of emphasis are tomato spotted wilt virus, late leafspot, stem rot, CBR, and root knot nematodes. This program has released 16 cultivars since 1977. The recently released cultivars ‘Carver’, ‘AP3’, C-99R’, and ‘Andru II’ have excellent combinations of disease resistance, seasonal maturity, and high yields, and have been widely accepted by the industry. Three new “high-oleic cultivars with multiple disease resistance were released in 2006 (McCloud, York, and Florida 07)

**Forage Legumes and Grasses:** The overall forage improvement program includes Drs. Ken Quesenberry and David Wofford in the Agronomy Department at Gainesville, and Dr. Ann Blount at the North Florida REC at Marianna, FL. These programs have focused on red and white clover, alfalfa, rhizoma perennial peanut, and bahiagrass. Major selection criteria include resistance to root-knot nematodes, fungal disease resistance, non-dormancy, ploidy manipulation, and late fall - early spring vigor. The programs are also developing biotechnology applications for improvement of forage legumes including selection of in vitro regenerative genotypes in *Arachis, Desmodium, Medicago,* and *Trifolium,* and the use of molecular markers to evaluate genetic diversity among and within various species. Methods and techniques for genetic transformation of several of these species have been developed. Important cultivars from these programs include ‘Osceola’ white clover which has been a major US white clover cultivar for over 15 years and is estimated to have been planted on almost 2.5 million acres. Florida 77 and Florida 99 alfalfa developed by this program are outstanding nondormant alfalfa cultivars for the southeast USA. ‘Cherokee’ red clover is a nondormant cultivar that has moved red clover production into the lower Coastal Plains of the USA, and the recently released ‘Southern Belle’ red clover has very high levels of root-knot nematode resistance. Additionally, ornamental applications of ‘Legendary Good Luck’ four leaf white clover have generated substantial support funding for the white clover breeding program. A new bahiagrass cultivar with improved early spring and late fall production is nearing release.

**Sugarcane:** Sugarcane is the number one agronomic commodity in Florida based both on acres
produced and value of production. The Florida sugarcane improvement program is a cooperative effort involving the USDA Sugarcane Field Station at Canal Point, FL, the UF/IFAS Everglades REC at Belle Glade, FL, and the Florida Sugarcane League, Inc. This program has released 43 cultivars since 1980. Cultivars developed by this program occupy about 90% of the 425,000+ acres of sugarcane production in Florida and are also being used at numerous worldwide locations. The improved cultivars of sugarcane from this program have been responsible in large part for increasing sugar yields per acre by about 30% over the past 25 years.

Turfgrass: St. Augustinegrass has been the primary focus of turfgrass breeding efforts at UF/IFAS. Today, St. Augustinegrass accounts for 72% of the total sod production in Florida. The first release was 'Floratine' developed by G.C. Nutter and R.J Allen, Jr., and released in 1959. 'Floratam', noted for its chinch bug resistance was released in 1973 by UF/IFAS and Texas A&M University. Eighty percent of the St. Augustinegrass produced in Florida today is Floratam. Russell Nagata at the Everglades REC currently has responsibility for the St. Augustinegrass breeding program and Brian Scully has recently released 'Ultimate', and 'Pristine' zoysiagrasses. In June of 2004, K.E. Kenworthy began a new turfgrass breeding program in the Agronomy department. His program will focus on some of the lesser used turfgrass species in Florida, to include: zoysiagrass, centipede, bermudagrass, tall fescue and the identification of alternative turf species for use in Florida and other lower latitude tropical climates. Of interest is the development of both vegetative and seeded cultivars with improvements in drought, disease and insect tolerances resulting in reduced chemical inputs.

Ryegrass: The UF/IFAS annual ryegrass improvement program has been directed by Dr. Gordon Prine since the early-1980s. The North Florida winter-spring climate provides an excellent opportunity for screening annual ryegrass for foliar disease response. Using multiple cycles of recurrent phenotypic selection Dr. Prine’s program has released over 15 cultivars. Material developed in this program now dominates the certified annual ryegrass market in the SE USA. With the recent retirement of Dr. Prine this program will be continued by Dr. Kevin Kenworthy in Gainesville and Dr. Ann Blount at the NFREC Marianna.

Tree Fruits and Nuts: The tree fruit and nut breeding effort at the University of Florida was initiated by Ralph Sharp. The emphasis of the program was the development of adapted low chill fruit and nut varieties. Dr. Wayne Sherman assumed leadership of the program in 1975 after Ralph Sharp retired. Under Dr. Sherman’s tenure 40 peach and nectarine varieties and 5 plum varieties have been released. In addition the low chill pear, apple and pecan varieties, ‘Tropicsweet’, ‘Flordahome’, and ‘Moreland’ have also been released by the program. The program has had a major impact in the subtropics with the publicly available stone fruit varieties being grown in over 30 countries worldwide. Plant variety patents have been obtained for 8 peach, 3 nectarine and 3 plum varieties. The newer patented varieties are grown commercially in licensee countries such as Morocco and Australia.

GRADUATE STUDENT TRAINING
UF/IFAS plant breeders are actively involved in training the next generation of highly skilled plant breeders. A recent survey of students trained by UF/IFAS plant breeders showed that since 1970 revealed that 98 Master of Science and 96 Ph.D. students received degrees in the UF/IFAS plant breeding program. Many of these students have gone on to fill productive and innovative plant breeding programs in the public and private sector in the USA and internationally. Examples of current positions of some UF/IFAS plant breeding graduates are given below.

**Dr. Jan Barten, Ph.D., 1991** Major Professor J. W. Scott. Dr. Barten is a tomato breeder and station director with DeRuiter Seeds in Almeria Spain. His varieties are having major impact on both field and greenhouse production in Spain and surrounding countries.

**Dr. Ann Blount, Ph.D., 1984. Major Professor - K. H. Quesenberry.** After a 10 year career as a research associate with the UF/IFAS small grains improvement program, Dr. Blount assumed responsibility for a new forage grass improvement program in 1998. She has developed a new bahiagrass cultivar that has enhanced late fall and early spring growth.

**Dr. Steve Calhoun, Ph.D., 1988. Major Professor – R. D. Barnett.** After working with CIMMYT as a small grain breeder, and with Louisiana State University as a cotton breeder, Dr. Calhoun is leading the Cotton Breeding Program for Mississippi State University located at Stoneville, MS.

**Dr. Neysa Call, M.S., 1993. Major Professor - K. H. Quesenberry.** After completing her M.S. at UF, Dr. Call obtained the Ph.D. from North Carolina State University in Weed Science. She soon moved into government agency employment, and currently is employed as a Legislative Policy Analyst in the office of Legislative and Public Affairs of the US National Science Foundation.

**Dr. Chris Deren, Ph.D., 1986. Major Professor - K. H. Quesenberry.** After a distinguished research career with sugarcane and rice breeding at the UF/IFAS Everglade REC, Dr. Deren assumed the position as Director of the University of Arkansas, Rice Research and Extension Center at Stuttgart, AR in 2002.

**Dr. Cheryld Emmons, Ph.D., 1996 Major Professor - J. W. Scott.** Dr. Emmons is an Associate Professor of Biology at Alfred University in New York state. She has numerous teaching responsibilities and directs undergraduate research projects.

**Dr. Phillip Griffiths, Ph.D., 1998 Major Professor - J. W. Scott.** Dr. Griffiths is Associate Professor of Horticulture at Cornell University located at the Geneva station. He conducts breeding and genetic studies on crucifers and beans as well as teaches breeding classes.

**Mr. Nikolaos Georgelis, MS., 2002 Major Professor - J. W. Scott.** Mr. Georgelis is presently
a Ph.D. student in Molecular Genetics at the University of Florida with Dr. Curt Hannah as his major professor.

**Dr. Liana Jank, Ph.D., 2001. Major Professor - K. H. Quesenberry.** Dr. Jank obtained her M.S. degree from UF in 1982 and began working at the EMBRAPA Beef Cattle Research Center (CNPGC) at Campo Grande, MS, Brazil, as a tropical grass breeder. She returned to UF, completed the Ph.D., and continues to direct an internationally recognized tropical grass improvement program at CNPGC focused on genetic improvement of guineagrass.

**Dr. Roy Martens, Ph.D., 1996. Major Professor – R. D. Barnett.** After a short post doctoral stay in the Montana State University spring wheat breeding program, Dr. Martens is serving as a sugar beet breeder for Syngenta and is located in Longmont, Colorado.

**Dr. Bruce Mowrey, M.S., 1985. Major Professor - Wayne Sherman.** After completing his masters at UF, Dr. Mowrey obtained his Ph.D at North Carolina State University. He was hired as a stone fruit breeder at Sunworld prior to becoming the lead strawberry breeder at Driscols strawberries, the leading private company for strawberry production in the USA. He is currently director of plant breeding at Driscols Strawberries and oversees the strawberry, bramble, and blueberry breeding programs.

**Mr. David Moon, M.S., 1993. Major Professor - K. H. Quesenberry.** Since 1996, Mr. Moon has been employed with Pioneer Wheat Breeding program, first in South Carolina and more recently at West Memphis, AR. He has primary responsibility for all Pioneer advanced wheat breeding line evaluations throughout the mid-South.

**Ms. Lisa Piccinino MS., 1985. Major Professor - J. W. Scott.** Lisa is presently a tomato breeder with Syngenta Seeds at their Naples Florida station. She developed the variety ‘Bobcat’ that is grown on considerable acreage in California, the second largest producer of fresh market tomatoes in the US.

**Dr. Jorge Rodriguez, Ph.D., 1984. Major Professor - Wayne Sherman.** Dr. Rodriguez was trained as a fruit breeder in the Horticultural Sciences Department. He subsequently became a faculty member of Instituto de Recursos Genéticos and Productividad in Montecillo, Mexico, where he has developed low-chill peach, nectarine, plum, and apple cultivars. He has also worked on systems for commercializing seedless cactus fruits and off-season raspberry, blackberry, and grape production. He has taught many courses in breeding and horticulture. At least two of his students, Raquel Cano Medrano and Alejandra Gutierrez subsequently received Ph.D. degrees from the Horticultural Sciences Department at the University of Florida.

**Dr. Bruce Topp, Ph.D., 1992. Major Professor - Wayne Sherman.** After completing his Ph.D. program, Dr. Toop assumed a position as a low chill stone fruit breeder for the Queensland Department of Primary Industries. Low chill cultivars developed by his program are among the most important for the Australian market.
* 2006 data only through July 06

Figure 1. UF/IFAS Cultivars Released by Decade

Figure 2. UF Cultivar Releases 1995-2006