EXECUTIVE SUMMARY

Through a diverse group of faculty members, students and staff, the Department engages in programmatic activities that have educational, scientific, economic, environmental, and social impacts. These impacts are summarized in this section. More detailed information can be found under the sections for individual faculty members (pages 12-50).

Educational Impacts

Our new BA degree program, the only one of its kind in the U.S., is offering our undergraduates new educational opportunities that better prepare them academically for service to the green industry (one of the largest agricultural sectors in the nation). This program is designed to allow students to improve business, language, and design skills—all skills that our industry stakeholders have indicated are of critical importance. Further, this program broadens student access to horticulture. In support of this program, new courses related to urban ecology have been developed and offered. To further broaden our students’ horizons, a course on the Science of Foods for Health is also being developed. Many of our graduates are now serving in leadership roles in the horticulture industry.

Escalating costs of higher education force most students to choose between work or exorbitant debt and their academic studies. Our Department helps mitigate these costs through its scholarship program. Last year we awarded 44 scholarships with a total value of $50,000. Fund-raising continues for additional scholarships.

We support the educational mission of the University by offering 3 courses that satisfy requirements for the University Core Curriculum: HORT 201/202 (Horticultural Science and Practices) counts toward the Natural Sciences requirement; HORT 203 (Floral Design) counts toward the Visual and Performing Arts requirement; and HORT 335 (Sociohorticulture) counts toward the Social and Behavioral Science requirement. In addition, we offer courses that satisfy University requirements for International and Cultural Diversity (HORT 335, Sociohorticulture) and for Writing Intensive courses (HORT 225, Horticulture Learning Community; HORT 315, Component Analysis of Horticultural Systems; HORT 418, Nut Culture; HORT 435, Urban Horticulture). HORT 481, Senior Seminar, was approved as a C course (communication intensive; meets second W course requirement.)

Several Departmental faculty members are engaged in the creation of teaching resources for local and national adoption. Three of our faculty members have written textbooks that are used not only at Texas A&M but at other institutions of higher education across the country. These books are in the areas of plant propagation, landscape plant materials, and floral design.

Our graduate program provides advanced training and mentoring to students. Several of our recent graduates have been hired in faculty positions at peer institutions. We also have trained young scientists who are now in the plant breeding industry.

Our department houses the one-of-a-kind Benz School of Floral Design which provides outreach through short courses and certifications for floral design professionals. This highly-recognized school attracts students from throughout the nation and world, with recent collaborations coming to fruition in South Korea.
Through our AgriLife Extension programs, we provide many outreach education opportunities within Texas, the nation, and the world:

*Texas Master Gardener™ Program.* Through 115 County Master Gardener programs, Master Gardener Intern training was provided throughout the state. Upon completion of a minimum of 50 hours of volunteer service requirements, these Interns are certified as Texas Master Gardeners. In total, this corps of 6,300 highly-trained volunteers provided about 500,000 hours of service to Extension educational projects, maintaining the Texas Master Gardener Program’s rank as the largest program in the nation.

*Junior Master Gardener® (JMG) Program.* Created, trademarked, and administered by Extension, this international youth gardening 4-H program enrolls more than 200,000 children (representing about 20% of Texas 4-H enrollment) through over 300 registered groups in Texas. The program continues to expand rapidly with JMG groups in all 50 states; 36 land-grant universities are registered/licensed JMG program partners; and 10 foreign countries, from Guatemala and Honduras to South Korea, have JMG programs. This unique program engages children in “hands on” learning experiences that promote an appreciation for gardening and the environment, and trains over 500 public school teachers and 275 volunteers each year. Much focus in 2011 will be toward activities associated with the $5 million USDA-AFRI grant secured by an interdisciplinary team led by Judy Warren and Lisa Whittlesey. The title of the grant is "Using Family Focused Garden, Nutrition and Physical Activity Programs to Reduce Childhood Obesity."

*Earth-Kind® Landscaping Program.* Created, trademarked, and administered by Extension, Earth-Kind® landscaping is a unit-wide effort to obtain program Outcomes measuring knowledge gained, intent to adopt practices, and anticipated economic impacts. Extension Specialists and County Extension Agents work in concert to evaluate and report these Outcomes using our Aggie-Horticulture website database and TExAS Reporting System. The program provides Master Gardeners, consumers, and green industry professionals with training to achieve water conservation, energy conservation, reduced pesticide and fertilizer use, and reduced yard waste entering landfills. In fiscal year 2010, 1,798 Outcome evaluations were obtained indicating: a 32% increase in knowledge gained by clientele and 78% of clientele anticipated economic savings by implementing recommended practices.

*Produce Food Safety Initiative Team.* In 2009, AgriLife Extension established an interdisciplinary team of Extension and Research Scientists to address food safety in Texas-grown produce. Juan Anciso and Joe Masabni, co-chairs, provide committee leadership for this systems approach to fresh produce food safety throughout crop production, handling, packaging, and shipping. A Texas Department of Agriculture-SCRI Block Grant ($282,500), secured in 2009, has galvanized the committee and resulted in the publication of the Texas GAPs and GHPs Training Curriculum, plus a website. The food safety website was design to accommodate all AgriLife activities (teaching, research, and extension), serving as a clearinghouse of food safety information, research projects and papers, faculty expertise and contacts, and educational programming. In 2011, additional GAPs/GHPs training, populating the website, and forging stronger relationship with the Center for Food Safety (Dr. Gary Acuff, Director) will be priorities.
Commercial Horticulture Outreach. Extension Horticulture educational programs and applied research serve horticultural food crop production and the green industries. Regularly scheduled educational events include: Pecan Orchard Management Short Course, Better Food Processors School, Prospective Wine Grape Growers Workshop, Pierce’s Disease Symposium, Fresh Produce Food Safety (GAPs) Trainings, High Plains Vegetable Conference, East Texas Fruit and Vegetable Conference, Southwest Greenhouse Growers Conference. In addition, Extension Specialists support educational efforts of the Texas Nursery and Landscape Association, Texas Wine Grape Growers Association, Texas Vegetable Association, Texas Produce Association, Texas Pecan Growers Association, Hill Country Fruit Council, and more.

Aggie-Horticulture® Website. Aggie-Horticulture.tamu.edu remains the most accessed website in Texas A&M AgriLife, serving over 6.6 million unique visitors, 10.8 million user sessions, and 37 million pages viewed for the time period of 1 September 2009 through 31 August 2010. Much time, effort, and expertise is required to actively manage and continually update the site. Aggie Horticulture contains over 100,000 documents providing Internet access to every topic in the art and science of horticulture. Of the 157 web sites reporting to the Texas AgriLife Extension Web Stats database system, Aggie Horticulture served 55% of the total pages viewed and 55% of the total unique visitors of AgriLife Extension websites during this quarter. According to the Alexa Traffic Rankings, for the past 6 months, Aggie Horticulture is the 8th most active website in the tamu.edu domain serving 3.2% of all traffic across websites in the domain. Aggie Horticulture is also the number two website under the category of Horticulture (out of 849 sites) and the number ten website in the overarching category of Agriculture (out of 4,049 sites) worldwide, according to Alexa Traffic Ranking.

Scientific Impacts

Through our research programs, faculty members have made significant contributions to plant science. Examples include: identification and use of molecular markers to better understand the ability of plants to withstand adverse environmental conditions such as drought; an improved understanding of the carotenoid pathway in watermelons (carotenoids have human health implications); improved knowledge of bioactive compounds in fruits, vegetables, and nuts which have human-health promoting properties; improved understanding of the molecular aspects of plant tolerance to salinity; discovery that complex N-glycans have a role in the establishment of root systems in water-limited environments; characterization of physiological differences between pecan genotypes which have ramifications for production and management practices; improved understanding of how plants respond to low atmospheric pressure which has significant implications for crop production in outer space; increased knowledge of the basis of plant/microbe interactions. Collectively, these scientific advancements have the potential to improve horticultural crop production and human health.

During the past year, such scientific impacts have been documented in a total of 58 refereed journal article publications and through a large number of presentations made at scientific meetings (see Metrics section, p. 7). Several faculty members and students were also given special recognition for their research accomplishments (see p. 9).

Economic Impacts

Potato is recognized as the third most important food crop worldwide, behind only wheat and rice. Twelve improved varieties have been developed/co-developed and/or released from the
Texas Potato Breeding and Variety Development Program. Virtually all of the russet potatoes grown in Texas in 2010 were to the improved Texas Russet Norkotah strains. When this program was initiated in 1973, the average yield of the summer crop in Texas was about 200 Cwt/A. In 2009 the average summer crop yield in Texas was reported to be 465 Cwt/A, the highest in the nation among 11 states with summer crop production. In addition, the farm gate value of the crop has grown from less than $20 million to about $85 million with an annual economic impact to the state estimated to exceed $215 million. Of all varieties released over the past 15 years by the 12 potato breeding programs in the U.S., those developed by the Southwest Project, which includes the Texas program, rank second nationally in total acreage approved for seed certification in 2010.

Nearly 150,000 trees have been produced from the four most recent low-chill peach cultivars released by our peach breeding program. This represents a farm gate value of about $4.2 million. Further, the development of low-chill peaches will open up economic opportunities to grow this crop in southern regions of the country. The development of new peach flesh colors, flavors, and nutritional content will help improve the profitability of peach production in southern regions. A collaboration with Thai researchers is developing low-chill cultivars to provide economic opportunity to grow peaches instead of the opium poppy for farmers in the temperate regions of Thailand.

Because a large amount of potential crop yield is estimated to be lost due to environmental stresses, studies of gene expression related to stress tolerance have economic implications. The outcomes of this work are helping to design more effective biotechnology strategies aimed at ultimately reducing yield loss due to environmental stress.

Pecan growers have begun adopting recommendations derived from our pecan research which have economic implications. For example, growers now understand that summer hedging of trees is not worthwhile and that winter hedging is worthwhile only if applied on a yearly or biennial basis. Research on the nutritional properties of pecans is helping increase the value, marketability, and profitability of pecan production.

Research aimed at developing postharvest technologies for fruits and vegetables will improve the quality of produce, increase food safety, and extend shelf-life. If successful, this will ultimately provide a wider range of healthy fruit and vegetable products for consumers.

Floricultural research is facilitating the selection of high-value, high-demand crops for cost-effective greenhouse production of high-quality, long-lasting products. Specific recommendations are being formulated for Dendrobium orchids, container gardens, and vegetatively-propagated annuals. Research on landscape plants is facilitating sustainable crop production and efficient establishment of landscape plantings. The Ellison Chair in International Floriculture produces a blog which provides up-to-the-minute information regarding economic factors affecting green industry businesses and provides suggestions to enhance profitability.

The 500,000 hours of volunteer service provided by Texas Master Gardeners provides a significant economic impact. This service, equivalent to well over 200 full-time employees, increases the human capacity of Extension by 6 percent. The economic value of this service translated to a $10.5 million benefit to the State of Texas.
Environmental Impacts

Research on sustainable horticultural systems is helping to reduce the requirements for water, fertilizer, and other inputs for field, nursery, and greenhouse crop production. Ecosystem research is helping to better manage the southern oak-savanna. Similar research is helping to better understand how negative environmental impacts of urbanization can be managed and reduced.

Molecular genetics research is leading to a better understanding of how to produce crops on marginal land with less water and fertilizer. This will ultimately increase food production while at the same time preserve wildlife habitat.

Throughout our courses, students are being taught about the importance of the environment and the need for sustainable management practices. Our Earth-Kind program focuses on how homeowners can preserve and protect our valuable natural resources through the use of "environmentally friendly" practices. In the Holistic Teaching Garden, emphasis is on the garden as an ecosystem and its relationship to the larger, natural ecosystem.

Social Impacts

Sociohorticulture research efforts have documented the benefits of gardening and green spaces for children, college students and the elderly. We also have a variety of courses that teach our students about these benefits. The Holistic Teaching Garden introduces students and all who visit it to the restorative value of nature, to the garden as a place and a process which help reduce physical and mental stress and fatigue. Research on bioactive compounds in fruits and vegetables has significant human health implications.
METRICS REPORT HIGHLIGHTS—On campus research/teaching faculty
Department of Horticultural Sciences, FY 10

- Number of refereed journal articles published=57
- Number of book chapters authored/co-authored=7
- Number of published abstracts=46
- Number of published conference proceedings=24
- External funding generated=$2.6 million
- Number of patent disclosures=5
- Number of postdoctoral scientists and visiting scientists hosted=18
- Number of graduate degrees awarded=11
- Number of undergraduate degrees awarded=56
- Number of invited presentations made by faculty members=64
- Number of undergraduate students involved in research projects=23
Honors/Awards/Special Recognitions Received by
Department of Horticultural Sciences Faculty, Staff & Students, FY 10

General/Leadership:

--Seven current faculty members are Fellows of the American Society for Horticultural Science, highest honored bestowed upon society members (Mike Arnold, Tim Davis, Fred Davies, Dan Lineberger, Creighton Miller, Bhimu Patil, Dave Reed)

--Fred Davies is President of the American Society of Horticultural Science

--Dave Reed serves as Vice President of the Education Division of the American Society for Horticultural Science and Secretary-Treasurer for the Southern Region
--Dr. Leo Lombardini and Dr. Bhimu Patil were both selected to participate in the inaugural class of the AgriLife Advanced Leadership Program.

**Research:**


--Papers authored by the following faculty members of the Department have been among the most read ASHS publications during the past year: Mike Arnold, Kevin Crosby, Steve George, Charlie Hall, John Jifon, Steve King, Daniel Leskovar, Leo Lombardini, Genhua Niu, Astrid Volder, Jayne Zajicek

--Dr. Bhimu Patil received the 2009 Vice Chancellor's Award in Excellence for On-campus Research.

--Ndambe Nzaramba, who completed his Ph.D. under the direction of Dr. Creighton Miller, was the recipient the Krezdorn Award for Excellence in Doctoral Research and Writing—this award is in recognition of the best paper developed from doctoral research and was presented by the Southern Region of the American Society for Horticultural Science

--Justin Butcher, a Ph.D. student working with Dr. Kevin Crosby, received an Honorable Mention Award for his poster presented at the Texas A&M AgriLife Conference graduate student poster competition.

--Andy Cartmill, a Ph.D. student working with Dr. Astrid Volder, received a Tom Slick Graduate Research Fellowship.

--Dr. Hisashi Koiwa received the Outstanding Young Faculty Award from the TAMU Molecular and Environmental Plant Sciences (MEPS) program.

--Kranthi Chebrolu, a graduate student working with Dr. Bhimu Patil, took second place in the ASHS-sponsored Herbs, Spices, and Medicinal Plants Working Group Graduate Student Poster Competition.

**Teaching:**

--Dr. Mike Arnold received the 2009 Vice Chancellor's Award in Excellence for Undergraduate Teaching.
--Michael Perez, a junior horticulture major, served as a congressional intern for Congressman Ruben Hinojosa in Washington, D.C.

--Dr. Steve King received a Texas A&M University System Teaching Excellence Award.

--Tim Hartman, a graduate student working with Dr. David Byrne, received the Hammett Award for being the Outstanding Association of Collegiate Branches Club Member.

--Our Horticulture Club received the Club Share Award at the SR-ASHS meeting held in Orlando.

--Our judging team took first place overall in the team judging competition at the SR-ASHS meeting held in Orlando.

--Chris von Kohn and Lauren Garcia, undergraduate students, were elected President and Secretary, respectively, of the ACB of ASHS.

--Amy McFarland, a graduate student working with Dr. Jayne Zajicek, and Ram Uckoo, a graduate student working with Dr. Bhimu Patil, were awarded travel grants for the ASHS annual meeting held in Palm Desert, California.

--Dr. Astrid Volder was named a 2010-2011 Montague Center for Teaching Excellence Scholar.

--Jim Johnson was selected as the recipient of a 2010 Association of Former Students Distinguished Achievement Award for Teaching.

**Extension/Outreach:**

--Dr. Juan Anciso received a Superior Service Award in the Extension Specialist category from Texas AgriLife Extension Service.

--The Texas Master Gardeners Association received a Partnership Award from Texas AgriLife Extension Service.

--Barbara Storz, County Extension Agent-Horticulture in Hidalgo County, received a Superior Service Award from Texas AgriLife Extension Service in the Diversity category.

--Dr. Joe Masabni, Extension Vegetable Specialist, was part of a team that received the Blue Ribbon Extension Communication Award at the ASHS Southern Region meeting held in Orlando.

--Dr. Juan Anciso received the Texas County Agriculture Agent Association (TCAAA) 2010 District Specialist Award.
--Dr. Don Wilkerson received the Spirit of Extension Award from the Galveston County Master Gardener Program for his educational outreach programming in response to Hurricane Ike.

--Keith Hansen, County Extension Agent-Horticulture, received a 2010 Communication Award from the National Association of County Agricultural Agents

--Dr. Bhimu Patil received a special recognition with a plaque from the Association of Kannada Kootas of America for his outstanding service to the Kannada Community of North America.
IMPACT STATEMENTS FROM INDIVIDUAL FACULTY MEMBERS

Dr. Juan Anciso, Associate Professor
& Extension Specialist, Weslaco

Food safety trainings for producers, middle buyers and entry level workers continued to be another important area for GAPs education in 2010 and the educational efforts in District 12. Entry level worker trainings in hand washing and hygiene were conducted in District 12 in Spanish by county agents. These county agents included Marcel Valdez, Jaime Lopez, and extension program assistant Ashley Gregory and they helped coordinate these meetings and employ the training material. Over 80 individuals were trained in hand washing and hygiene through this effort in Spanish in 3 separate trainings. The HEB Produce Safety Training for producers and middle buyers continued in 2010 with 4 trainings in San Antonio. Over 76 individuals were trained in the new GAP metrics and 92.8% were mostly or completed satisfied with the course and training. These individuals represented over 108,000 acres of produce production in the United States and Mexico.

With a grant from the Texas Department of Agriculture ($181,500), a comprehensive GAPs/GHPs food safety training curriculum and website was developed to educate producers and food safety managers. As an added incentive those that participated in the GAPs/GHPs trainings from this curriculum would be eligible to be reimbursed up to $750 of the cost of a successful GAPs or GHPs audit ($75,000 total funds available at TDA). In an effort to make this curriculum as comprehensive as possible, Texas AgriLife Extension Service reached out to several departments from the A&M University to contribute their expertise to the manual; the Department of Horticulture; the Department of Biological and Agricultural Engineering; the Department of Animal Sciences; the Department of Veterinary Medicine and Biomedical Sciences; the Department of Agricultural Economics; and the Department of Agriculture and Environmental Safety. In addition, we had contributions from the Center for Agricultural Business, California State University-Fresno; the Department of Animal and Dairy Science, Mississippi State University and the Department of Plant Pathology, A&M- Kingsville. In total 19 people contributed to the content of the manual and it was reviewed by an additional 7 people who are leaders or professionals in the agricultural industry. A large chunk of time was devoted to gathering information, compiling it into a manual and then formatting and editing it so that it was easy to read and understand. The Communications Department checked facts, resources and gave it a professional finish. The final product is a 58 page manual (B-6244) that has a total of 8 chapters, including follow up questions for each chapter. It covers most aspects of food safety starting from the farm all the way to the packing shed and can be purchased for $10 at the AgriLife Bookstore.

The other half of the project was to use the curriculum from the manual to develop power point presentations what would be presented at the 4 workshops across Texas. Dr. Anciso and Dr. Masabni presented most of the presentations at the workshops, but at each of the 4 workshops there was at least one additional author that came to present their respective material. Overall, this project was very successful. The manual Texas GAPs and GHPs Food Safety Training
Curriculum (B-6244) covers a wide range of food safety topics. Over 1,000 copies were printed so it will be in stock for a long time. At each workshop the participants were provided with evaluation forms and all the comments were positive and most felt the information was relevant, up to date and needed. The majority of the people were completely satisfied with the presentations and said despite feeling well informed they learned a lot from the training. The success was creating a great educational resource that is now available for them when they are ready to get started with a GAPs/GHPs audit. The website will provide current information and all the resources they need to move forward with their food safety plans. The workshop training material is available to them in the form of an online course that they can take at their leisure and complete on their own schedule. The website will continue to reach and educate producers and consumers long after this project has ended.

I was also the state-wide coordinator for the 2010 Statewide Watermelon Trial which involved organizing the results in a handbook and website. These results have been compiled from 2000 to 2010 and can be found at [http://aggie-horticulture.tamu.edu/vegetable/varietytrials/index.html](http://aggie-horticulture.tamu.edu/vegetable/varietytrials/index.html). The state-wide trial was conducted in four locations in 2010 with 40 watermelon varieties being evaluated. Texas continues to be one of the top producing states of seedless watermelons and information generated from this trial helps evaluate the seedless watermelon varieties best suited for the different growing regions in Texas.

Other significant programs included my participation with the Texas Vegetable Association as a board member in which one annual educational program was planned (Texas Produce Convention, South Padre Island, TX). Hosted one of the workshops (February) of the National Harmonization of GAPs Task Force under the guidance of United Fresh Produce Association. This involvement with the GAPs Harmonization Initiative has resulted in a final document that should be utilized to decrease the costs and inefficiencies of multiple audits and standards now being used to measure compliance with Good Agricultural Practices by various auditing companies and retailers ([http://www.unitedfresh.org/newsviews/gap_harmonization](http://www.unitedfresh.org/newsviews/gap_harmonization)).

Dr. Michael Arnold, Professor

My teaching efforts directly impacted approximately 200 undergraduate or graduate students through direct classroom and laboratory instruction. These efforts were further validated by my receipt of the 2009 Vice Chancellor’s Award in Excellence for in Undergraduate Teaching, the College of Agriculture and Life Science’s highest career teaching award. Mentoring of graduate students resulted in the graduation of a M.S student who is continuing his education in a Ph.D. program, another who is nearing completion and service on several graduate students’ advisory committees, including several from other colleges.

In the research arena a total of over $33,000 of funding was generated from a combination of competitive grants, contracts, and royalty from intellectual property to support a highly
productive program in sustainable nursery crop production, low resource requiring landscape plants, and efficient establishment of landscape plantings. Three peer reviewed refereed journal articles, two editor reviewed conference proceedings, and several presentations at international, national, or regional scientific or professional meetings were produced. Two popular press articles helped to translate these works’ relevance to the general public. Our research or outreach efforts were highlighted in articles by five other authors.

A Plant Variety Patent was issued in the summer of 2010 for a release developed from our breeding lines, PVP No. 200600009 for *Helenium amarum* ‘Dakota Gold’, subsequently named the College of Agriculture and Life Sciences’ Centennial Flower.

I am currently serving the TAMU Department of Horticultural Sciences as chair of the Departmental Promotion and Tenure Committee and also represent the Department on the TAMU College of Agriculture and Life Sciences Promotion and Tenure Committee. In addition, to several university related committees, I serve on a number of industry and professional society committees, and I am the 2009-2010 president elect, 2010-2011 president for the Southern Region of the American Society for Horticultural Sciences.

**Dr. Dave Byrne, Professor and Basye Chair in Rose Genetics, Associate Department Head**

**Stone Fruit Breeding and Genetics Program**

The development of medium and low chill *Prunus* varieties will open up the southern regions of the country for peach production advancing the commercial harvest by 2-3 weeks. This advances the harvest in two ways: shortening the fruit development time and lowering the chilling requirement to allow earlier bloom and excellent production in the more southern zones. The further development of commercially useful varieties adapted in these low chill zones in the USA could add another 10% in production capacity. This would have the potential value up to $50,000,000 annually in the USA.

Work with partners throughout the world extends this concept and potentially will increase stone fruit consumption. Work in Thailand focuses on the development of low chill peach as an alternate high value crop to poppy.

Additionally work progresses to develop new types of peach products (flesh colors, flavors, nutritional content) adapted to these low chill zones to create a more profitable production paradigm. In the next 2 years there is a planned release of two medium chill white flesh peach series (White Delight and White Jazz), a series of yellow peaches (Yellow Jazz) and a series of nectarines (Smooth Texan Nectarine). This will allow many more options for our medium chill producers and allow them to expand their product lines to include white peaches and nectarines.
Fruits have been touted as very healthy foods. Thus far we have shown that stone fruit phenolics are an excellent source of antioxidants (especially plums), inhibit the oxidation of LDL, inhibit platelet aggregation, and selectively inhibit the proliferation of breast cancer cells over normal breast cells in in vitro assays. This year we showed that these phenolics also assist in suppressing the oxidative and inflammatory processes involved in the pathogenesis of vascular diseases and that chlorogenic acid, a key phenolic in stone fruit, reduced DSS induced injury and NF-κB activity in a rat colitis model system. This will help the consumer decide what foods to eat to maintain their health.

The diversity of low chill peach germplasm indicated that Brazilian germplasm and particularly low chill germplasm from southeast Asia was distinct from the low chill germplasm developed in the USA. This information will aid in the selection of germplasm to include in the national germplasm collection and in the breeding of better low chill peach and nectarine cultivars.

**Rose Breeding and Genetics Program**
Over the last 20 years the sales of landscape roses has decreased about 30% mainly due to their reputation as a hard to grow plant. Disease resistant rose varieties are expanding the market for roses as a landscape plant and reduce the amount of pest and disease control chemicals needed to maintain the plants’ health. This work is complemented by mapping and genomics studies which will lead to a better understanding of the rose genome and better methods to create disease resistant varieties.

Preliminary work has identified differences in heat tolerance among roses and paves the way towards the development of roses that flower consistently in hot climates.

**Teaching in Fruit Culture, Tropical Horticulture and Genetics**
I firmly believe that the best way to impact a student’s understanding of their world is to experience the subject and get them to “see” things in as many ways as possible. In my courses, I have guided projects in which I give my input during various stages of the project. In this way, I feel I am able to encourage the students to develop their reasoning and communication skills: both essential skills

**Dr. Luis Cisneros, Associate Professor**

My program has two main research lines which we consider benefits TAMU and the State of Texas. On one side we study the use of appropriate post-harvest technologies that can keep the quality, safety and extend the shelf-life of different types of fruits and vegetables while enhancing the health promoting properties of produce. For this purpose we use controlled abiotic stresses to design appropriate technologies based on molecular studies.

A second research line includes the area of bioactives. We focus on bioactive compound discovery (drug discovery) from different plant sources including fruit, grains, vegetables and herbs using an array of biological and molecular assays associated to chronic diseases including cancer, the metabolic syndrome (obesity, diabetes, cardiovascular disease), chronic inflammation,
and others. We screen plants, identify compounds, study extraction methods and stability properties.

The generated information potentially benefits Texas because we can design post-harvest strategies to provide high quality and healthier products to consumers. On the other hand our bioactive compound discovery work has the potential to provide value-added to a diverse range of crops and the possibility to reach high value markets such as the functional foods, dietary supplements, cosmetics, pharmaceutical and agrochemicals.

My courses at TAMU attract students from different areas including majors of Food Science, Horticulture, Nutrition, Ag Economics. In addition, I have a very active international component to my program including invitations to give seminars and short courses as well as active research collaborations in Europe, Asia and Latin America.

**Dr. B. Gregory Cobb, Associate Professor**

Pierce’s Disease is the limiting factor for growth of wine and grapes now. It is present in all wine growing regions and has the potential to completely devastate the wine industry in Texas and California. *Xylella fastidiosa*, the bacterium that causes PD, inhabits and spreads in the xylem; the water transport system in plants. It disrupts water and nutrient flow and leads to vine death in as little as two years. While the great majority of work has focused on examining the genetics and range of *Xf*, I decided to examine the xylem and *Xf* interactions at the cell level by using electron microscopy. In a paper published this year, we showed that the basis of movement of *Xylella fastidiosa*, the bacteria that causes PD, is due to the ability of the bacteria to breakdown cell walls which allows the bacteria to infect the entire plant. This along with similar findings from other researchers is a major advance in our knowledge of PD infecting the host plant.

Texas Wine Industry - A major focus of my work is devoted to improving the transport, processing and wine making in Texas. About 3 years ago I started examining transport of grapes in Texas. The transport of wine grapes long distances is new and very little information is available about transport. Wine grapes are routinely transported across Texas and significant quantity of wine grapes are shipped from California. During transport the temperature of grapes in refrigerated trucks remains at a relative high level, with little cooking occurring. Indeed, significant fermentation can occur which has a very negative effect on wine quality. Next season we will test several methods that can be used to control grape quality during transport.

**Dr. Kevin Crosby, Associate Professor**

During FY 2010 we published 5 refereed journal articles, including pepper salt and insect responses, melon grafting and a new pepper cultivar release - ‘TAM Ben Villalon.’ Additionally, we published 1 conference proceeding and 8 abstracts. I delivered 2 invited presentations and
served on four committees. I reviewed manuscripts for JASHS, HortScience, Plant Disease, and Molecular Breeding. I served as major professor for three PhD students and committee member for three MS students. I wrote or co-wrote 10 grant proposals and received funding for 3 of these amounting to $50,000. I submitted disclosures for 14 elite melon lines, and one pepper line to the OTC, for licensing to three private companies. We received a plaque and recognition for the PVP on TAM Mild Jalapeno 2. We generated more than 600 new lines and hybrids of pepper, tomato, carrot and melon, testing them in field trials to assess commercial potential. Six peppers and one tomato were chosen by private industry collaborators to license as soon as seed is available for production. Seed of two new melon cultivars, one new hot pepper and two tomatoes were produced in field plots for commercial production during 2011. We continued work to saturate our molecular map of melon, focusing on QTL for sugars, beta-carotene and fruit quality traits. Additionally, we generated transgenic plants of two elite melon lines. Finally, we verified resistance to powdery mildew in novel melon and pepper lines and communicated with several interested seed companies.

Dr. Fred Davies, Professor

Fred Davies is a Regents Professor involved in teaching and research in Horticulture at College Station. His research program has focused on three areas: 1) utilization of beneficial mycorrhizal fungi as biofertilizers, and for enhancing drought and nutrient stress resistance of ornamental plants, 2) NASA-funded low atmospheric pressure, controlled environment crop systems, and 3) assessing the influence of fertilization on insect herbivore population dynamics and crop quality using chrysanthemum and gerbera as model crops.

There will not be a human presence in Lunar or Martian habitation without Horticulture. Davies, Dr. Chuanju He and Dr. Ron Lacey (Biological and Agricultural Engineering) have been collaborating on NASA-funded research ($908,102) since 2001. There are engineering, safety and cost advantages in growing plants under low pressure conditions. In addition they report that plants do better under low pressure (25 kPa) than earth ambient pressure (101 kPa), in part because low pressure depresses the phytohormone ethylene (which can cause senescence and irregular plant growth), plus dark respiration (at night) slows down, which leads to greater biomass production. This research also has application to controlled crop production systems, sustainable, reduced input production systems and controlled atmospheric (CA) storage systems of horticultural crops. Their research was reported in a British Broadcasting Corp (BBC)-Science in Action Report and one of their papers made the Oct 2007 cover of *Physiologia Plantarum*, one of the leading plant biology journals. Davies’ Lab in collaboration with Drs. Luis Cisneros, Ron Lacey and Chuanju He have been conducting hypobaric research using hypoxic stress to enhance phytochemical composition and functional quality of lettuce plants. From January 2008 through August 2009, Davies gave nine invited presentations on NASA hypobaric research, was a plenary speaker at the 50th Anniversary of Canadian Plant Physiologists in Ottawa in June 2008, and gave talks in December 2008 at the International Potato Center (CIP) and the National Agrarian University (UNALM), Lima, Peru on "Growing Plants for NASA-Challenges in Lunar and Martian Agriculture".
Four refereed manuscripts from Davies’ group were accepted in 2009, including a *Physiologia Plantarum* article to be published on “Ethylene reduces gas exchange and growth of lettuce plants under hypobaric and normal atmospheric conditions”. To our knowledge, this is the first report to show the adverse affect of ethylene on net photosynthesis and dark-period respiration, leading to reduced plant growth and development, under both hypobaric and ambient total pressure. There was a direct, negative effect of increasing ethylene concentration reducing gas exchange, as well as an indirect ethylene effect on leaf epinasty, which reduced light capture and photosynthesis. Photosynthesis was more sensitive to increasing ethylene concentration than dark-period respiration. Hypobaria had no significant effect on endogenous ethylene production, even though ethylene levels were 16% lower with hypobaric than ambient pressure lettuce plants. This study further documents that lettuce can be grown under subambient pressure (≈ 25% of normal earth ambient total pressure) without adverse effect on plant growth and gas exchange. Regardless of ethylene levels, hypobaric plants had a lower dark-period respiration, but similar gas exchange and plant growth and development, compared to ambient total pressure plants. This information is highly relevant to NASA’s goal of long-term lunar and Martian habitation. Besides submitting an $330,000 NASA NRA grant (the 1st competitive NASA-NRA in plant biology offered in 3-year), Davies’ group was awarded a $100,000 supplementary grant from NASA in July 2008 to continue with the hypoxic studies.

His research group (Dr. Chuanjiu He, Jay Spiers) in collaboration with Drs. Kevin Heinz, Amanda Chau, Carlos Bogran and Scott Ludwig in Entomology have been funded for the past six years on a USDA-Floriculture and Nursery Research on “Floriculture and Nursery Crop Production with Reduced Cultural and Pest Management Inputs.” To date they have reported that aphids exposed to high fertility regimes depress plant vegetative and reproductive growth, decrease plant photosynthesis and increase ethylene production in reproductive buds and young leaves, thus influencing plant quality and salability. Their results also show that commercially used fertility levels will increase western flower thrips population sizes, which decrease photosynthesis and stomatal conductance and reduces plant quality. A long-term goal of this research was to fine-tune and reduce fertility and pesticide usage in controlling insect pest population levels and enhancing plant quality. A PhD student, Jay Spiers, who has since taken a tenure-track Assistant Professorship at Auburn University, completed his studies during the fiscal year on the effects of nitrogen fertility on the host plant resistance of gerbera to western flower thrips. His research studied the systemic acquired resistance responses of how gerberas respond to thrips and the natural chemicals gerberas produce in the resistance process — such as jasmonic, salicylic acid and phenolics.

Davies is the current President of the ASHS.

**Jayla Fry, Extension Program Specialist**

As an Extension Horticulture Program Specialist, I support the efforts of the County Extension Agents, Extension Horticulture Specialist, and citizens throughout Texas through the coordination of the Master Gardener Program. The work I have done with the Master Gardener program includes: training Master Gardener volunteers, assisting agents with the coordination and management of their Master Gardener programs, working with Extension Specialists to establish new training opportunities for Master Gardeners, teaching new employees about the Master Gardener program, identifying a statewide volunteer reporting system for use by volunteers, and acting as the advisor to the Texas Master Gardener Association.
In 2010, I taught over 20 counties, reaching approximately 753 Master Gardeners in an Introduction to the Master Gardener Program, Earth-Kind Landscaping, and Plant Growth and Development. I worked with Denton County and Midland County Master Gardener Associations to facilitate board officer training. The agenda for these meetings included officer roles and responsibilities, committee job descriptions, team leadership skills, and planning sessions. I was asked to speak at Extension Foundations about the Master Gardener program. There were approximately 35 new agents and specialist in the session. I also had the opportunity to work with agents individually as I traveled to train volunteers. I have worked with Extension Specialist to develop three new Master Gardener Specialist training classes. The new classes are Compost Specialist, Citrus Specialist, and Tree Steward Specialist.

This year an online reporting system was identified for use by Master Gardeners. During this process, I had the opportunity to meet with AgriLife Communications, the Software Development team, and the Evaluation and Accountability team to discuss options for use by other volunteer programs within the Agency.

The Texas Master Gardener Association has revised their bylaws to better align with the mission of the county Master Gardener programs and Texas AgriLife Extension. I helped facilitate the writing of job descriptions for each committee and helped prepare a plan of action to better meet their new goals.

2010 has been a productive year for the Master Gardener program. There were approximately 500,000 volunteer hours provided by 6,300 Master Gardener volunteers. This equates to a 10.5 million dollar economic impact for our agency.

Dr. Steve George, Professor & Extension Specialist, Dallas

Issues
There is general agreement that the four greatest environmental concerns regarding American landscapes are that homeowners are: (1) wasting irrigation water, (2) abusing fertilizers, (3) abusing pesticides, and (4) allowing a valuable resource, namely tree leaves and tree limbs run through a chipper, to become an increasing burden in our already overcrowded landfills.

Actions Taken
To address these issues, I first developed the overall Earth-Kind® Environmental Landscape Management System, then I created and serve as the National Coordinator for the Earth-Kind Rose Program.

We have launched two national Extension programs, one on Earth-Kind Roses, the other on Earth-Kind Environmental Soil Management.
We are conducting, what is to my knowledge, the largest single site environmental rose research study in the nation, supported by randomized, replicated field trials at 61 total sites in Texas, Iowa, Kansas, Kentucky, Louisiana, Nebraska and West Virginia. We have cooperators testing Earth-Kind roses in 27 states (Alaska to Florida) and four foreign countries (Bermuda, Canada, India, and New Zealand). We took our Earth-Kind Rose concept worldwide in 2009 at the prestigious World Federation of Rose Societies Convention in Vancouver.

**Program Impacts**

We have shown across many climates and soil types that Earth-Kind roses will give outstanding landscape performance with a 70% reduction in irrigation, total elimination of fertilizers, total elimination of pesticides on the plants, and that a mulch of tree leaves and wood chips will serve as a super-slow-release fertilizer which should significantly reduce pressure on our landfills. This program improves varietal selection, increases quality of life, and provides great environmental protection by conserving water and safeguarding air and water quality.

Earth-Kind Roses have become, to my knowledge, the fastest growing and most popular university program of its kind in the nation. This makes Texas AgriLife Extension Service a national and international leader in research-based environmental landscape management. Our work has been favorably reported on in *The New York Times, Martha Stewart Living, Reader's Digest, Christian Science Monitor, London Financial Times.com, American Nurseryman*, and *Organic Gardening and Farming*. Our National Earth-Kind Rose Research was featured as the cover photograph for *HortScience*.

Our Earth-Kind team has conducted day-long Earth-Kind Rose Symposia in Kansas, Louisiana, Mississippi, Oklahoma, and several cities across Texas.

I now have valued colleagues at eight other universities (Colorado State, Iowa State, Kansas State, LSU, and the Universities of: Arkansas, Minnesota, Nebraska, and Wisconsin) who are providing their own funds to join us in doing Earth-Kind research.

Cities find great value in Earth-Kind as well. Addison has created the world's first Earth-Kind park and Tyler is building the world's first Earth-Kind botanic garden. The Park of Roses in Columbus, Ohio, has built their first Earth-Kind display garden, and the New York Botanical Garden has initiated their first Earth-Kind rose trial.

Finally, along with Dr. Griffith Buck and David Austin, I was recognized at the 2008 Great Rosarians of the World Conference in New York City.

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**Dr. Charlie Hall, Professor and Ellison International Floriculture Chair**

The mission of the Ellison Chair in International Floriculture is to advance the health and vitality of the floriculture industry on a national and international scope through exemplary academic
leadership, cutting edge applied research, innovative extension outreach programs, and by mentoring well-educated, impassioned leaders to support the future of floriculture.

Research output for the Ellison Chair included 12 refereed journal articles, 5 published articles in conference proceedings, numerous articles in industry trade journals, and 2 symposium presentations at the International Horticulture Congress meetings. During the fiscal year, grant projects totaling $180,747 were active.

To serve as a vital outreach tool, the blog entitled *Making Cents of Green Industry Economics* was maintained during 2010. To date, there have been 91,161 readers with 664 regular subscribers (as of 12/13/10). This weblog provides up-to-the-minute information regarding economic factors affecting Green industry businesses and the strategic responses to enhance profitability. The blog serves as a vital mechanism for communicating with key clientele and promoting TAMU horticulture. Many speaking engagements have stemmed from the exposure generated by the blog’s content. The blog is located at ellisonchair.blogspot.com. **SHINE IN '09 WEBINAR SERIES**

**Dr. Ed Hellman, Professor & Extension Specialist, Lubbock**

Dr. Ed Hellman provides statewide leadership for the Viticulture Extension and research programs, and teaches viticulture at Texas Tech University. He directs the Viticulture Extension Team comprised of four Extension Program Specialists, and the Texas Viticulture Certificate Program, a CEU-credit program collaboratively delivered by AgriLife Extension and Texas Tech University. He supervises the Certificate Program Instructor, and one Research Associate and a Technician serving the viticulture research program.

Hellman is a recognized national leader in Viticulture Extension, serving on the Board of Directors of the National Grape & Wine Initiative and its Extension and Outreach Education committee. Hellman is co-PI and a project leader for the newly created Grape Community of Practice within the national eXtension program. This activity is supported by a grant from the Specialty Crops Research Initiative. Hellman is also active in the American Society for Enology and Viticulture and the American Society for Horticultural Science.

The statewide Viticulture Extension Team collectively provides research-based information, educational programming and outreach services to the entire Texas wine industry. The Extension program works closely with industry members to identify needs and develop effective educational programs. The Viticulture Team addresses needs of varied audiences including home gardeners, prospective commercial grape growers, and experienced producers. A variety of instructional methods and media are used to address clientele needs including the Texas Winegrape Network website, the Prospective Winegrower Workshop, the Viticulture Certificate Program (80% distance-delivery), and assorted field days, workshops, tailgate meetings, on-farm research, newsletters, and site visits. Continued expansion of the Texas wine industry, with an annual
economic impact of over $1.35 Billion, has been partially attributed to the activities of the Viticulture Team. New and experienced growers have expressed that Extension programming support gave them confidence to start a new vineyard or expand an existing one. Texas has experienced more grapes planted during the past 4 years than any time in history. Specific examples of Extension programming impact on the Texas wine industry include: reduced crop losses to grape berry moth, wood canker diseases and spring frost, and rejuvenation (increased yield and enhanced quality) of largest vineyard in north Texas (19 acres).

Hellman’s viticulture research program discovers new knowledge and addresses critical issues identified by the Texas wine industry. Research efforts involve collaboration with numerous scientists and include investigation of the physiology of grapevine adaptation to climate, evaluation of grape cultivars and rootstocks, analysis of climatic and edaphic conditions of Texas winegrowing regions (“terroir”), and vineyard economics studies. Recognition of Hellman’s work on terroir led to his participation in the VIII International Terroir Symposium in Soave, Italy. Hellman’s terroir studies have led to improved vineyard site selection that should result in higher sustainable yields and enhanced fruit quality. Adaptation of a netting system for hail protection will preserve yields of vineyards in west Texas.

Dr. Kendal Hirschi, Professor

During the previous funding periods we were able to interface traditional plant biology and nutritional science. We characterized the first crop plants that had increased calcium content due to increased expression of plant calcium transporters. We then established robust methodologies to measure nutritional readouts to quantify differences among calcium bioavailability and taste components in plant-based diets. Although we used animal models to initially provide evidence related to calcium bioavailability, there are differences in the mechanism of nutrient absorption between humans and small animals. We thus concluded our studies by demonstrating increased bioavailability of our novel foods using human feeding studies. All the goals set forth in the previous grant were met. We proved we could build improved foods and assay their nutrient content. We now seek to establish improved vegetable models that are altered in calcium partitioning and suitable for more elaborate feeding studies.

During the research period, I have trained numerous undergraduate students and three graduate students. Recently, my student Sean Thompson graduated with his M.S. degree.

I have submitted a proposal to the NIH as a PI with Farzad Deyhim (from the VFIC) as a co-PI.

Our lab has published 7 research publications this year and several book chapters. Students from my lab have presented their VFIC related activities at International Meetings in Australia and Mexico. My VFIC students received grants from the National Science Foundation to attend the meeting in Mexico.
I have served on the organizing committee of several international meetings this year and am on
the editorial board for The Journal of Biological Chemistry (which remains the most highly cited
journal in science). I also serve on the American Society of Plant Biologists Dennis R. Hoagland
Award Committee. This award, to be made not more frequently than triennially, is for
outstanding plant research in support of agriculture.

Dr. G.K. Jayaprakasha, Research Assistant Professor

I am involved in the separation and characterization of bioactive components from fruits and
vegetables. In continuation of my research, different bioactive compounds were isolated by
various chromatographic techniques. Four bioactive coumarins were isolated from Poncirus
 trifoliata for the first time. These results may be useful for citrus industries for exploring new
biological and commercial applications. In addition, our group has isolated several compounds
from grapefruits and lemons. Two compounds were found to be novel. I have completed different
citrus, pepper, carrots and melon purified compounds for the structural identification. In addition,
several samples from citrus, carrots, peppers and watermelon were analyzed by GC-MS.

During the above research period, I have trained four undergraduate students and co-supervised
six graduate students, for the partial fulfillment of their ongoing research projects.

I have submitted one proposal to The American Society of Pharmacognosy as a PI, three
proposals as PI for USDA Sp. Grants. Two more proposals submitted to CIPRT and NIH as Co-
PI.

I have published two prior reviewed articles as a corresponding author, co-authored in 6 papers,
four oral presentations at conferences and Institution. Presided General Papers, at 239th ACS
American chemical Society meeting at Boston, Aug. 22-26, 2010. In addition, I am working as
Chair-Elect, Subdivision of Functional Foods and Natural Products, Agricultural & Food
Chemistry, American Chemical Society.

Serving as editorial board member for “International Journal of Applied Research in
Natural Products” http://healthy-synergies.com/editorialboard.aspx and The Open
Bioactive Compounds, Bentnum Publisher, http://www.bentham.org/open/tobcj/EBM.htm
Floral Design is both an art form and a viable commercial career in the USA. Both aspects of floristry are addressed in the Benz program at Texas A&M, the only university worldwide to have an Endowed Chair in Floral Design, which helps fund the floral program. Many of our graduates become successful florists, community leaders, and leaders in the floral industry – such as President of the Texas State Florists’ Association.

As evidence of worldwide impact, the Benz School of Floral Design has entered (by request) South Korea. We have four levels of coursework translated and taught in Korea in a year-long program. I go to Seoul three times a year to train the teachers and test their students. This program is in its first year and it is going well. There have been 123 graduates from the first two courses.

Specific Impacts of the Benz School are as follows:

**Academic** – Texas A&M Benz School of Floral Design teaches that floral design is based on the same elements and principles as architecture, landscape architecture and fine art. This philosophy promoted by Buddy Benz, gives legitimacy beyond craftsmanship.

**Educational** –

Local/Campus - Floral Design is offered on two levels: BA and BS degrees in Horticulture and Continuing Education. In the degree program classes, each semester I interact with:
-100 undergraduates in four courses
-20+ students weekly in floral design club meetings – these students get “real-world” experience by making and delivering floral designs for campus departments and organizations
-Chair 2 graduate student committees, emphasizing floral design
-Member of 1 graduate student committee, Psychology Dept.

State and Regional – Continuing Education
-100 students in 3 two-week classes and three 2-day classes, international attendance
-Benz School material is taught in NC, KY, LA and other states’ florist certification programs
-I host the annual “Survival of the Creative Mind” conference in NM, international attendance
-Student exchange connections in Germany
-Four levels of continuing education classes - 123 student graduates from first two levels
**Economic** – The world’s only Endowed Chair in Floral Design (the Benz Chair here at Texas A&M) helps to fund my salary and other aspects of the program such as the Benz Gallery of Floral Art.

**Social** – interaction with people all over the world lends exposure and prestige to the students, the department and the university.

**Environmental** – the Benz School works hand-in-hand with the National Garden Clubs Inc. and the Garden Clubs of America in protecting the environment in co-hosting classes and workshops.

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**Jim Kamas, Assistant Professor &
Extension Specialist, Fredericksburg**

The Texas AgriLife Extension Pomology & Viticulture Extension Outreach Program in Fredericksburg continues to impact the lives of commercial fruit growers and homeowners through increased farm profitability and quality of life. As Extension Outreach Coordinator of the Texas Pierce’s Disease Research and Education Program I plan, coordinate and implement pertinent applied research that has developed sound Pierce's disease management strategies for moderate and low risk grape production areas. Those strategies are delivered through newsletters, web content, presentations at extension and industry educational events, as well as one-on-one consultations. Variety trials have been initiated that will offer new high quality varietal options for grape growers in high disease risk areas. The 2010 release of 'Victoria Red' will greatly impact commercial and home grape production across the Gulf Coast regions of the United States. In addition, in a collaborative effort with plant pathologists, new research has been initiated that appears to be leading to a practical, economical and environmentally sound bio-control for this disease.

The Fredericksburg effort also continues to work with both commercial and home producers of perennial temperate tree fruit. Educational efforts continue to be coordinated with state and local grower organizations as well as through county-based extension programming. The establishment of a sustainable fruit crops evaluation block in Fredericksburg has been well received by both commercial and private fruit growers. The pomegranate evaluation block at this site will evaluate the production and fruit quality potential of twenty three novel varieties as well as provide a benchmark for varietal cold hardiness. Seven new blackberry advanced selections have been established and three promising primocane-fruiting selections will offer extended production potential for growers well into the fall. Forty two fig varieties as well as twelve pear varieties are also being evaluated for production and quality potential. These fruit selections are being grown without insecticide inputs, only organic fungicides and to date have received no commercial sources of nitrogen. This effort has elevated AgriLife Extension’s visibility within the green, organic and sustainable agriculture community across the state.
Matthew Kent, Assistant Lecturer, Safety Officer, & Building Proctor

I taught Hort 201, *Horticulture Science and Practices*, Hort 202, *Horticulture Science and Practices Laboratory*, Hort 309, *Interior Plants*, and Hort 485, *Directed Studies*. Hort 201, as a summer offering with 34 students enrolled, was almost 100% non-majors. Hort 202, with an enrollment of 90 students per semester, also serves many non-majors. Hort 309, taught for the first time in '09 to primarily majors (18 students), attracted 5 non-majors this year. Renovations to the Floriculture Greenhouse on main campus have been instrumental to the success of the Hort 309 lab, and the HFSB atrium will be incorporated as an *Interior Plants* teaching resource in Fall '11. Experiential learning through plant installation projects on campus have continued to be vital to the student learning process.

Our connections to the interior landscape industry have broadened. Students enjoyed presentations by local (Kathy Martine, Green Teams, Bryan TX) and state industry (Michael and Joshua Senneff, President & CEO, Plant Interscapes, San Antonio, TX; ranked 7th nationally, annual revenue $8M) representatives. Plant Interscapes has shown interest in supporting research into subirrigation for exterior container use in Central Texas, green wall technology for interiors, and continuing education for interior plant technicians. Plant Interscapes has also, for the first time, offered a mini-internship to one of our students. Additionally, we have been contacted by prominent national interiorscape mogul David Liu (President, Foliage Design Systems, Orlando, FL; ranked 2nd nationally, annual revenue $37M) on the role of contemporary scientific light measurement technologies and their impact on interior landscaping and architecture. Mr. Liu has expressed the need for dissemination of this information to the industry.

Kent continued to serve as Departmental Safety Officer. These duties encompassed Work Area Chemical Inventory (online inventory), department-wide Research-Lab Inspections, Fire and Life Safety Inspection (and drills), Teaching-Lab Safety Program oversight, AED program oversight, and a continued Pesticide Licensing Program, started in '09. The departmental fume/perchloric acid hood update has moved into the demolition/installation phase following hood inspections (with Alvin Walker, EHSD) and asbestos abatement inspection (with Chandini Revana, EHSD).

Dr. Steve King, Associate Professor

The primary goal of the watermelon breeding program at Texas A&M University is to train young scientists in the field of plant breeding. This goal is achieved by developing a world-class
breeding program focused on developing innovative genetics to deliver to the growers of Texas and the world through seed companies that support the research efforts at the Vegetable & Fruit Improvement Center and the Department of Horticultural Sciences. The program strives to strike a balance between basic research in the lab, more applied research in the field, and continuous consulting with growers, other researchers and the industry. An effective balance will ensure that any discoveries made in the lab will have an application in the field and be of benefit to the growers and industry that we support. We will strive to stay abreast of the whole vegetable industry in Texas and adapt to changes as they occur.

So far we have delivered a better understanding of the carotenoid pathway in watermelon and have developed a molecular marker to distinguish between red and canary yellow flesh watermelon. We believe this marker is actually attached to the key gene in the carotenoid pathway that causes watermelon to either accumulate lycopene, or other downstream carotenoids. This information has confirmed that the published literature is incorrect which reports that there are two genes distinguishing these two flesh colors. We have also recently discovered a new phenotype in watermelon which we are calling “pale yellow” to distinguish it from white flesh. We believe that previous studies on flesh color in watermelon erred because they used visual color ratings instead of biochemical profiles to classify their phenotypes. Visual color ratings are subject to bias and are heavily influenced by the environment. Our biochemical profiles are less subject to the environment and help us ensure that our findings are valid. In fact, a recent correspondence from a major seed company informed us that our molecular marker for flesh color was the first published marker they have used in watermelon that actually works. We have established a watermelon grafting protocol in our lab and have several publications on grafting. We plan to continue our grafting projects to increase our understanding of the advantages and disadvantages of grafting so growers will know when it may be useful and when it may be a waste of time and money. We have discovered a new rootstock that can improve cold tolerance of watermelon allowing growers to plant much earlier than they currently can which will allow Texas growers to expand their marketing window by at least several weeks. We also have a new elongated mini watermelon soon to be released that has been trialed with growers in Texas. One grower who operates a CSA is excited about this new variety for his niche market and plans to increase his production of this variety as it has many unique features not available in current commercial varieties. We also believe this unique variety will be of benefit as a pollinator for mini seedless watermelons as it has a unique shape that will help distinguish it from the triploid varieties when harvested in the field.

Dr. Patricia Klein, Associate Professor

My research focuses on developing the genomic tools and resources in cereal crops to enable us to map base clone genes of economic/agronomic importance, to understand the underlying mechanisms that plants use to withstand abiotic stress (particularly drought stress), and to aid in the development of plant feedstocks for the emerging cellulosic biofuels industry. World
population is now over 6 billion and is projected to increase to ~10 billion before peaking between 2025 and 2050. In addition, the increasing cost of energy and dependence on imported oil, and finite oil and gas reserves has created a national need to improve U.S. energy production and specifically biofuels from biomass. To meet these needs, crop productivity must increase significantly on current agricultural land while preserving habitat for wildlife. Fortunately, there is good evidence that crop productivity can be increased through genetic improvement. Average yields of most U.S. crops are 3 to 4-fold lower than record yields, primarily due to abiotic constraints, especially drought and nutrient limitation, preventing plants from achieving higher productivity and reaching their full genetic potential. Therefore, U.S. agricultural productivity and the world’s food, feed, and biofuels needs could be improved if genes and alleles that ameliorate the impact of abiotic constraints on productivity are identified and incorporated into crops together with genes for durable pest resistance. Therefore, my research is aimed at obtaining the knowledge and developing the tools needed to identify the network of genes that condition crop adaptation to harsh environments and to use this information to advance the understanding of the genetic and biochemical basis of sorghum biomass generation in marginal environments. A major focus of my research has been in the development of genomic tools and resources for sorghum, a model C4 cereal grass. My group in collaboration with others has built an integrated genetic, physical, cytogenetic and comparative map of the sorghum genome, participated in an in-depth EST sequencing project, and helped develop microarray and RT-PCR technology for the analysis of gene expression in response to biotic and osmotic stress. Since initiating this work in late 1997, I have collaborated in publishing 43 peer-reviewed articles to date and this work has been cited over 800 times. In recent years, my lab has been collaborating with other TAMU scientists on the development of sorghum as a biofuel feedstock. My lab has been instrumental in developing markers for traits such as flowering time, height and anthracnose resistance for use in a marker-assisted breeding program. The markers that we have developed and deployed in the breeding program have been more than 99% effective in identifying materials that should be culled out of the bioenergy breeding program as they will flower too early to develop high biomass yields. This has led to a significant reduction in time and labor for the sorghum breeding program as these materials no longer have to be test-crossed in subsequent years. During the past year we have continued our work on mapping QTL for important cereal traits as well as cloning genes of agronomic importance. We recently completed studies leading to the identification of the major maturity gene, $Ma1$ and have identified two new fertility restorer loci, $Rf2$ and $Rf5$. This past year, the patent for the aluminum tolerance gene AltSB was awarded and a non-provisional patent on the use of the $Ma6/ma5$ system for production of high biomass sorghums was published. We recently submitted a provisional patent with collaborators from the Department of Employment, Economic Development and Innovation in Warwick Australia for the stay green 1 and 2 loci in sorghum that are involved in post anthesis drought tolerance. My research findings have contributed to the field of comparative and evolutionary genomics, and the genomic resources that we have developed are being used by a number of sorghum researchers around the U.S. and the world to further their own research programs. The information that we are generating on sorghum’s abiotic stress tolerance is providing valuable information on how this cereal has evolved strategies to tolerate water-limited environments. Finally, the integration of our research on abiotic stress tolerance and flowering time will be used to aid in the development of sorghum hybrids that produce high yield biomass for the biofuels industry.

My research program is committed to diversity, internationalism and collaboration. I have graduated two Ph.D. students, one through the Molecular and Environmental Plant Sciences program and the other through the Plant Breeding program. I have also trained seven post-doctoral scientists from numerous countries including Chile, Germany, India, China, Korea, and the U.S. I have participated in several international collaborations with scientists from France, Switzerland, Australia and Brazil. Currently international collaborations include those with Drs.
David Jordan, Andrew Borrell, and Emma Mace with the Department of Employment, Economic Development and Innovation in Australia and Dr. Jura Magalhaes from EMBRAPA Maize and Sorghum in Brazil. I am part of a sorghum genomics and breeding team that is composed of scientists from several departments at Texas A & M including John Mullet (Biochemistry), and Bill Rooney and David Stelly (Soil and Crop Sciences). In addition, I have ongoing collaborations with Heather Wilkinson and Chuck Kenerley (Plant Pathology) and David Dahl (Statistics). I also collaborate with scientists from the USDA-ARS including Robert Klein and LJ Grauke (College Station, TX) and Doreen Ware (Cold Spring Harbor, NY).

Dr. Hisashi Koiwa, Associate Professor

Our research focuses on the mechanisms that connect basic biology of plants and salt/osmotic stress tolerance of plants. It has been estimated that up to 70% of annual crop yield is lost because of various abiotic stresses. Transcription of stress tolerance determinant genes is a key process for mounting acquired tolerance. Unexpectedly, the process that regulates general transcription is a pivotal regulatory mechanism of expression of such determinant genes. Our research also discovered potential link between osmotic stress response and iron nutrition.

The outcome of our research will help designing more effective biotechnology strategies that involve gene expression and improve the nutritional quality of plants. One of such effort is initiated to design molecular switch to amplify gene expression during osmotic stress using a combination of a stress-inducible promoter, transcription factors and a mutant that is altered for general transcription machinery. Furthermore, our new finding indicated enhanced gene expression of iron acquisition pathway in cpl1. This will be further explored in our research.

Another unexpected regulation of plant salt/osmotic stress response operates at post-translational N-glycosylation of proteins. Complex N-glycans that are synthesized in the Golgi determine salt/osmotic stress tolerance of root growth. Furthermore, we found that N-glycan modification regulates cellulose biosynthesis pathway. A cell-wall–based osmotic stress tolerance determinant, KORRIGAN1, was identified and its mode of function is under investigation. Collaboration of N-glycan and disease resistance has been initiated to determine additional function of plant N-glycan.

Casey L. Krueger, Lecturer

The Landscape Industry has continued to increase in the past six years. The Horticulture Department has seen an increase in demand for qualified individuals to fill these positions in the
landscape industry. With this growing demand, there has been a 26 percent increase in the
number of students participating in the landscape horticulture classes.

The Department has increased the number of classes in this growing interest area and is
constantly revising teaching methods and techniques taught each year to match that of the
industry. Through participation with industry professionals the Horticulture Department is
reshaping the curriculum to better prepare students for the landscape industry job market. The
department has also taken an interest in PLANET (Professional Landcare Network) to promote
student-industry relations at Texas A&M University. Several classes have been added to the
curriculum to better prepare students for these trends. These efforts are essential to the
department in the development of the new Bachelor of Arts degree program.

Dr. R. Daniel Lineberger, Professor,
Associate Department Head

Mentoring Undergraduate Researchers
The processes of micropropagation and plant tissue culture represent compelling systems for
undergraduate research projects. Techniques are fairly easy to learn for the students, but the
range of morphological and physiological responses exhibited by the tissues present powerful
glimpses into the nature of plants responses to the physical and chemical environment in which
they grow. Since he completed his undergraduate thesis last year, Kah-Yat Isaac Wong has
assisted me in directing two undergraduate research projects in the lab. Jake Ueckert (now a
graduate student working with Dr. David Byrne) completed a project on micropropagation of
Lagerstroemia ‘McFadden’s Dwarf Pinkie’ and Kathryn Harvey completed a project on
somaclonal variation in ‘Laura Bush’ petunias. Both wrote an ASHS-style final paper, and
Kathryn placed second in the ACB oral paper contest at the national ASHS meeting. The
outcome of Jake’s project was that approximately 1,000 liners of ‘McFadden’s Dwarf Pinkie’
crapemyrtle were shipped to Larry Stein and Jerry Parsons to facilitate evaluation and eventual
release of this outstanding ornamental selection.

Revision of the Departmental Website, HortSciences.tamu.edu
Departments were directed in May, 2010 to reformat their Websites to fit into the design template
of the Agrilife program. In this template, College, Agrilife Extension, and Agrilife Research
share common design elements and overall appearance. In anticipation of an eventual directive to
house departmental Websites on Agrilife Program servers, I elected to move the HortSciences
Website to the Wordpress content management system hosted by Martin Anderson since
Wordpress is one option on the Agrilife Program servers. Transfer to the Agrilife servers can be
effected by moving an archival copy of our Website when that time comes resulting in a
considerable savings in labor.

An additional benefit of the transition to the content management system was the installation of
Google Analytics as a means to determine user accesses. Since the new system was implemented
in November, the site has logged 7,634 user visits from 3,291 unique visitors. This resulted in
21,872 pageviews (Google Analytics data for November 4 – December 10, 2010).
Impacts of Teaching
As reported last year, I have devoted considerable attention in both my undergraduate courses, HORT 225 and 481, to assist students in the preparation of professional-quality electronic portfolios. Students have access to outstanding resources for the preparation and serving of individual personal Websites through the Open Access Labs, and this enables them to create and serve comprehensive portfolios that will assist them in gaining proficiency in computer and communication skills as well as creating resources to assist in job placement. In addition to the student benefits of the portfolio requirement, the assessment committee has incorporated portfolio review as an important element of our outcomes assessment program. During the current year, a common template was prepared for the portfolios and stronger emphasis was placed on the expectation for reflective writing.

As a result of our use of portfolios in assessment, I was invited to co-present a workshop at the 2011 Assessment Conference to review the development of our departmental assessment plan and the role that portfolios play in it.

I developed a proposal for HORT 481 to be a C (communication-intensive) course and it was approved. HORT 481 can now meet the second writing requirement for our students. I have developed and submitted a proposal to re-certify HORT 225 as a W (writing-intensive) course.

Impacts of Club Advising
The TAMU Horticulture Club is an important part of the undergraduate experience for many of our students. I co-advise the club with Dr. Leo Lombardini. In addition to a very strong local program that includes industry interaction, service activities, and fund raising events, the TAMU Horticulture Club continues to dominate the regional and national judging competitions (winning both the Southern Region contest in Orlando and the national contest in Desert Palms, CA) and taking the first place club award at the national level. Several of our students serve as regional and national ACB officers.

Dr. Leo Lombardini, Associate Professor

Pecan is the most valuable nut tree that is native to North America and has been grown for centuries for its edible nuts and timber. Today, pecans have an annual value worth about $60 million in Texas alone and about $300 million for the entire country. Despite these impressive statistics, pecan is a ‘young’ crop which has been cultivated for only approximately one and a half century. Many aspects of pecan growth, development, cultivation, post-harvest handling, and health attributes are only partially known and understood.

Cultivation
Tree crowding is a phenomenon that pecan growers have to face during their production cycle. Crowding induces reduction in number of flowers, productivity, percent kernel and it has been indicated as one of the possible causes for increase in alternate bearing. Nitrogen application is another essential horticultural practice for optimal tree growth and profitable pecan production. Recommended rates are between 250 and 400 lbs/acre of effective nitrogen per growing season,
but it is not rare to find growers that over fertilize their orchards by applying as much as 800 lbs. Trials were established in commercial orchards in different regions of Texas to investigate different approaches to minimize the negative effects caused on yield by tree crowding. Trials focused on timing, intensity and frequency of hedging. Additional trials focus on regulating pollination and fruit set. A field experiment is currently underway to investigate the consequences of different nitrogen rates on root development and tree health and performance. A few growers have started adopting the recommendations which derived from our investigations. For example, we have proved that summer hedging should not be applied and that winter hedging is worthwhile only if applied on a yearly or biennial basis. The results of the nitrogen investigation will provide essential preliminary information for more targeted and efficient nitrogen applications for pecan cultivation, thus reducing costs and nitrogen waste into the environment.

**Physiology**

Understanding canopy and root physiology of pecan trees can help maximize efficiency in carbon assimilation, nutrient uptake, responses under stress conditions, etc. Studies have been and will be conducted to investigate the physiological (gas exchange, responses to light, nutrient uptake, etc.) and morphological (root growth, stomatal and trichome density, etc.) characteristics in selected provenances and genotypes. Results from our studies will be very important to improve management practices, especially those aiming at reducing the amount of inputs (fertilizers, water) necessary to produce this crop.

**Health properties**

Nuts and small fruits have received particular attention because of their high content in phytochemicals. Pecans and other nuts are particularly rich in phytounsaturated fatty acids, vitamins, phenolics, minerals, and fibers. The research we are conducting on the nutritional properties of pecans is significant because it is expected to increase the value, marketability and profitability of pecans. Organizations of pecan producers (Texas Pecan Growers Association, Texas Pecan Board, and Salopek Foundation) and distributors (National Pecan Shellers Association) are very interested in our research. Their interest has resulted in invitations to present results at their annual conferences and in providing additional funding to continue the research.

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**Dr. Joe Masabni, Assistant Professor & Extension Specialist**

As the Extension vegetable specialist, I am leading a program with five focus areas, namely, produce safety, conventional commercial vegetable production, small-acreage vegetable production, organic vegetable production, and Master Gardener Specialist training. Activities with produce safety included co-chairing of a multi-disciplinary taskforce, participating in a college-level food safety taskforce, presenting 4 workshops, publishing a training curriculum (B-6244), and designing a website to include an iPhone app for sale. Activities with traditional commercial vegetable production include cultivar trials such as a watermelon cultivar trial; grafted tomato and grafted watermelon trials; Earth-Kind variety
evaluations; raised bed research; and field evaluations of new herbicides for pepper, squash, and watermelon. The results were used in training Extension agents through development of educational programs and through presentation of educational programs to commercial producers and regional meetings such as SR-ASHS. I participated in 12 educational conferences for commercial and small-acreage vegetable producers, such as the Blackland Vegetable Short Course in Williamson Co.; Vegetable Conference in Fort Bend Co.; and the East Texas Vegetable Conference in Smith Co., to name a few, resulting in 1,151 contacts and 2,899 contact-hours.

My program activities with small-acreage vegetable producers include the development of a ‘Small-Acreage Horticultural Crops’ output and outcome plan for use by County Extension agents. Two online webinars were delivered to about 400 producers on vegetables, high tunnels, and production economics. An average of $240 per producer were reported as anticipated savings after learning the material presented. In addition to 27 farm visits in 2010, I have supported the programs of Extension agents through participation in field days or workshops on small-acreage organic or commercial farms. I am also a co-chair of a ‘Produce Food Safety’ and ‘Organic Production’ initiative at the college level. An ‘organic production’ website encompassing cross-disciplines and cross-departments is currently finalized. I was invited to present vegetable production classes at 10 Master Gardener classes reaching about 466 clients and 1,866 contact hours. In addition, I have developed one 2-day workshop for Master Gardeners wishing to become certified as Vegetable Specialists, with a goal of ‘training the trainers’. These Master Gardeners provided hundreds of hours of volunteer service to educate the public in home vegetable production. Two workshops were planned for 2010, but only one was held. Finally, I have launched a ‘vegetable variety selector’ website which maintains a centrally-located master list of recommended vegetable cultivars for use by all Texas counties.

I have revised 37 Easy Gardening extension publications, 18 of which are currently available online at AgriLife Bookstore. I have updated 2 additional publications for organic and commercial vegetable producers, sold for $10 each at AgriLife Bookstore. Finally, a self-taught online course (Tomato 101) was launched in 2010 and is available for sale at $10. This online course is accessed by about 6-10 participants per month.

Dr. George Ray McEachern, Visiting Professor

Viticulture and Small Fruits HORT 410 was taught in Sprint 2010 with 49 students participating in class lecture, term papers, and field work including vineyard pruning, shoot thinning, VSP shoot positioning, leaf pruning, and harvest. Concepts in Wine Production HORT 420 was taught in SSII and Fall 2010 with 26 students in each class.

Pecan orchards on the TAMU Experiment Station at the Brazos River Plantation were managed for tree and production revitalization. Five orchards include; the 60 year old Brison block with 10 acres, the 50 year old Adriance block with 20 acres, the 25 year old Storey block with 10 acres, the 7 year old Grafted block with 2 acres, and the one year old Seedling block with 14
acres. The Brison block with a 100 x 100 foot spacing of very large trees is in good shape. The Storey block received tree thinning, stump removal, irrigation repair, lower limb pruning, and stump shoot grafting. The Adriance block has received limited reconstruction; however, major limb pruning, brush removal, poison ivy control, and burn pile work was conducted. The Adriance block will be the last major rebuilding challenge and remains as future work. The Grafted block is in good shape. The Seedling block received a new sprinkler irrigation system with one head for each of 420 trees. Establishment was a success with 95% young tree survival. All blocks received at least 8 foliar zinc and nitrogen sprays. Irrigation was used on the three blocks with working systems. The young Seedling block trees received 9 surface applied applications of granular nitrogen fertilizer. Weeds and grass were controlled with three applications of ROUNDUP herbicide. Two harvests were conducted on the bearing trees; September and November. The Horticulture Club sold the crop for $13,000 with 5% for their use. The second harvest was sold wholesale for $4,000. Halley Hannah continues to conduct nitrogen / root distribution research in the Seedling block. Five students and one part time worker were hired to conduct the pruning, irrigation installation, weed control, fertilization, and harvesting operations. Funding for the Pecan Orchard Revitalization was from the Salopek Foundation of Las Cruces, NM and Mr. Wiley Hatcher of Richmond, Texas. Distribution of funds were 50% salary, 25% production costs, and 25% equipment purchase and repair.

Hill Farm Irrigation Pond construction was conducted with funds from the Houston Chapter of the KNIGHTS OF THE VINE and consultation, technical support, and surveying from Mr. Wiley Hatcher of Richmond, Texas.

**Dr. J. Creighton Miller, Professor**

Twelve improved varieties have been developed/co-developed and/or released from the Texas Potato Breeding and Variety Development Program. Virtually all of the russet potatoes grown in Texas in 2010 were to the improved Texas Russet Norkotah strains. When this program was initiated in 1973, the average yield of the summer crop in Texas was about 200 Cwt/A. In 2009 the average summer crop yield in Texas was reported to be 465 Cwt/A, the highest in the nation among 11 states with summer crop production. In addition, the farm gate value of the crop has grown from less than $20 million to about $85 million with an annual economic impact to the state estimated to exceed $215 million.

Of all varieties released over the past 15 years by the 12 potato breeding programs in the U.S., those developed by the Southwest Project, which includes the Texas program, rank second nationally in total acreage approved for seed certification in 2010.

As a point of interest, the FAL recently listed potato as the third most important food crop (replacing maize) worldwide, behind wheat and rice. This underscores the significance of a continued effort by TAMU AgriLife research with this important crop.
Monte L. Nesbitt, Extension Program Specialist

Pecans, citrus and other fruit crops are important to the economy and sociology of Texas. Texas is the nation’s second leading state in pecan production and the largest state for pecan tree acreage, holding approximately one third of the acreage, farms, and trees in the U.S. Texas is also third nationally in citrus production with approximately 27,000 acres of trees and 560 million pounds annual production. Other important fruit crops in the state include peaches (6,000 acres) and grapes (4,000 acres in 2007), and there is strong state-wide interest in these important commercial crops as well as emerging crops, such as pomegranates and blackberries. The operating budget for this position was supported in 2010 by unrestricted gifts from Texas Pecan Growers Association and Texas Fruit Growers Association.

My work in 2010 encompassed a very visible educational program to meet the broad demand for information on culture of fruits and nuts in Texas and abroad. I gave 52 presentations during the year which were attended by 2,876 people, including 78 AgriLife extension agents. The presentations given include 34 different titles and were delivered in 21 different counties of Texas. I was an invited speaker for three pecan growers conferences or shortcourses in Alabama and New Mexico. Education was also provided to pecan growers throughout the U.S. by publishing five (5) articles in Pecan South magazine, an important trade publication with 4,400 subscribers. Two powerpoint presentations were made available to pecan growers on two industry websites (TPGA and Texas Pecan Board). Five interviews were given to online/print newspapers, including two with The Dallas Morning News, which has a print circulation of 264,000.

The citrus industry in Texas faces an imminent destructive threat from citrus greening disease, which has been detected in Florida and Mexico. Texas AgriLife Extension received funding from USDA-APHIS for outreach and education efforts to increase the capacity of stakeholders to assist in prevention. Funds from this grant were directed to Extension Horticulture for creating a Master Gardener citriculture specialist training. As Co-investigator on the grant, I organized and coordinated two training workshops that were completed by sixty-one (61) Master Gardeners and seven (7) ANR extension agents.

The Master Gardeners were effectively educated in the area of citrus greening, their knowledge gain measured at greater than 80% in the area of citrus disease identification, greater than 90% in the area of citrus insect identification and greater than 90% in the area of quarantines and the Texas budwood program. These volunteers then conducted a survey of citrus plants in their 23 counties of residence, resulting in zero detection. Trained volunteers also conducted educational programs on citrus greening through numerous public events, including plant sales, clinics, garden club talks, and newsletters. These Master Gardener specialists have the capability to deliver educational programs on citrus, to screen and survey plants, and to communicate changes to the threat level of emerging citrus diseases in the future that will provide ongoing value to the state of Texas.
Dr. Joe Novak, Senior Lecturer

Hort 301 - Garden Science and Hort 335 - Sociohorticulture have been adapted to become significant courses in the new Bachelor of Arts degree program in the Department and both courses attract a significant number of non-majors, some of whom transfer to become majors in our department.

Development of the Holistic Teaching Garden has had a significant impact on the programs in the Horticulture Department. The Holistic Teaching Garden introduces students and all who visit it to the restorative value of nature, to the garden as a place and a process which help reduce physical and mental stress and fatigue. In the Holistic Teaching Garden emphasis is on the garden as an ecosystem and its relationship to the larger, natural ecosystem. The Holistic Teaching Garden is accessible to all, regardless of physical abilities. The Holistic Teaching Garden is a working model for others to observe and to adopt ideas that they believe are appropriate for their institutional or private gardens. It has become an "incubator" for projects in Brazos County and around the state.

Over 800 students do projects in the Holistic Teaching Garden each year and many others have less direct involvement. Courses that use the garden extensively include:

- Hort 301 - Garden Science Lecture
- Hort 302 – Garden Science
- Hort 335 – Sociohorticulture

Several other courses in horticulture, entomology, plant pathology, agricultural education and other areas use the garden for one or more activities. It has become a resource for a number of faculty who gather demonstration materials from the garden for their lectures and labs or take their students on tours in the garden. It also provides a ready source of plant materials for use in floral design workshops.

The Holistic Teaching Garden provides hands-on experience for students in other ways.

- eight to ten student workers gain experiential education while working in the garden
- students in undergraduate research courses use the garden and greenhouse
- students on garden-related scholarships use the garden to do the projects required by their scholarship donors
- the new student volunteer program offers students from any major an opportunity to participate in maintenance and development of the Holistic Teaching Garden

Over 1500 persons participate in organized tours and workshops conducted at the Holistic Teaching Garden and some use it for resource materials for their programs. Many others visit the garden on weekends.

- master gardeners
- Texas Junior Master Gardeners
- garden clubs
- students in other courses at TAMU
- school children
- teachers from public and private schools
Workshops conducted or planned (some in conjunction with Brazos County Master Gardeners) include:

- Organic Gardening
- Basic Garden Techniques
- Fruits and Vegetables in the Home Garden
- Horticultural Therapy
- Community Gardens
- Gardens as a Tool for Neighborhood Development
- School Gardens and Basic Garden Management for Teachers

The garden maintains an e-mail list of over a thousand addresses of persons who want information about gardening in Brazos County, want to receive copies of the garden's newsletter, the Whole Scoop, and announcements about programs and sales.

Dr. Bhimu Patil, VFIC Director & Professor

The first-of-its kind course “The Science of Foods for Health (SFFH)” was taught during the Fall 2009 semester. Interdisciplinary students from three land-grant universities-Texas A&M, Iowa State University, Ohio State University took the course. The impact of the course, multi-disciplinary and multi-state faculty role, was externally evaluated by Purdue University. Students groups also developed and presented eight content lectures. Midterm course evaluations revealed that students felt the course discussions were helpful and enhanced learning. The students also identified problems with team interactions and presentations. At the end of the course, presentations created by the students who completed the course were included in workshops for six high school teachers in Texas. The high school teachers taught the following subjects: Science, Health, Family & Consumer Sciences, Nutrition, and Agricultural Science. These teachers all taught lessons on nutrition before attending the workshop, but only 33% taught a lesson on foods. These teachers were interested in more obtaining more information about Foods for Health. They were interested in workshops (50%), lessons (83%), curriculum (50%), updates (67%), research abstracts (50%), and conferences (67%). The teachers positively commented about their experience. One teacher said, “This was a great experience! All the information was extremely beneficial!” Another teacher commented, “Terrific experience. Great info.”

A new interdisciplinary course “SFFH” was designed, implemented and evaluated as well as funded by the USDA-challenge grant. The course engaged 18 faculty in the development and testing of a new curriculum in the Science of Foods for Health. Faculty increased their teaching capacity through the collaborative project. Eighteen content lessons were developed and recorded to engage faculty in development of a curriculum in SFFH for undergraduate students majoring in a relevant field of agricultural science. Twenty-six undergraduate and graduate students increased content knowledge, improved their skills in integrating complex information from multiple scientific disciplines, and synthesized the knowledge through a technical scientific paper and a non-technical presentation. Several strategies were used to improve recruitment and retention of
undergraduate students in agricultural sciences. First, undergraduate students were taught by 18 different experts and received hands-on training with scientists in laboratories. Second, high school teachers received professional development on how to integrate the science of foods for health into the high school curriculum. Third, undergraduate students developed relationships with graduate students through their learning experiences in the course. Graduate students served as role models in helping undergraduate students see the possibilities of continuing further study in the science of foods for health. VFIC Kids program was able to provide training to approximately 257 kids and it is clear that some of these kids have changed their eating habits due to our kids program.

We have initiated collaborative human intervention clinical studies to understand grapefruit health benefits. Our research led to ten peer-reviewed publications, four editor reviewed proceedings, and seven invited international presentations and 8 national presentations. Scholarly activities include serving as an editor of the Proceedings of Acta Horticulturae 841. In 2010, Texas AgriLife recognized my scholarly activities and received Vice Chancellor Award for research Excellence (on campus). Patil’s graduate students have excelled, which is evidenced by their outstanding record of refereed publications, national and regional awards/honors, and professional presentations.

Our Center hosted several industry, academician’s tours, scientists and general public around the world. Legislators continued their support due our excellent research and educational program and scientist visits are increasing due our excellent research activities. In 2010, VFIC scientists were successful with large number peer-reviewed publications, as well as several invited presentations. In addition, scientists presented their research findings in several international, national, state, regional professional and industry meetings. Industry presentations impact the commodity groups and consumers in their decision to change lifestyle. I have chaired and/or co-chaired four major national/international conferences related to Foods for health including nomination committee chair of the Agricultural and Food Chemistry of the American Chemical Society and chaired a session during the international symposium. Served as international advisory committee member for the First workshop (WS23) "Networking the FAV and Health Networks" during the 28th International Horticulture Congress, Lisbon, Portugal. Served as a Panel Member- USDA-ARS NP306 Quality and also worked as an ad hoc reviewer.

In 2010, as a part of the TAMU footprints in India, Patil lead Texas A&M and AgriLife delegates including Dr. Ed Price and Dr. Eric Bost and visited four agriculture Universities and Indian Council of Agriculture Research administrators, Government officials, and faculty to continue the collaborative efforts between two countries and also discussed how both US and India can help other developing countries. In response to TAMU delegates trip to India, high level delegates from Govt. of Karnataka and the Vice Chancellor of University of Horticultural Sciences visited with TAMU key administrators as well as entire team of AgriLife administration to establish Center of Excellence on Foods for Health in India in collaboration with Texas A&M AgriLife and VFIC and also discussed initiating joint degree program.
Dr. Elizabeth (Betsy) Pierson, Associate Professor

Elizabeth Pierson is a member of the teaching and research faculty in the Department of Horticultural Sciences. A major focus of her research program is on understanding microbe-microbe, microbe-plant, or microbe-insect interactions in plant-associated or insect-associated biofilm communities. Ultimately, I hope the study of microbial community interactions at population and molecular levels will provide a better understanding of the control points involved in the establishment and dynamics of microbial communities, including those that cause disease or protect the host from disease on plants.

The work of my lab group has focused on the ecological significance of molecular signaling via the production of N-acyl-homoserine lactone signals (AHL’s) between bacterial populations on plant roots. This mechanism of cell-cell communication enables bacterial strains co-inhabiting plant surfaces to influence the outcome of competition by affecting the regulation of physiochemical behaviors at a genetic level. Our model system, *Pseudomonas chlororaphis* (*aureofaciens*) strain 30-84, is an effective biological control agent for wheat take-all disease caused by the fungal pathogen *Gaeumannomyces graminis* var. *tritici*. This bacterium has two quorum-sensing (QS) systems that modulate the expression of genes involved in phenazine antibiotic production, exoprotease activity, and cell surface characteristics. Expression of these genes affects the ability of our strain to survive and compete with other microorganisms (including other bacteria and fungal pathogens). We demonstrated that a subset of the bacteria inhabiting the wheat rhizosphere produce diffusible signals that positively communicate with strain 30-84 (e.g. their signals also could activate gene expression in strain 30-84). Subsequently, we discovered a small subset of the population that negatively communicate with strain 30-84 (e.g. their signals could down-regulate QS in strain 30-84). We also found that the two QS regulatory systems and the phenazine antibiotics under QS control are involved in biofilm formation by strain 30-84. These discoveries have advanced knowledge of microbial ecology and genetics and improved understanding of biological control applications.

Current work with this model system focuses on other roles of phenazines in microbial community interactions and how expression of different phenazine derivatives affects these interactions. This work is funded by USDA-NRICGP in a grant to collaborator LS Pierson. The rationale for this work stems from the notion that secondary metabolite production by beneficial plant-associated bacteria is central to plant-microbe interactions and plant health. Many secondary metabolites, classified as antibiotics, are controlled via complex sensory pathways consistent with the hypothesis that they have multiple roles. Our current work systematically tests specific hypotheses for the roles of phenazines produced by *Pseudomonas chlororaphis* strain 30-84. Phenazine derivatives are inhibitory to a range of organisms and are produced by a variety of bacteria. A fundamental question is why different strains produce different phenazines. Recently, we showed that phenazine mutants of strain 30-84 were defective in cell attachment/biofilm development. This defect was rescued by phenazine addition or genetic complementation.
Further, we found that different ratios of phenazine derivatives change biofilm architecture. Phenazines also may promote iron-acquisition. This current work seeks to identify the roles of different phenazines in the development of biofilms both in vitro and on plant roots. Specifically this work looks at 1) how changing the ratios and structures of PZs affects cell attachment and biofilm architecture; 2) whether phenazines themselves serve as molecular signals that influence biofilm development via gene expression patterns; and 3) whether phenazines are involved in iron-acquisition that benefits the bacterium and the plant. Aspects of this work were recently presented as part of an invited talk in the Special Session: The Multifactorial Basis for Plant Pathogen Suppression by Bacteria at the ASM 110th General Meeting May 23-27, 2010 in San Diego, CA and as part of an invited talk in the Special Session: More than Just Antibiotics: The Multiple Mechanisms Leading to Biological Control and Plant Growth Promotion at the APS Annual Meeting August 7-11, 2010 in Nashville, TN.

Other areas of current research in microbial ecology include our discovery of a novel mutation that bypasses the need for QS and enables phenazines to be expressed in a non-QS dependent manner in our biological control bacterium, *Pseudomonas chlororaphis* strain 30-84. This same regulatory gene exists in a number of interesting pseudomonads including the human pathogen *Pseudomonas aeruginosa*, where it regulates the production of the phenazine, pyocyanin. This work is funded by the National Science Foundation in a grant to collaborator LS Pierson and EA Pierson. Our research utilizes these two well-characterized systems: the plant commensal *P. chlororaphis*, a model for plant disease control, and the plant pathogen *P. aeruginosa*, a model system for genomic and proteomic research. We hypothesize that RpeA/RpeB negatively regulates phenazine production and that inactivation of RpeA/RpeB eliminates the requirement for QS and increases phenazine production regardless of nutritional inputs. Under low nutrient conditions, the presence of a functional \( rpeA \) blocks phenazine expression even when sufficient QS signals accumulate. The overall goal of this proposal is to understand the linkage between the sensory networks, used by many host-associated bacteria, to modulate phenazine production in response to environmental and population signals.

Previously, we participated in a *Pseudomonas* sequencing project funded as part of the FY 2000 Microbial Genome Initiative (USDA/NSF). This project was a collaborative effort between researchers at the USDA-ARS in Corvallis, OR and Pullman, WA, Oregon State University, the University of Arizona, and The Institute for Genomic Research and resulted in the publication of the genome sequence of *Pseudomonas fluorescens* strain Pf-5. Continuing work by the collaborative group includes the sequencing of multiple *Pseudomonas* biological control strains including *P. chlororaphis* strain 30-84.

A new area of research focuses on the potato zebra chip disease, which is causing significant economic impact on potato growers in Texas and elsewhere in the world. This work is currently funded by the Texas Department of Agriculture as part of the Texas AgriLife Research Zebra Chip Disease Program in a grant to EA Pierson and collaborator Dennis Gross. The objectives of this project are to develop simple, accurate, and inexpensive methods for species-specific detection, localization, and visualization of the ZC pathogen in the host and vector. Accurate pathogen detection is essential for developing strategies useful to growers that will help forecast the presence of the pathogen and improve control strategies to reduce costs. Comparison of pathogen translocation and localization in susceptible vs. tolerant cultivars of commercial potatoes will be useful for identifying plant host characteristics that limit systemic infection and may lead to the identification of selectable markers for improving potato resistance. This work was recently presented at the Zebra Chip Annual Conference Proceedings November 7-10, 2010 in Dallas, TX.
Dr. David Wm. Reed, Professor

In teaching, Dr. Reed has developed the beginning undergraduate horticulture course into one of the most popular and respected science core courses in the university. Over the past 30 years, Dr. Reed has taught over 15,000 students. At the graduate level, his course on applied physiology of horticultural crops has received similar recognition as evidenced by requests to teach it in Sri Lanka and Mexico. The excellence of Dr. Reed’s teaching has been recognized by having received virtually every teaching award given by his college, university, and regional and national scientific society. In 2008, he was appointed Associate Dean for Graduate Programs and Faculty Development.

In service, Dr. Reed has served as Interim Head on 4 occasions, served as President and Secretary-Treasurer of his regional scientific society, written a widely utilized text for greenhouse growers, and presented over 100 talks at grower and producer conferences, trade shows and educational meetings. He has been elected to serve on the American Society for Horticultural Sciences Board of Directors as Vice President for Education.

Dr. Julian Sauls, Professor & Extension Specialist, Weslaco

As the sole member of the Horticulture Department with the expertise and responsibility for Extension programs in citrus and subtropical fruits, I provide technical advice to Extension colleagues, county Extension agents, growers, homeowners, industry representatives, allied industry personnel, administration, government agencies, and the media in all aspects of citrus production in Texas, including cultural and production practices, pest and disease identification and management, and economic and marketing issues. Because of my expertise and years of service to the industry, I am a key contact for growers and industry representatives from other citrus-producing states and areas looking for information about Texas citrus and how our systems might be adapted to other areas.
The Citrus Directory, which I developed and maintain, of the Aggie-Horticulture website averaged 34,200 user sessions per month during 2010. Urban clientele are the primary users of this information, but a surprising number of growers and colleagues in Texas and other citrus-producing areas regularly access the information. While many believe that citrus in Texas is primarily a Valley or Gulf Coast commodity, citrus trees have been documented in at least 110 counties across the state.

I work closely with colleagues at the TAMU-K Citrus Center and with the industry to provide the most current information possible. I have long been involved in the citrus budwood certification program to assure that all Texas citrus trees are grown from budwood sources that are free of diseases and are true-to-type horticulturally. In addition, I am actively involved in the overall educational and regulatory efforts of local industry, state and federal personnel to try to prevent Huanglongbing (citrus greening)—and other serious diseases such as canker, tristeza, variegated chlorosis, citrus black spot and leprosis—from being introduced into Texas.

During 2010, more so than the prior year, the bulk of my work has been in the HLB/ACP program. Because of Citrus Health Response Program funding to Extension from USDA, Extension organized and conducted a number of public outreach events to educate the public regarding this disease. I personally provided training on citrus greening to 601 growers and Master Gardeners in nine different group meetings, responded to 190 different agent requests for information on the disease and responded to 456 different requests directly from clientele about the disease. In addition, I spent four days in Florida taking pictures of citrus greening, citrus canker and citrus black spot, as well as learned how Florida professionals scout groves for the disease and how some growers are using nutritional sprays to prolong the productive life of greening infected trees.

I supported an area-wide ACP control spray in late January, 2010, and again in November, 2010, to reduce overwintering vector numbers. In the January effort, 58 percent of all groves were sprayed, with 84 percent participation in November. Another application will be conducted in January-February, 2011. I published a comprehensive compilation of various symptoms of citrus that could be confused with HLB, as well as those due to HLB on [www.texascitrusgreening.org](http://www.texascitrusgreening.org), but was unable to determine user numbers for this website. I continue to publicize the latest information on the spread of HLB in the US and in Mexico, as well as the efforts of the various state and federal agencies in intercepting citrus plant materials and insects at national ports of entry and within the state.

I also prepared a Camtasia/PowerPoint web-based module on citrus greening for use by agents and specialists in routine Master Gardener training sessions across the state. It is available on the Aggi-Horticulture website.

Sweet Orange Scab, a disease previously unknown in North America, was initially detected in Houston in July, 2010 and subsequently discovered in a number of counties in Texas, Louisiana and Mississippi—as well as on citrus fruit in Texas supermarkets that originated in either Mexico or California. The Texas citrus industry enacted a voluntary moratorium on the shipment of fresh Texas citrus into California until a risk assessment of the disease could be completed. The moratorium lasted for 7 weeks during November and December, which is one of the busiest times for shipments to California, resulting in as yet untold losses to growers and shippers. During this period, I was intensely involved in educating people about the disease while also participating in numerous meetings with industry,
research, Extension, and state and federal agencies as we tried to resolve the problem and enable the resumption of shipments to California markets.

Even with the preponderance of my work in the last year focusing on HLB/ACP, I still managed to keep the industry apprised of the other production issues which growers face daily, continued to provide service to homeowners with concerns about their citrus trees, and responded to the needs of CEAs with questions from clientele.

Dr. Terri Starman, Associate Professor

Relevance. All research projects focus on increasing sustainability for production of horticultural commodities to reduce impact on the environment while producing a high quality product for the consumer. Projects in 2010 focused on: the effect of irradiation as a phytosanitary treatment for cut flower exports; lighting during vernalization and cooling after vernalization of dendrobium orchids to extend their market period; use of growth regulators for improving water use and shelf life of bedding plants; using a water conserving irrigation system during greenhouse production to reduce runoff and acclimate plants for longer shelf life; and screening garden rose cultivars for heat and drought tolerance.

Response. We published two refereed/peer-reviewed manuscripts, two non-refereed scientific publications, one international scientific abstract, two national scientific abstracts, and three trade articles and presented an invited workshop to the OFA Short Course.

Results. This year we determined: flowering in Dendrobium orchid cultivars can be deferred by low temperature holding; a strobilurin fungicide was not effective in improving water use or shelf life of two species of bedding plants; methods utilized to determine heat tolerance in garden rose varied in their efficacy; and, reducing soil moisture content from 40 to 10% did not reduce shelf life of *Angelonia angustifolia* (summer snapdragon).

Dr. Larry Stein, Professor & Extension Specialist, Uvalde

My expertise and work in the culture of pecan has allowed the Texas AgriLife Extension Service pecan educational program to become the best in the world. Numerous years of result
Demonstrations and research plots on crop load management and best management practices have allowed me to stay on the cutting edge of pecan growth and development. I hosted and coordinated the Texas Pecan Orchard Management short course on campus on 25 – 29 January 2010. Over 58 folks from as far away as Mexico as well as all over the United States attended. Evaluation of the program indicated that 91% of the participants were completely satisfied with the program and 100 percent felt the program would help them make better management decisions. In addition I organized a mini short course in conjunction with the Texas Pecan Growers Association annual meeting to provide a quick review of best management practices. Ninety nine percent indicated they thought the course would help them make better management decisions. I also published 5 articles in *Pecan South* to keep growers in tune to local happenings in the pecan world. I, along with Monte Nesbitt, George Ray McEachern, Bill Ree, and Al Wagner, developed a GAPs document for pecans.

The brunt of my vegetable work focused on spinach though trials were conducted on tomatoes, watermelons, and cabbage. Spinach plant population work has shown that more lines of spinach with the same plant population as fewer lines will yield more and better quality spinach due to the full expression of the plant as a result of having more space. My trials resulted in baby leaf spinach becoming a norm rather than an exception for the winter garden. The International Spinach conference will be held in the Netherlands in 2011 and I will again host the meeting in Texas in 2012. My spinach work resulted in a note being published in Plant Disease 94(11):1377.

Jim Kamas and I continue to work on our fruit plantings in both Fredericksburg and Uvalde to determine the potential for new pomegranates, figs, pears, blackberries and cold hardy citrus crosses between Changsha tangerine and Satsuma orange. We have recently completed the Texas Peach Handbook which will be published in 2011 by the Texas A&M Press. In addition we have released a new grape variety with the University of Arkansas. The grape tested as ARK 1475 will be known as Victoria.

I also continue to work with various color variants in bluebonnet and released a new cultivar known as Ladybird Johnson Royal Blue which will be distributed by Wildseed Farms in Fredericksburg.

**Dr. Astrid Volder, Assistant Professor**

**Relevance, response and results**

Urban and natural green areas provide a wide range of ecosystem services to the community. My lab aims to conduct a wide range of experiments on the effects of climate change and urbanization on plant communities. Currently, four problems are being addressed by my program. (1) Urbanization usually results in the removal of mature trees from the urban landscape – contributing to urban heat island effects that can cause urban temperatures to be up to 6°C higher than the surrounding rural landscape. Over a 50-year lifetime, a healthy tree generates $31,250
worth of oxygen, provides $62,000 worth of air pollution control, recycles $37,500 worth of water, and controls $31,250 worth of soil erosion. Maintaining mature trees in the urban landscape could provide great benefits in terms of reduced replanting cost, additional shade (cooling) and general aesthetics. In response we have established an experiment to test the effects of porous and non-porous concrete on the growth and general physiological health of mature trees. We found that in heavy clay soils there were few benefits of using porous concrete over standard concrete for Sweetgum growth. Placement of any pavement (porous or standard) doubled soil CO2 concentrations and strongly reduced root growth without any apparent consequences for aboveground growth.

(2) Stormwater management and energy use are major issues in maintaining sustainable urban ecosystems. The use of vegetation on roof surfaces (green roofs) could keep water on site while also saving cooling/heating energy. As a general estimate, green roofs can reduce summer cooling costs by up to 30% and reduce stormwater release by 40-60%. Green roofs are still rare in Texas due to a general lack of public awareness, lack of suitable species and lack of convincing research data from Southern States. So far we have identified two plant species that can potentially do well in very shallow green roof substrates without irrigation. In addition, we are testing water quality of green roof runoff versus standard roof runoff and found that green roof runoff contains less nitrogen than standard roof runoff, but has higher losses of other fertilizer components. Tests using a variety of soil depths, growth medium mixtures and plant species are under way in both College Station and Houston.

(3) More than 60% of applied fertilizer does not end up in crops. Sustainable management of agricultural systems includes the efficient use of water and nutrients and the efficient use of these resources is heavily influenced by processes that occur primarily belowground at the root level. It is crucial that studies on sustainable production system management start including questions aimed at the performance of the belowground components. We are in the middle of a study in Pecan orchards that studies the interaction between fertilizer use efficiency and timing of fertilizer application and root growth. If we can apply fertilizer at a time of high root growth and nutrient uptake we may be able to improve fertilizer use efficiency as well as apply less fertilizer. In addition, a new study aimed at comparing several methods of sustainable vegetable production is being designed.

(4) Southern oak-savanna represents an ecological tension zone that separates the grasslands of the Great Plains and the deciduous forests of the eastern US. It is an area where the effects of climate change may be particularly strong, as the dominant growth forms represent very different plant functional types. Southern oak-savanna is being invaded by *Juniperus virginiana*, a very invasive evergreen species. We are in the 7th year of a study of oak-savanna dynamics that includes measurements of physiology, soil nutrient fluxes and above- and belowground production. The data will be used to model future responses of oak-savanna to projected climate change.

Dr. Al Wagner, Professor &
Extension Specialist

The interest in value added food products continues to grow in Texas. The need for continued help and advice on getting started and producing safe products is continuous. In the past year, I
have helped over 105 companies develop a better understanding on how to produce safe food products. Many of the food processors are small businesses, while others are established multi-million dollar corporations.

I tested 318 products, from 85 different companies, in 2010 and rendered advice for improving safety. If certain parameters are not maintained the product could cause a food-borne illness or simply spoil, thus making the product unsellable. This is a loss of inventory to the producer and affects the company’s image. By serving as a “process authority” recognized by the Federal and State Food and Drug agencies, we are saving these companies close to $500,000 a year.

Dr. Russ Wallace, Associate Professor & Extension Specialist, Lubbock

My research and extension efforts continue to increase the national visibility of the Texas High Plains Vegetable Research & Extension Program in Lubbock, as well as areas in specialized training for regional county Extension Agents, Master Gardeners and home gardeners. During 2010 my efforts had direct impacts with growers, especially where choices were needed concerning production needs. My program had impacts at regional and national scientific meetings and with presentations given to many growers, Master Gardeners, extension and industry professionals, as well as over 15,000 listeners/homeowners through radio programming. These efforts have resulted in more than 100 direct requests for assistance through phone and email conversations, or with direct office visits. The Texas High Plains Vegetable Program Website is linked to Aggie-Horticulture; and growers, industry reps and home gardeners may download updated research/extension information obtained through my research and outreach programs, as well as view presentations on courses taught. My 2010 outreach efforts have extended to other states including Washington, Tennessee and Wisconsin where research and extension programs involving high tunnels and biodegradable mulches were evaluated with four universities and over 20 researchers.

Complementing my extension efforts in 2010, I had a strong research program that emphasized vegetable variety evaluations for economically important crops. Crops were tested for heat tolerance, disease resistance, and yield performance. Evaluations included weed control in snap beans, as well as fungicide and insecticide evaluations in onions and watermelons, respectively. In 2010 time and effort evaluated organic and sustainable methods in high tunnel production funded through a 3-year grant received from the USDA Specialty Crops Research Initiative, Sustainable Research and Education Program. Results created significant interest from growers within the state. Unrestricted gifts from private sources were important to my research program, and these funds ($35,352) assisted with purchasing supplies and covering expenses for my programs. Through USDA funding, I was able to support a full-time salaried technician, as well as three student wage positions. Herbicide research continues to be difficult due to a lack of industry support. However, in part, through my efforts, the State of Texas received special registrations in cabbage, broccoli, cauliflower and lima beans for 2010, improving weed
management strategies for Texas growers. Variety testing for heat tolerance, disease resistance and yield performance continues to improve the production on the High Plains.

**Dr. Doug Welsh, Professor**  
**Extension Specialist, Associate**  
**Department Head**

I serve as Associate Department Head and Project Leader for Extension Horticulture, an unit comprised of 52 professionals: 21 Extension Specialists/Program Specialists, 20 CEA-HORTs, an Extension Assistant, a Web Administrator, an Administrative Assistant, and 6 partially Extension-funded Support staff professionals. Educational programs and activities associated with this unit include: Earth-Kind® Environmental Stewardship, Produce Food Safety Initiative, Small-Acreage Horticultural Crop Production, Junior Master Gardener®, Texas Master Gardener™, Aggie-Horticulture® website, Pecan Orchard Management Short Course, Better Food Processors School, and Prospective Wine Grape Growers Workshops.

Prior to 2008, I served for 21 years as coordinator for the Texas Master Gardener Program, the largest in the nation. In addition to supporting all aspects of consumer horticulture, I give special emphasis to landscape water management (e.g., Xeriscape® and Earth-Kind®). I co-authored the book, *Xeriscape Gardening: Water Conservation for the American Landscape* (Macmillan, 1992) and my most recent book is *Doug Welsh's Texas Garden Almanac* (Texas A&M Press, 2007), which won Gold and Silver Medals of Achievement from the Garden Writers Association (2008). The book will be updated and reprinted in 2011 as part of the AgriLife Series of the Texas A&M Press.

I have over 32 years of experience as a garden writer and broadcaster, having provided regular garden programming and columns for WOAI-AM1200 (San Antonio), KTKR-AM760 (San Antonio), KTAM-AM1240 (Bryan), KSAT-TV (San Antonio) and the *San Antonio Express-News*. Currently, I produce a weekly garden segment on KBTX-TV (Bryan) and a weekly one-hour, call-in garden show on KAMU-FM, public radio (College Station). These segments and shows are archived at *kbtx.com* and *kamu.tamu.edu*.

**Lisa A. Whittlesey, Extension Program Specialist**

The primary focus of my work within the Extension Horticulture unit is to provide international leadership to the International Junior Master Gardener program whose mission of growing good
kids through igniting a passion for learning, success, and service through a unique gardening experience. Since the inception of the program, I have worked to garner over 6 million dollars in external grant funds and generate approximately $130,000 annually in sales revenue and gifts that goes to support the JMG program. The development of strategic programmatic partnerships with other land grant universities, organizations and programs (National Gardening Association, National Wildlife Federation, American Horticulture Society) and with state level educational agencies has been a strategic part of my responsibilities in order to further the mission of the program and extend the JMG program to more youth across the United States. The expansion and growth of the JMG program internationally has been accelerated through the development of international collaborations with the Borlaug Institute for International Agriculture, Amigos de los Americas, and international programs in Korea. I have worked to provide financial and programmatic support to a variety of research projects that have provided evaluation on the positive impact of the JMG program on children and the effectiveness of the program in enhancing science competencies for teachers. My work and expertise has been cited in over 150 popular press magazines, newspapers, and television outlets and I have been an invited speaker to over 130 regional and national conferences/programs. In addition to the providing leadership to the Junior Master Gardener program, I provide creative leadership and expansion to the Horticulture Technician program for prisons. This includes development and enhancement of programming partnerships with Lee College, Texas Department of Criminal Justice, and the Federal Bureau of Prisons. Finally, I provide support to the local county Extension program and community by providing Master Gardener and adult educational programs in the areas of botany, plant growth and development, plant propagation, floral design, and youth gardening.

Dr. Kilsun Yoo, Research Associate Professor

My research has been focused on chemical analysis in fruits and vegetables. I have worked on developing new methods and improving existing methods for higher efficiency. Our research efforts are the first of its kind in vegetable breeding program since the establishment of the VFIC, incorporating phytochemical concept to the conventional breeding program that focused mainly on yield, disease resistance, and other pests. With this type of collaboration, we were successful in developing sweet onion ‘Legend’ and ‘BetaSweet’ carrot, which became representative cultivars of Texas vegetables.

My research will enable biotechnologists to discover the genes involved in synthesis of carotenoids, capsaicins, and flavonoids and eventually help breeders to develop new cultivars with high levels of desirable compounds or with low levels of undesirable compounds. By help of my research, new cultivars with high vitamin C and flavonoids will be developed for growers in Texas and other States. These new cultivars of vegetables will provide a new opportunity to growers, who are eager to find new crops to diversify the production and sources of alternative income, to increase and expand the production and income.
Food supplement industry is now over billion dollar business. Developing new supplement products may increase of sales of the products and attract several related companies to join the Center for the collaboration.

My research will also attract new graduate students to learn the techniques in the analytical chemistry of phytochemicals, and as a result, the Horticulture Department and VFIC can maintain the leading edge in this research and bring in new graduate students.

Dr. Jayne Zajicek, Professor

Undeniably, society has a strong affection for nature and plants; the resulting economic implications have contributed to the growth of the horticulture industry. While generally accepted, this relationship and attraction for plants is virtually undocumented. Research exploring this attraction and need for green surroundings is minimal, and the relationship between people and plants is vastly unknown.

With a steady increase in urban development, communities have experienced negative impacts of overexpansion, greater commercial land use, and decreasing areas of undisturbed parcels of land. Moreover, a greater number of people are working and spending leisure time indoors, and research has shown that people are potentially experiencing some negative consequences as a result of decreasing amounts of time spent in natural surroundings. One of these consequences is the epidemic of obesity in both children and adults that is sweeping our country due to sedentary life styles and poor dietary habits. Sedentary life styles and poor dietary habits can also lead to increase in other types of diseases and a poor quality of life many times leading to depression.

Gardening is one of the United States most popular home-based leisure activities and can be linked positively to physical activity, healthier diets, and better quality of life. In addition to current goals of the Growing Minds Research Program stated below, a concerted effort has been initiated evaluating the effects of gardening on health, physical activity, dietary choices, and quality of life of all populations including adults, the elderly and children.

Program Definition and Goals:
The goal of the Growing Minds Research is to develop and conduct sound scientific research projects in the following areas:
1) evaluate school gardening as an instructional method in discipline areas including, but not limited to, science, math, nutrition, environment, and parental involvement.
2) evaluate school gardening as a method of fostering fine and gross motor skills and delayed gratification
3) evaluate the effects of gardening and horticulture on additional populations including youth-at-risk and the elderly.

**Research Accomplishments:**

Research published by the Growing Minds Research Program has documented the benefits of gardening and green spaces on children, college students, adults and the elderly. Specifically, children that garden or participate in outside activities have better environmental attitudes, better nutritional attitudes, better academic performance, higher self esteem, fewer health problems. A recent study indicated that there was a significant relationship (negative) between time spent indoors on video games or watching television and health problems in children. In addition, time spent outdoors in free play was inversely related to reports of health problems.

Higher quality of life for college students and office employees was reported when these populations had access to green spaces, participated in gardening, or were exposed to plants and gardening either directly or indirectly.

In two studies, adults and the elderly who gardened reported better quality of life than those who reported that they did not garden. In addition, these populations that gardened rated their overall health and their physical activity levels higher than did nongardeners.

In this time of growing urbanization, gardens and green spaces have important values beyond the aesthetic and utilitarian. This research supports the ideas that contact with nature through hobbies such as gardening will not only support our physical being, but can have positive effects on one’s mental well-being, quality of life, academic achievement, dietary habits, and overall health.