

Department of Horticulture
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EXECUTIVE SUMMARY

The Department of Horticulture at Penn State recently celebrated its 100 anniversary. During the past century the department was recognized as one of the stronger horticulture programs in the country and as a leader in training horticulturists, discovery research, and supporting horticultural industries. Over the years, the priorities of the department have evolved in response to changing needs and funding sources. In the late 1980s the department established the landscape contracting program to support the rapidly growing green industry. With good support from the College, the program is now recognized as possibly the best in the country, and is the model used by other horticulture programs. During the past quarter of a century, the needs of the horticulture industry have expanded from requiring primarily production-related information to also requiring information related to marketing, business management, food safety, environmental protection, energy, and labor. The department has responded by expanding its efforts and collaboration in most of those areas. The Pennsylvania Master Gardener program was also established in the 1980s to help county-based extension workers provide research-based home horticulture information to a very large group of diverse stakeholders. In addition to supporting domestic horticultural industries, department members also participated in programs in Eastern Europe, South America, and Africa to generate and deliver horticultural information to various stakeholder groups and to train plant scientists to help support their expanding horticultural industries and improve quality of life. Horticulture touches everyone every day and as the importance of horticulture to human health and well-being is increasingly recognized, we must use our strengths to take advantage of emerging opportunities to develop and maintain programs that are relevant to the commonwealth and the world.

The 2005-2008 strategic plan focused on enhancing undergraduate and graduate programs, attracting and retaining students, and enhancing departmental flexibility and capitalizing on funding opportunities. Despite instituting a number of strategies, the number of students majoring in our programs has continued to decline, but a large number of students

choose to minor in horticulture and our student credit hours are increasing. Our graduates continue to be in high demand. A planned review and possible revision of our curriculum will solidify the relevance of our teaching programs. Although the number of faculty members in the department has declined, the amount of external funding has increased and, with prudent financial management, the department's financial situation has improved.

The department will participate in all five of the strategic initiatives outlined in the College's new strategic plan, but in our 2008-2013 plan we will emphasize two areas: food, fiber, and health; and entrepreneurship. In response to faculty retirements during the past decade the department has lost research and teaching FTEs. To maintain quality resident education programs in ornamental horticulture and landscape contracting, extension and research FTEs were converted to teaching FTEs. A priority for the department is to enhance our research capabilities. Faculty efficiency will be enhanced by reorganizing our undergraduate curriculum and extension programs, so more faculty time can be directed at research to take advantage of new funding opportunities related to horticulture. With this vision, we can become the regional leader in discovering and delivering horticultural information to on-campus and off-campus students and stakeholders.

STRATEGIC CHALLENGES AND STRATEGIC ADVANTAGES

Commercial horticulture is an important part of the U.S. crop production economy, with roughly the same economic value as program crops. The PA Ag. Statistics report indicated that in 2002 the farm gate value of utilized horticultural crops was about \$392 million. The recently released 2007 Census of Agriculture was performed differently, but reported that the market value of horticultural products sold (includes mushrooms and sod) was \$1.19 billion. Value-added processed products, such as wine, canned and frozen fruits and vegetables, fruit juices, snack foods, and ornamental crops sold at retail nurseries and garden centers, farmers markets, on-farm markets, and supermarkets within the Commonwealth contribute much more to the state's economy. The latest figures available for the Pennsylvania Green Industry (ornamental horticulture and landscaping goods and services) indicate that sales generated \$3.6 billion in value-added economic activity in 2002 and the industry has been growing at an annual rate of 10 to 15%

[([http://www.ufe.org/files/pubs/EconomicImpactsoftheUSGreen%20Industr\(NUCFACfinalreport\).pdf](http://www.ufe.org/files/pubs/EconomicImpactsoftheUSGreen%20Industr(NUCFACfinalreport).pdf))]. Within the United States, Pennsylvania ranks in the top 10 states in utilized production for many horticulture commodities including sweet corn, fresh market tomatoes, cantaloupes, pumpkins, processing snap beans, Christmas trees, floriculture crops, nursery crops, strawberries, apples, tart cherries, grapes, peaches and pears.

This increase in horticultural economic activity is accompanied by increasing and changing demands from agricultural stakeholders. The 2007 Census of Agriculture reports that there are more farms in the U.S. than in 2002, and that "these new farms tend have more diversified production, fewer acres, lower sales, and younger operators who also work off-farm." This trend holds within Pennsylvania. For example, the number of farms on which vegetables are grown increased from 3,478 to 4,338, a 24.7% increase, and the number of farms with orchards increased from 2,370 to 2,683. The increasing number of producers, especially new growers, has led to increasing demands for information in these commodity areas.

Off-farm, horticulture is becoming increasingly important to the quality of life of all Americans: Americans are encouraged to consume more horticultural products as part of a healthy diet and properly designed and maintained landscapes have a major impact on many

aspects of our environment, including energy use, biodiversity, carbon sequestration, storm water runoff and water quality. The health benefits of house plants and outdoor landscapes are being identified

(www.gardeningsolutions.ifas.ufl.edu/giam/shows/transcripts/2008/oct/benefits_plants.pdf); social scientists are reporting that flowers have profound positive effects on our emotions to reduce stress and anxiety (<http://www.inlieuofflowers.info/index.php?s=1>); and Gallup Polls put gardening as the number one adult leisure-time activity. The popularity of horticultural pursuits and requests for information from non-commercial stakeholders puts additional demands on an already-stretched Extension system. We must develop new ways to more efficiently deliver information.

In recognition of the fact that the economic value of horticultural products is similar to, and will likely surpass, the value of agronomic crops, Congress recently appropriated substantial funding for high-value horticultural crops with the Specialty Crops Research Initiative.

The Department of Horticulture is well positioned to compete for funding from a wide variety of sources, including programs authorized in the recent Farm Bill (Specialty Crops Research Initiative, Organic Agriculture, and New Farmers). These programs require stakeholder input, and multi-state or multi-institutional teams that apply trans-disciplinary and multi-functional approaches. Ours is one of the few departments in the northeast or mid-Atlantic regions with the comprehensive expertise to provide leadership on these types of projects. In addition, horticultural producers are taking advantage of the Value-Added Producer Grants program designed to encourage producers to process their raw products into marketable goods, and the Pennsylvania Department of Agriculture can apply to the Specialty Crops Block Grant Program designed to provide state assistance to enhance the competitiveness of specialty crops. Recently the department has also obtained significant funding from commercial companies, federal and state granting agencies, and international and domestic partners, and we expect future opportunities will increase.

Our Horticulture Department is one of a few in the northeast and mid-Atlantic regions with the expertise and facilities to provide a comprehensive undergraduate education in horticulture and landscape contracting. We offer courses not available at most other universities in the region (Post-Harvest Physiology, Deciduous Tree Fruits, Small Fruit Culture, Arboriculture, Horticultural Systematics, Horticultural Business Management, Interior Plantscaping, EcoRoof and Living Walls, Plant Nutrition, and Plant Growth Regulators) and our students have exceptional employment opportunities upon graduation. With input from the green industries, the Landscape Contracting program recently performed an assessment and developed a strategic plan that was shared with the College of Agricultural Sciences Administration and is being partially implemented. Requested faculty positions to maintain quality ornamental extension programs were not approved. A similar evaluation of the Horticulture program will be implemented in the near future. Such an evaluation is needed to ensure that we are educating students about topics that are relevant and timely and that will provide students with the knowledge and skills needed for successful and rewarding careers in their respective fields.

The department has the strongest horticultural extension programs in the region and growers from Pennsylvania and surrounding states depend on our programs for current research-based information. The new restructuring of extension will help us to become better organized and integrate county educators, Master Gardeners (MG), and specialists to develop strong state-wide programs to serve diverse stakeholder groups. The Pennsylvania Master Gardener Program annually provides research-based training on various aspects of horticulture for about 2,200

people, who may then become certified as Master Gardeners. Upon obtaining certification, MG volunteers provide service and educational programs to the public. In 2008, MGs donated more than 126,000 hours and reached nearly 205,000 stakeholders. One important MG activity involves working in county extension offices to answer home horticulture questions. The value of this volunteer activity is more than \$2.4 million per year and allows county educators and specialists to focus on developing and implementing state-wide programs for commercial growers and horticultural retailers. Dr. Tom Bewick, CSREES-NIFA National Program Leader for Horticulture, recently indicated that home horticulture is critically important because it contributes \$35 billion to the nation's economy annually. Since federal funded programs are increasingly requiring stakeholder participation, all three missions within the department, along with expertise from other departments and institutions will need to be integrated to successfully compete for funding.

The primary challenge facing the Horticulture Department is maintaining a balance between the three missions so we can continue to provide quality undergraduate and graduate programs, conduct cutting-edge research, and provide research-based information to increasing numbers of commercial and noncommercial users of horticultural information. The department has not hired a faculty member since 2004, but we have had three retirements. Over the past few years, the teaching void created by these retirements has been filled by converting extension positions to teaching positions. This approach has allowed us to maintain high-quality teaching programs, but we no longer can provide leadership to state-wide extension ornamentals programs. Hence, extension educators have responded by developing regional programs. To take advantage of emerging opportunities in all three missions, the department needs to hire new young faculty members with cutting-edge training in the areas of emerging emphasis.

MISSION, CORE VALUES, AND VISION

Mission Statement

The mission of the Department of Horticulture is to develop timely and relevant research and extension programs that foster the sustainable production, utilization and marketing of flowers, fruits, vegetables and ornamentals; and to provide our students with the highest quality education in horticultural science and landscape contracting that prepares them for a lifetime of contributions to Pennsylvania, the nation and the world.

Core Values

Excellence, creativity and productivity in the scholarship of resident education, research and extension/outreach.

Openness and respect in a work environment that values all members of the department as unique individuals and promotes professional and personal growth and development.

Interdisciplinary collaboration and communication to promote horticultural knowledge and solve problems for the common good.

Commitment to recognize, investigate and address emerging issues raised by our stakeholders.

Vision

The Horticulture Department is committed to being a comprehensive unit, with disciplinary strengths, that will be one of the top departments in the nation. We will continue being the premier school in the nation for instruction and training in landscape contracting. The department will be a destination of choice for students considering a degree in Horticulture or Landscape Contracting. Our graduates will be highly recruited and well paid. We will be a leader in the development and application of system approaches to advancing horticultural sciences and horticultural crop production in an environmentally responsible way. The system approach will be facilitated by our commitment to ecological principles, and to interdisciplinary cooperation with other departments within the college, the university and other institutions. We will be viewed as a strong asset for the college and the university. Our faculty will be key team members in many international horticultural projects around the world.

STRATEGIC INITIATIVES

The Department of Horticulture is active in all five of the College's strategic initiatives, and they are discussed in order of degree of departmental activity.

Food, Diet, and Health.

Horticultural food crops are a cornerstone of a healthy diet. Nutrition is important to human health and the National Institutes for Health, the Centers for Disease Control and Prevention, and the USDA are urging Americans to consume more fruits and vegetables. Faculty members in the Department of Horticulture work with both edible and non-edible horticultural crops, but about 60% of the faculty members work on production, breeding, postharvest handling, or marketing of food crops. Courses covering the production of all major horticultural food crops are offered for all Horticulture students. Extension specialists work closely with producers and marketers of horticultural crops. Most research projects in the department focus on various aspects of vegetable and fruit production, including plant nutrition, genetics, breeding, molecular biology, germplasm evaluation, mechanization, season extension, organic horticulture, post-harvest handling, and marketing. These areas of activity also overlap with the major programs identified in the Specialty Crops Research Initiative (SCRI).

The department will continue to emphasize the production and marketing of high value horticultural crops, including food crops, in its resident education, extension, and research programs. The department, along with other departments in the College, has the expertise and the infrastructure to provide regional leadership in multi-disciplinary, multi-institutional, and multi-functional, programs emphasized in government funding programs. The department will also continue to seek opportunities to partner with industry groups and international agencies to generate new information and train researchers and teachers.

Entrepreneurship

There is a great diversity of horticultural businesses in Pennsylvania, ranging from large farms producing for processors and wholesalers, to medium-size operations with retail markets, to small and part-time operations targeting farmers markets. The large Green Industry is composed of production nurseries, landscape design, installation and maintenance companies, retail florist shops and garden centers. A major goal of the department is to help these

horticultural businesses remain both environmentally and economically sustainable. New opportunities for non-traditional business, such as locally-grown products, value-added processed products, organic farming, and community supported agriculture (CSA), are recognized as being important by members of the food producing system and consumers alike.

Teaching, research and extension programs in the department include aspects of entrepreneurship and this area will continue to be emphasized. The Cellar Market is a unique opportunity to provide instruction on marketing and to gain research information concerning consumer preference and attitudes related to horticultural products. Entrepreneurship is being incorporated into several horticulture and landscape contracting courses as well as extension programs. A one-credit course was developed to focus specifically on this issue and entrepreneurship fits into the “consumer and markets system” identified as a priority in the SCRI. The department will continue to work with the mid-Atlantic Young Growers Alliance to help future leaders of the horticultural industries develop needed skills in the production and marketing of horticultural crops, as well as network with politicians, policy makers, and industry leaders from Pennsylvania and surrounding states.

There are great opportunities for increased urban horticultural production in Pennsylvania. Urban farming is a small, but profitable industry with opportunity for tremendous growth in the future. Urban horticulture activities are already being used to teach urban youth and adults about plants and entrepreneurship, especially in the Harrisburg area. There are also opportunities to partner with PSU campuses around the state to teach students and local residents about plant science, human nutrition, and environmental issues. Abandoned urban lots, large estates or even sections of urban parks/greenways can be converted to attractive green space or they can be used to develop farm businesses that provide local residents, CSAs, community food stores, urban farm markets and restaurants with fresh produce. With the heat island effect in urban areas, cool season crops can likely be grown year-round with season-extension techniques, such as plastic mulches or high tunnels. The larger cities in the state already have urban farms, but because they are unorganized there is little research activity to generate new information that they need and there are no educational programs tailored to their specific needs. An Urban Horticulture Production Specialist would organize state-wide programs, involving faculty members from PSU as well as other educational institutions, state agencies interested in environmental issues, human health, economic development, and urban revitalization, and also private institutions such as food stores. Urban horticulture production would provide opportunities to teach urban youth about agriculture in general and plant science, human nutrition, environmental issues, business management, and marketing. Converting abandoned urban space into small farms would offer youth and city residents opportunities to grow fresh produce for their own use or for local sales. There would also be opportunities to conduct research to learn how to farm soils that may contain hazardous materials, evaluate new specialty horticulture crops, develop new season-extension techniques, document the environmental impacts of urban green areas, and evaluate the social implications of replacing unsightly space with urban farms. Revitalization or renewal of the urban landscape through implementation of an urban horticultural production initiative would require the participation of many different disciplines from the biological to the social sciences and would certainly be a noble and fitting effort in keeping with the mission of a large land grant university like Penn State. Such a position would support at least three of the initiatives in the College plan: Food, Diet and Health; Entrepreneurship; and Water Quality and Quantity. The department is currently meeting with members of other departments, other colleges, and state agencies to identify the programs

already in place, and we will use the resulting information to develop to request a position for an Urban Horticulture Production Specialist.

Energy

Although the Department of Horticulture does not have a position dedicated to energy, the department involves various aspect of energy in our teaching, extension, and research programs. Greenhouse management students perform energy audits on commercial greenhouses and recommend energy conservation practices. Research and course work in EcoRoof and Living Wall Technology has energy-conservation components and this information is being extended to private industry, government agencies, and homeowners. Two researchers are involved in research to genetically improve the oil-bearing plant *Jatropha* and this work is planned to continue. Several faculty members are involved in air pollution research and we teach a course covering the effects of air pollutants on plants and ecosystems. Members of the department also have funding to investigate carbon sequestration of biodiesel crops. The Center for Plasticulture has pioneered several methods for reducing energy needs in horticultural production. Using high tunnels for season-extension of high-value crops is more energy efficient than growing these crops in heated greenhouses. Horticulture faculty members are cooperating with Agricultural Engineers to develop and market a non-polluting incinerator to generate energy from waste plastics rather than sending the plastic to landfills. Testing of biodegradable polymers that may serve as replacements for petroleum-based plastics is another facet of current research that will help solve this problem. Since many of our horticultural producers have signed or are considering signing leases overlaying the Marcellus Shale, the department is in a position to assist them in considering ramifications that may occur when leasing land to companies involved with exploring the shale. The department will participate in the College's efforts to hire new energy positions and we will continue to search for opportunities to be involved in energy production and energy conservation, as well as the energy initiative supported by the College of Agricultural Sciences.

Water Quality and Quantity

Water is important for production of horticultural crops in the field and in protected environments, as well as for establishing and maintaining landscapes. Weather patterns appear to be changing and regions of the state experience drought most years. Therefore water issues have been emphasized in our educational programs. Students and stakeholders around the state are exposed to modern concepts of efficient water use. In addition, horticultural practices can affect water quality, especially in nursery and greenhouse operations. Nursery and greenhouse extension programs have focused on minimizing the impact on water quality. Landscapes and greenroofs have a large impact on storm water runoff and living walls may be modified to clean up polluted water, and these themes have been incorporated into our Governor's School activities. Plastic mulches with drip irrigation reduce the need for herbicides and high pressure irrigation systems. Metrics addressing various aspects of land development and management that affect the ability of a site to provide a variety of ecosystem services are outlined in a 2008 draft of the *Sustainable Sites Initiative* and these metrics are being incorporated into our courses. The Sustainable Sites Initiative is an interdisciplinary effort by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center and the United States Botanic Garden to create voluntary national guidelines and performance benchmarks for sustainable land design, construction and maintenance practices. (<http://www.sustainablesites.org/report/>). Horticulturists

are identifying root traits that allow plants to more efficiently utilize water and mineral nutrients. Crops with these traits will require less fertilizer and water. The enhanced energy and water efficiency will improve water quality by reducing nitrogen and phosphorous runoff. Researchers will continue to address issues that may affect water quality, such as decreasing erosion with no-till production, and making efficient use of organic and inorganic fertilizers. Teaching and extension programs will continue to deliver research-based information on water use and water quality.

Pest Prediction and Response

Several programs within the department involve aspects of pest prevention and control, and this information is incorporated into our teaching, extension and research programs. The annual cost of invasive plant species to the U.S. economy is estimated at \$120 billion. The department has contracts with state agencies to identify ways to manage unwanted vegetation along our roads and to train workers how to control these species. The department has breeding programs to develop new genotypes with greater resistance to pests. Horticulturists will continue to work with entomologists and plant pathologists to develop methods to identify, prevent, and manage pest problems by evaluating new germplasm, production practices, and pest monitoring techniques. Funding is also being sought to work with Dr. Joe Russo, President of SkyBit, Inc., to develop a model for the PIPE program to help predict bloom, optimum harvest date, and possibly timing for effective thinner application for apple. Since the phenological development of fruit trees and most pests are influenced similarly by environmental factors, these models can be utilized while developing pest control strategies.

DEPARTMENT GOALS, STRATEGIES, AND MEASURABLE TARGETS

Goal A: Extension

Currently there are several strong regional horticultural programs with some state-wide coordination, but the new reorganization of extension will enhance state-wide programming efforts. The number of county educators and state specialists working with horticultural crops has declined while the number of horticultural producers has been increasing, so new methods of delivering research-based information to various stakeholder groups are needed. These strategies and instruments for evaluating impact of our programs will be identified during the restructuring process. Therefore, the strategies outlined here are considered provisional.

Strategies for 2008 – 2013

Develop strong state-wide horticulture programs.

Most Horticulture extension specialists will be involved primarily in the Horticulture natural working group (NWG). Nearly 100 extension workers have bought into the Horticulture NWG and there is a great deal of diversity within this group. The group will meet in early March to determine the program teams that will be required to address the potential needs of stakeholders. Initial conversations indicate that there may be as many as three teams (edible crops, ornamental crops, and home horticulture involving Master Gardeners), but this is yet to be determined.

Expand efforts to externally fund the Master Gardener program.

Master Gardener volunteers allow county educators to work with commercial producers by responding to a large volume of consumer requests for information in county offices. Recently, the program has been greatly enhanced by providing more uniform training to MGs and improving the reporting system. Currently a county extension educator provides half-time leadership for the state-wide program, but the program could have a stronger presence if this half-time coordinator position were expanded to a full-time position. A sustainability committee is identifying strategies to externally fund this position.

Explore new ways to reach traditional and non-traditional audiences.

Traditional audiences include primarily stakeholders involved in commercial production, handling, and marketing of horticultural crops. Initial attempts to reduce the number of county meetings attended by state specialists, while continuing to serve our traditional audiences, using videoconferencing were not successful because there was inadequate buy-in from county educators and stakeholders. Since travel funds are inadequate to support travel to existing county meetings, new methods of information delivery are needed. Examples of technologies that will be considered include web seminars and workshops, podcasts, and Adobe connect. Through the restructuring process, we will work with county educators, CEDs and RDs to get their buy-in on this new approach to delivering state-wide educational events. We are also working with county educators to increase registration fees to reimburse specialists expenses. The department will search for cost-efficient ways to serve the growing needs of nontraditional audiences, such as part-time farmers, home horticulturists, and citizens involved in greening urban environments.

Participate in the new Penn State Center in Pittsburgh.

The department will explore ways to participate in the Penn State Center in Pittsburgh, possibly by providing expertise in the greening of inner city space. We will also explore emerging opportunities to partner with other Penn State campuses and colleges, other universities, and community organizations interested in establishing gardens and small horticultural businesses in urban spaces.

Performance Indicators

Develop strong effective horticultural teams to provide state-wide programs.

The teams within the NWG will identify methods of documenting impact of the state-wide programs. Criteria will be developed to evaluate the contribution of specialists and educators to extension programs. A possible approach is to survey stakeholders after educational events to determine what they learned and if they plan to change practices in the coming year. During the following year the stakeholders will be asked if they actually did change their practices and if the changes enhanced their sustainability.

Enhance the sustainability of the Master Gardener Program.

Currently the College provides funding for a half-time state-wide MG coordinator. The MG sustainability committee developed a three-tier plan to make the program self-supporting. The regional directors rejected the plan that called for MGs to pay for their training. The committee will work with the college development office to identify potential contributors to the

program. A goal is to attract external funding by 2013 to annually support half of a full-time state-wide coordinator (about \$25,000 per year).

Identify methods to efficiently deliver information through state-wide programming.

Specialists have enhanced the quality and uniformity of state-wide training to MGs without leaving campus by using video-conferencing. The MG coordinators conference was also administered with this technology. We will work with stakeholders, county educators, and county extension directors to identify methods of delivering needed information to other stakeholders in ways that reduce travel for specialists and county educators without sacrificing program quality.

Goal B: Increase Enrollment and Enhance Student Success

Increasing enrollment, student retention, student credit hours, and placing graduates is vital to the future of the department. To accomplish this, we need to more effectively market our programs to attract potential students. The growth of our horticulture-related industries also depends on access to qualified employees.

Strategies for 2008 – 2013

1. The department will fund a graduate student to visit Commonwealth campuses and work with DUS advisors to inform advisors and students about the opportunities for students majoring in horticulture and landscape contracting.
2. In an attempt to introduce more students to Horticulture, HORT 150 “Plants and Humans” will be taught each year. In 2008 the course was taught for the first time with 90 students.
3. To enhance student retention, the department will continue to teach a section of AG 150S, “*Be a Master Student*”.
4. To improve yield rates and diversity, the department will continue to offer scholarships to outstanding students in offer status
5. Have undergraduates develop a short video for You-Tube to explain the department undergraduate programs, the opportunities presented to students, their experiences, and their expectations in the field after graduation.
6. Revitalize undergraduate curriculum
 - The Landscape Contracting program was assessed by industry leaders and provided the basis for the 2007 strategic plan to serve the Green Industry. Two primary objectives for the undergraduate program were to add a minor in Arboriculture and incorporate more information technology into the program. With financial help from the tree-care industry, a half-time instructor was secured and the arboriculture minor is being offered. A non-tenure track instructor teaches the CAD courses and new software; however we would like to hire a tenure-track assistant professor with a research component to identify new applications for students and industry stakeholders, as well as new methods of teaching information technologies, such as using videocasts and podcasts in the classroom and for industry audiences.
 - A new course in organic horticulture has been added to take advantage of the growing interest in organically-produced food.

- A new course, entitled “Nursery Entrepreneurship,” was offered for the first time during the Fall 2008. The course focuses on helping students understand the process of developing a business plan while learning the roles and responsibilities of a business owner. The course will continue to be offered and will be expanded from one to three credits. In addition, the scope of the course will broaden to not focus solely on nurseries but all possible horticultural operations.
 - During the next two years, the Horticulture curriculum will be thoroughly reviewed to ensure that we are teaching courses that are relevant to preparing our students for successful careers. This will likely involve adding and deleting some courses, while other courses may be rearranged.
 - Ensure that all undergraduate students participate in a research project or an internship experience
 - Students will be encouraged to participate in international study programs and team competitions
 - The department will participate in student-reviewed request for proposals to enhance teaching programs
7. Continue to explore opportunities for joint recruitment activities with other Plant Science programs in the College.
 8. Enhance graduate student programs
 - Revitalize the department colloquium series by obtaining more input from students.
 - We have changed the colloquium course to include a classroom-type course along with the seminar series. Starting Fall 2008, the grad students were also asked to organize the seminar series for each fall semester with a theme topic chosen by them.
 - Starting spring 2009, the Department of Horticulture at Cornell University will send one or two graduate students to present seminars each spring and we will send one or two students to present seminars at Cornell.
 9. Enhance graduate student experience
 - Increase social opportunities for Graduate students to develop a stronger graduate student community
 - Meet with Graduate students at least once a year to identify ways the department can improve their experiences
 - Graduate students will participate in University and College sponsored programs involving Scholarship and Research Integrity
 - We established the “Hortfest” event, where each semester students share their research results in a social setting.

Performance Indicators

Increase Enrollment

Although there are very good employment opportunities for our graduates, undergraduate enrollment in the plant sciences has been declining nationally. Our enrollment has declined at a slower rate than at most Land Grant institutions, and we have more horticulture majors than our peer institutions (see Appendix I). However during the past four years the number of Horticulture majors has declined about 10%. The number of majors in Landscape Contracting

has remained fairly stable. The strategies described above are expected to stabilize and hopefully attract and retain more students. In 2001/02 the department was responsible for 5,336 student credit hours (SCHs) and that number fell 8% to 4,914 in 2004/05, but SCHs have increased to 5,166 during the 2007/08 academic year. By committing a graduate assistant to recruitment, we expect to attract more students to our majors, and the addition of a new general education course and courses related to organic horticulture are expected to increase our SCHs.

Increase Graduate Enrollment

Graduate student numbers are directly related to the amount of funding available to support students. The department will continue to leverage support for students in Intercollege programs by funding some students for one or two years. Efforts will be made to support more graduate students on grants.

Increase Student, Employee, and Alumni Satisfaction Measures

Exit interviews with graduating seniors indicate that students are highly satisfied with course work, advising, and interaction with faculty, but horticulture majors indicate a desire for more hands-on activities. During curriculum revision, more hands-on labs will be added to horticulture courses. To better quantify student satisfaction, students will be surveyed at graduation time and again three years after graduation. Employers of our students in industry and advisors of our students in graduate school will also be surveyed to evaluate how well our students are prepared for their careers. Currently we do a poor job of tracking our horticulture students after graduation, and these surveys should help provide those types of information.

Goal C: Assess student learning outcomes

Essential Program Competencies

1. Horticulture - Upon completion of a B.S. degree in Horticulture all students should have the following competencies.
 - a. Technical competency – master major issues related to horticulture, including:
 - 1.) Understand plant structure and function
 - 2.) Understand how environmental factors affect plant growth
 - 3.) Familiarity with production and marketing systems for edible and non-edible horticultural crops.
 - 4.) Understand nomenclature and identification of annual, perennial and woody plants.
 - 5.) Understand how to manipulate the environment to produce higher quality horticultural crops
 - b. Interdisciplinary – students will be knowledgeable about and appreciate disciplines related to horticulture, especially entomology, plant pathology, business and marketing, soils, and environmental sciences.
 - c. Communication skills- students will be able to communicate clearly to make their meaning apparent to others through written and oral communication and presentation skills.

- d. Intellectual skills -students will be able to think analytically, critically, and creatively.
 - e. Personal & Social responsibility- students will have skills for lifelong learning, leadership, multiculturalism, ethnical competency, experiential learning, teamwork, and service & responsibility
2. Essential program competencies – Landscape Contracting
- a. Critical thinking
 - 1. Problem Solving - students will learn to recognize problems, identify causes and consequences, analyze alternative approaches, synthesize preferred solutions, and evaluate actions and consequences.
 - 2. Information literacy – Students are taught to find information in a variety of forms and from a variety of sources, they can assess information critically and effectively, they can process information in a manner that fosters comprehension, and integrate new information into an existing body of knowledge.
 - b. Oral and Written Communications
 - 1. Speaking – students can present ideas and concepts clearly to individuals and groups
 - 2. Writing – Students can produce professional written business correspondence, professional resume and portfolio of work, comprehensive design narratives, construction notes and specs.
 - 3. Language skills – students have a working knowledge of basic Spanish, understand important aspects of Hispanic culture, and terminology used by Hispanic landscape workers.
 - c. Technical Literacy –
 - 1. Possess landscape design knowledge and skills – students will understand design and employ it at a variety of scales using graphic and labeling techniques to effectively communicate design intent, and integrate plans elevations, sections, perspectives, models, and details into a comprehensive plan set.
 - 2. Possess landscape construction knowledge and skills – students will be familiar with common construction materials and methods of installation, understand project scheduling systems, read and produce construction drawings, use surveying equipment and procedures to gather field data and stake our site improvements, and calculate cut and fill volumes from grading plan.
 - 3. Possess landscape management knowledge and skills – students can calculate material application rates and calibrate equipment, properly prune trees and shrubs, and assess existing landscapes.
 - 4. Possess horticultural science knowledge and skills – students can recognize and identify plant material commonly available to the landscape industry, understand the attributes and

limitations of plants used in residential and commercial landscapes, identify and recommend treatment for common pests and diseases of landscape plants, and understand the use of chemical mixtures and treatments to solve plant problems.

5. Utilize appropriate math skills to solve problems related to landscape contracting –students can calculate areas and volumes for landscape materials, mix rates and application rates for fertilizer and pesticides, and percentages for estimating and bidding.
 6. Employ appropriate business strategies to create and maintain a healthy, profitable enterprise – students will understand principles of marketing, sales, accounting and business management. They will be able to estimate direct and indirect costs, calculate profit for landscape construction and maintenance projects, and embrace community service as a business goal and marketing tool.
 7. Employ digital methods to maximize the quality of landscape design and construction plan sets – students will demonstrate an understanding of computer software availability to the industry, including 2-d and 3-D computer aided design with color rendering and presentation. Students will understand strengths and limitations associated with individual software packages, and manage information in a manner that makes it accessible and useable.
- d. Human understanding and interaction
1. Employ appropriate interpersonal skills – students will conduct themselves in a manner that displays appropriate business etiquette, display respect for internal and external partners, and act in a manner that creates a professional impression
 2. Establish and adhere to a high level of personal and professional ethics – students will recognize boundaries of appropriate behaviors, and demonstrate honesty and integrity in all aspects of business.
 3. Collaborate effectively with others – students will provide and accept criticism in a constructive way, deal with opposing ideas and resolve conflicts, and know when to lead and when not to lead.
3. Horticulture Graduate Students- Upon completion of a graduate degree in Horticulture all students should have the following competencies.
- a. Technical competency – Understand major issues related to their research areas.
 1. Familiarity with research methods used in their field of research.
 2. Understand how to search the literature for relevant information.

3. Interdisciplinary – students will be knowledgeable about and appreciate disciplines related to their areas of research, especially genetics, entomology, plant pathology, business and marketing, soils, and environmental sciences.
 - b. Communication skills- students will be able to communicate clearly to make their meaning clear to others through written and oral communication and presentation skills.
 - c. Intellectual skills -students will be able to think analytically, critically and creatively. They will also be able to read and interpret research information in the literature.
 - d. Personal & Social responsibility- students will have skills for lifelong learning, leadership, experiential learning, and service and responsibility, and they will be able to work with people from different religious, ethnic and national backgrounds.
 - e. Scholarship and Research Integrity – students will be able to conduct research in a responsible and ethical manner.

4. Courses that map strongly to the Horticulture competencies
 - a. Ag 150S “Freshman Seminar”
 - b. Hort 315 “Environmental Effects on Horticultural Plant Growth”
 - c. Hort 390 “Junior Seminar”
 - d. Hort 490 “Senior Seminar”
 - e. Hort 455 “Retail Horticulture Business Management”
 - f. Hort 402W “ Plant Nutrition” or Hort 412W “Post-harvest Physiology”

5. Courses that map strongly to the landscape contracting competencies
 - a. Ag 150S “Freshman Seminar”
 - b. Hort 120 “Computer Applications for Landscape Contracting”
 - c. Hort 269 “Residential Landscape Planning”
 - d. Hort 368 “Landscape Planting Design”
 - e. Hort 410W “Issues in Landscape Contracting”

6. Courses that map strongly to the graduate student competencies
 - a. HORT 590 “Colloquium”
 - b. The SARI program at Penn State
 - c. The new statistics course being offered

Goal D: Implement cost savings

Strategies for 2008-2013

- Purchasing recycled computers for the Landscape Contracting labs will save about \$20,000 per year.

- The flower trials have been moved to Landisville, where growing conditions are more similar to conditions near population centers. This has eliminated the need for wage-payroll personnel to maintain the gardens, at a savings of \$6,000 per year. Fifty percent of a standing appointment position was also re-assigned from the gardens to the greenhouse. This allowed us to eliminate a fixed-term appointment position in the greenhouse, saving an additional \$26,000 per year.
- Responsibilities for an administrative staff were modified due to the loss of a Support Assistant. We are working with college web support staff to maintain our web site. Salary savings to the college will be about \$26,000 per year.
- The travel costs for extension specialists to train Master Gardeners (MG) at off-campus locations were prohibitive; more than \$5,500 in travel and about 40 man-days per year. To enhance the quality and uniformity of MG training around the state, the Master Gardener program is using the College's polycom system to allow specialists on campus to participate in MG training at 9 locations.
- The annual Master Gardener Coordinators Conference is now using polycom technology and will save about \$10,000 in travel, lodging, meals, and registration compared to bringing participants to campus.
- The annual Alumni Newsletter is distributed electronically, saving about \$3,000 in publication and mailing costs per year.
- The department had a policy of paying 50% of the cost of fixed-term research technicians and each year the department paid 50% of the salary increases. The department's contribution has been stabilized at 2007 levels and faculty members are now required to pay for salary increases for the five staff members, saving the department about \$6,500 per year, with cumulative savings over a 5-year period of about \$34,000. The faculty recently approved a plan to further reduce departmental commitment by \$3,000 per year per employee for the next 4 years. This strategy will save the department \$15,000 in 09/10, \$30,000 in 10/11, \$45,000 in 11/12, and \$60,000 in 12/13.

Goal E: Enhancing the recognition, reporting, and distribution of the impact of our programming

Traditionally many horticultural operations in the state were predominantly large wholesale operations and many produced for the wholesale and processing markets. More recently there is an emergence of many new and often part-time growers, producing for retail markets. The increasing diversification of horticultural industries will require new methods to communicate science-based information to ensure their sustainability. There is also an increasing demand for home horticulture information. Master Gardeners help alleviate the workload on extension educators and state specialists by responding to home horticulture questions and by providing educational programs for noncommercial stakeholders. If county educators and state specialists are to work closely with commercial producers and generate research information, we must explore new methods of satisfying the increasing demand for home horticulture information. During the next five years we will undertake a series of activities to improve communications with the horticultural industries and to obtain additional financial and political support from our diverse stakeholders.

Strategies for 2008-2013

1. Develop a horticultural advisory board. Board members will represent all commodity groups and will provide input on our teaching, research, and extension programs.
2. Improve the department web site to provide information to diverse stakeholders
3. Submit multi-disciplinary agricultural experiment station project proposals
4. Continue to provide opportunities for county educators and possibly master gardeners to participate in multi-functional applied research
5. Enhance recognition, reporting and distribution of our program's impacts by surveying stakeholders to assess impact of extension recommendations
6. The Landscape Contracting program established a Facebook group for alumni in 2007. To date 130 have joined. The site is used for informal and formal communications, including news about the program, faculty, students, and alumni. Posts include photographs, important dates, and job announcements. A similar site is planned for alumni of the Horticulture major.

Performance Indicators

Improve department web site

The number of visitors accessing the Department of Horticulture's web pages will be monitored to determine if more people are accessing information from our programs.

Enhance impact reporting

Members of the horticulture NWG will develop evaluation instruments to capture information related to the impact of our extension programs. The Master Gardener program has greatly improved the reporting of its activities and this will be continued.

Electronic reports annually summarizing research projects will also be posted on the department web site.

Enhance recognition of horticulture programs

The horticulture alumni newsletter was first published in 2005 to inform alumni of the department's activities in teaching, extension, and research. The newsletter will be published annually and, when appropriate, other activities will be reported through news releases.

Goal F: Fostering Diversity

The Department of Horticulture will continue to participate in the College of Agriculture's diversity plan. During the past several years the department has attempted to improve the climate in the department and we will continue to explore new opportunities. Below is a summary of the department's recent activities.

Strategies for 2008-2013

- A climate Committee was formed and meets several times each year to identify opportunities to improve the working environment within the department.
- A monthly coffee hour was established to enhance interaction between staff, faculty and graduate students.

- Other social activities have included luncheons, breakfasts, and group attendance at Spikes baseball games.
- A column is included in our monthly newsletter “Hort d’oeuvres” to provide background information, by way of interviews, about graduate students, staff, and faculty. Some newsletters also have a quiz about departmental employees.
- A Climate Survey was administered to determine if department members experienced or observed discrimination or harassment. Few problems were revealed, and graduate students, members of the staff and faculty are encouraged to attend workshops on Sexual Harassment and other issues intended to improve the working environment within the department.
- To recruit underrepresented students, several faculty members have visited high schools with large populations of minority students to encourage students to apply to Penn State.

Priority Programs

The highest priority of the Horticulture Department is to strengthen its research capabilities. The department has not hired a new faculty member since 2004. In the last three years three faculty members have retired, and the department lost 1.1 research FTEs. Only one of the last five hires had a research appointment of more than 30% and two positions had no research appointment. As a result, the department has only 2.2 research FTEs at the Associate rank and we have no faculty members at the Assistant Professor level. Despite the loss of research FTEs, the department has recently increased the level of external funding, and infusion of additional faculty with new research expertise is critical for the department to remain competitive.

In the past three years, two faculty members with considerable teaching responsibilities in the ornamentals area (Beattie and Kuhns) retired. Extension appointments were substantially converted to teaching appointments to maintain the undergraduate programs. As a consequence, the department is no longer able to provide state-wide leadership to the extension programs serving the green industry. With the restructuring of extension, county educators will likely be expected to provide leadership for state-wide programs and state specialists with three-way appointments will provide some support for the ornamentals programs.

During the next five years, two more retirements with considerable teaching responsibilities in the ornamentals area are expected. The Horticulture curriculum will be reevaluated and courses will be reorganized to use teaching faculty time more efficiently while maintaining the quality of our undergraduate programs. This will allow us to teach important courses without further conversion of extension and research resources into teaching.

A new research emphasis in the department will be in the area of climate change as it affects horticultural production systems and plant biology. Jonathan Moore, American Society for Horticultural Science (ASHS) National Issues Consultant, recently provided the ASHS National Issues Task Force with a summary of a lunch meeting he attended with a staffer for Representative Colin Peterson, chairman of the new House Ag. Committee. *Climate Change* was one of the priorities that were mentioned. The department already has strong programs dealing with various aspects of climate change and environmental factors affecting plant growth and productivity, as well as the influence of plants and plant production on the environment, air quality, and water use and water quality. The department will continue to emphasize these areas in its research, teaching, and extension programs, and a request for a new faculty position with a

heavy research appointment will be developed to provide a focal point in the area of climate change and environmental factors. We will explore possible collaboration with the college of Earth and Mineral Sciences for a co-funded position in this area.

Another area of strength in the department is in edible crops. Since horticultural products are an important source of vitamins, minerals, and health promoting compounds, we would like to strengthen and expand the program with a position in nutritional genomics. A researcher studying the genetic traits associated with high nutritional value would support our genetics and breeding programs and could also work with applied production researchers to study the influence of cultural practices, such as plant nutrition, plant stress, and cultivars selection on the health properties of our crops. Such a position might be co-hired with the department of Food Science or the College of Health and Human Development.

Another area of emphasis will be entrepreneurship. Several faculty members have incorporated entrepreneurship into existing courses, and it will be the focus of a newly created course. The Cellar Market provides a unique opportunity to expose students to marketing and retailing. Entrepreneurship has also been increasingly incorporated into our extension programs. The Mid-Atlantic Young Grower Alliance originated with a group of young fruit growers in Adams County, but has rapidly expanded to include young fruit and vegetable growers from the mid-Atlantic region. Leadership for this organization has come from Pennsylvania Cooperative Extension and personnel will continue to work closely with this group of energetic horticultural producers because they represent the future of the horticultural industry.

The department will continue to seek a tenure-track position in the area of information literacy. One reason our students are in such high demand is because they are exposed to information technology that programs at other universities don't provide. We will explore opportunities to provide programs leading to a two-year certificate and/or associate degree in landscape contracting affiliated with the Penn State Center in Pittsburg. We expect most of the courses will be delivered electronically, and this position will be instrumental in developing and enhancing those courses. These would be the first web-based courses in landscape contracting that we are aware of and it would elevate our program to a new level. This program could also be expanded to other locations in the state. A two-year program is also expected to help us recruit new students into our four-year program at University Park.

An area of concern to the department is the anticipated demolition of existing greenhouses and headhouse complex. The department eagerly anticipates access to modern greenhouse facilities, but we are concerned that there may be inadequate greenhouse space on campus to adequately teach our courses. We are working with other departments to evaluate more fully teaching needs and a report will be submitted to the college in spring of 2009. We are also concerned that the space charges in the new research greenhouses may be too high to support applied horticultural research that traditionally has not been funded at the levels more common for fundamental research.

Of greater concern is the loss of the headhouses. Located in the headhouses is a classroom, a teaching lab, a research lab, a dark room, growth chambers, and office space for a faculty member, four research technicians, and about six graduate students. Headhouse space is also used for teaching labs in several courses, tomato seed extraction, and corn seed extraction and storage. The Cellar Market may also be lost and would no longer be available for teaching and marketing research. Half of the Cellar Market is also used for storing tools and equipment for the Landscape Contracting program and Arboriculture courses, as well as for some research projects. The department will work with the college to find solutions to our space losses.

PROGRESS REPORT ON THE 2005-2008 STRATEGIC PLAN

The Department of Horticulture accomplished many of its goals, while some objectives were not met due to various factors.

Goal A. Increase enrollment and enhance student success

1. Increase efforts to recruit and retain a high-quality and diverse pool of undergraduate students.

- The HORT and LSCPE websites were improved to emphasize recruiting. Student projects, student activities and career opportunities are highlighted. An Undergraduate student resource page was also added to provide a wide range of information about the department, the college and PSU that is useful for students.
- To improve student retention, a section of AG 150S was developed in 2007 for students majoring in Horticulture and Landscape Contracting.
- A student recruitment committee was established.
- DUS advisors were visited and given a plant for their desks at the beginning of fall semester to remind them about the Horticulture programs.
- Several faculty members visited high schools and middle schools to judge science fairs or present demonstrations, and also to provide information describing our majors.
- Jim Savage presented a number of tree climbing demonstrations for various audiences, including school children and he distributed recruitment information.
- Scholarship awardees and award winners are publicized in the departmental monthly newsletter and in the departmental alumni newsletter.
- The department dedicated some scholarship money for students in offer status or transfer to encourage them to accept our offer.
- The LSCPE major was promoted through student projects on campus including promotional signs on the tool trailer and a large banner identifying LSCPE participation.
- The Arboriculture minor was promoted by placing informational signs at the locations of student tree climbing activities.
- Additions to the Tyson Building lobby promote the department. These include a sign listing our majors, a picture directory of our faculty, staff, graduate students, and postdoctoral scholars, and interior plantings maintained by students. Our majors were promoted within Tyson Building by installing informative posters near the three classrooms that are used for non-departmental classes and throughout the building.
- Our students installed a new landscape surrounding Tyson Building to better reflect what we do.

- Students provide flower arrangements for the Nittany Lion Inn and the Ag Administration Building to promote the program and pictures of these arrangements are featured on our department web site.

2. Improve placement rates of our students

- Exit interviews with graduating seniors indicate that every Landscape Contracting graduate and 80% of graduating HORT majors have at least one offer.
- Exit interviews also indicate that most Landscape Contracting students take internships and most find them very useful. Many have job offers from the companies where they did internships.
- Students enrolled in *Greenhouse Management* performed energy audits in commercial greenhouses to improve interaction with the industry.
- Students enrolled in *Retail Horticultural Business Management* develop marketing plans and promotional strategies, and develop target customer profiles for local horticultural businesses.
- Company representatives frequently visit the department to recruit students, advise students on resume development, interview students for internship possibilities, and participate in lectures to provide a real-life perspective.
- Freshman enrolled in AG 150S are exposed to many of the research, extension, and international activities in the department, visit most of our research facilities, and are encouraged to do a research project. Undergraduate student projects are featured on our department web site.
- All students enrolled in AG 150S and HORT 269 are required to attend the College Career Fair.
- All Landscape Contracting and some Horticulture Students are archiving their college career accomplishments in e-portfolios and potential employers have greatly appreciated these efforts.

3. Evaluate current curriculum

- In 2006, the Landscape Contracting program was evaluated during a day-long meeting with leaders in the landscape, nursery and tree care industries. The resulting strategic plan for the program was used to justify a new position in Landscape Contracting to incorporate more information literacy into our courses.
- The second priority identified by industry leaders was an Arboriculture minor. The minor in Arboriculture was approved during the summer of 2008. We hope this minor will attract more students into our program.
- In 2006, a lab section of HORT 101 "*Introduction to Horticulture Lab*" was added to improve student retention. After consultation with College Administration, in 2007 this course was dropped in favor of adding a section of AG 150S intended for Horticulture and Landscape Contracting students to improve student retention.
- The General Education course, HORT 150 "*Plants in the Human Context*", was taught for the first time in spring 2008. About 90 students enrolled in this course and we hope some students may decide to transfer into Horticulture.

- Courses in Organic Agriculture and Organic Horticulture were taught and an option in Organic Horticulture is being developed. The Organic Agriculture course was taught in spring 2008 and the Organic Horticulture course was taught in fall 2008. Faculty members have also started incorporating more information on Organic production methods into horticulture courses. Other Horticulture departments have documented an increase in students majoring in Horticulture after adding similar courses.
- A one-credit course in Nursery Entrepreneurship was taught in fall 2008 and will be expanded to a three-credit course to include all horticultural commodities.

4. Strengthen teaching program by seeking grant support

- HORT 101 is offered by World Campus and has attracted students from outside of PA. Each year enrollment has increased.
- Students have participated in Studies Abroad, including study tours to England, Italy and Holland, and another tour is being developed for France. Student costs were partially defrayed with gifts from industry and alumni.
- In the Landscape Contracting program, rather than teaching students how to use software packages, they are being taught how to find software to do a particular job and how to teach themselves how to use it. In this manner, information literacy is incorporated into all courses.
- From July 2004 to June 2008 the department submitted 9 proposals for funds to develop or enhance instructional programs; 7 were successful for a total of \$161,680.

The Graduate Program

1. Improve the educational experiences of graduate students

- HORT 524 “*Experimental Procedures in Plant Science Research*” was taught in 2007 to provide students with training in applied experimental design, data analysis and data interpretation. Working with a College Graduate Committee, we requested the Statistics Department to offer applied courses for our students and the first in a two-course series was offered fall 2008.
- We have worked with the College Committee to develop an orientation program for new students.
- An effort has been made to improve the quality of the department seminar series. A graduate student was added to the Seminar Committee to encourage student input for speaker suggestions. In fall 2008 the graduate students organized the entire seminar series.
- Increased socialization is encouraged through monthly coffee hours and departmental events such as attending a Spikes baseball game and periodic breakfasts and cookouts.
- The Graduate Student section of the department web site was upgraded to include the revised Graduate Student Handbook, which includes the guidelines for completing a graduate program. This site also has information concerning

departmental research facilities, department and university policies and regulations, awards that are available, financial assistance, and sexual harassment.

- When possible, the department provides some financial assistance for students to attend professional meetings.
- A departmental IT lab, with four computers, a printer, and a scanner was developed for graduate students. Computers have software packages requested by students.
- New chairs have been placed in the graduate student office to encourage students to use their office desks.
- “Hortfest” was started in fall 2008. One evening each semester graduate students meet to socialize. Several students give 15-minute presentations on their research in an informal setting, followed by a pot luck dinner and fellowship.

2. Enhance graduate student recruitment

- The department increased M.S. assistantships to grade 11 and the PhD students are at grade 12, which is competitive with most other horticulture programs in the country.
- At least 12 faculty members have been involved in international activities during the past three years. A number of international students have been funded by cooperative projects with international scientists.
- An endowed scholarship has been used to fund a graduate student working in the area of floriculture.
- The department continues to provide funding for several students in Intercollege programs each semester. This has been particularly successful where faculty members have been able to leverage partial funding from Intercollege programs and with grant support.
- The number of inquiries about our graduate program increased immediately when we indicated on our home page that we had assistantships available.
- The diversity of our graduate program was increased by accepting two Latino students.

3. Evaluate opportunities to increase enrollment in the Master of Agriculture program.

- We are working with the College to replace the Master of Agriculture with a Master of Professional Studies.
- Conversations with county educators and horticultural industry leaders indicate a general lack of interest in a program similar to a Masters of Ag, but there may be more potential in the Landscape Contracting area. Enrollment in these programs will likely be influenced by the availability of funding.

Goal B. Enhance Departmental Flexibility and Capitalizing on Funding Opportunities Assuming Few Additional Resources

1. Enhance international funding.

- During the last three years Horticulture faculty members have been involved in six programs in Ukraine and other Eastern European countries, with more visits planned for the future.

- In collaboration with the University of Guanajuato, five Mexican students received training in applied vegetable research, plasticulture, and outreach.
- An agreement was signed between PSU and South China Agricultural University for further collaboration and inaugurated the joint lab of root biology. This will allow Chinese graduate students and faculty members to perform research at Penn State and to facilitate exchanges for graduate students and faculty members.
- The McKnight Foundation Collaborative Crop Research program and the Bean/Cowpea Collaborative Research Support program were collaborative efforts with students and scientists from Latin America, the Caribbean, Africa, and China. These projects are being continued.
- Research is being conducted in Greenland to examine how environmental factors can affect plant productivity and nutrient cycling.
- The Horticulture Department participated in a visit to the University of Puerto Rico at Mayaguez to sign a memorandum of understanding to facilitate exchanges and cooperative initiatives between the two countries in the area of teaching, research, and Outreach. The department participated in this program by hosting undergraduate students from UPR-M for a summer research experience.

2. Increase end-user support of outreach activities.

- Some county educators have increased their meeting registration fees to reimburse travel expenses for specialists.
- We have worked with PVGA and SHAP to cover expenses for departmental speakers to their annual convention in Hershey.
- We were limited by university regulations concerning charging for extension materials, but specialists now get 10% of the sales price for bulletins that they write. In 2008 the department received \$5,168 from the publications distribution Center and these funds were distributed to the authors.
- The Master Gardeners have met with several state agencies to discuss training of their employees involved in community beautification. If successful, some of the funds will be used to help support the state program.
- Sizable grants have been obtained from Monsanto and from Jatropha Biofuels.
- Members of the Horticulture Department were involved in three successful proposals to the Specialty Crop Research Initiative in 2008 and the total value of the grants was more than \$8 million. Additional proposals will be submitted in the future.

3. Increase industrial collaborative proposals.

- The Larry Kuhns Endowment was established to provide continuing support for extension and applied research in nursery crops. Thus far only \$1,200 has been obtained. The PLNA has verbally committed \$12,000 as a challenge gift and we are working with the PA Christmas Tree Growers to meet the challenge.
- Specialists met with Development staff to develop a list of potential donors for our extension programs.
- Faculty in the Landscape Contracting program met with Development personnel and we are developing a strategy to generate financial support for the Landscape Contracting program.

- PVGA now provides \$10,000 per year for general support of the vegetable program.
- The green industry has provided financial support for our students to attend national competitions, field trips and study tours. The tree care industry has donated equipment for the Arboriculture program and the industry provides partial funding for the arboriculture instructor. Gifts of greenhouse supplies are obtained each year.
- The department has contributed some funds along with much larger contributions by OPP and CAS to improve some of the greenhouses.
- There have been initial meetings with the wine growers to develop partial funding for a viticulturist.

4. Increase collaborative proposals.

- The department submitted a proposal for a position as part of the biofuels initiative.
- Collaborative research has been established with the departments of Animal and Dairy Science, Plant Pathology, Entomology, Agricultural and Biological Engineering, Agricultural Economics and Rural Sociology, Food Science, Biology, and scientists from several PSU institutes, and scientists from Cornell University, UC Davis, Univ. of Minnesota, Texas A&M Univ., Carnegie Mellon University, and the USDA.
- The department took a leadership role in developing a successful SCRI planning grant and will provide leadership for a larger future multi-state grant proposal.

GOALS, MEASURABLE TARGETS, STRATEGIES, AND ACTIONS

APPENDIX : Benchmarking against peer Institutions

Undergraduate and Graduate student enrollment history (2001 – 2008)

Student	08	07	06	05	04	03	02	01
Undergraduate Students								
HORT	48	57	63	53	69	71	80	76
LSC	129	128	140	138	126	124	126	109
Graduate Students (HORT plus Intercollege)								
M. Ag.		1	1	1	1	0	2	5
MS		15	9	14	16	15	11	8
PhD		24	24	24	23	23	27	26
Student Credit Hours								
Hort&LSC		5166	5094	4955	4914	5219	5287	5336

Peer Institutions used for Benchmarking (data from 2007)

Institution	Department Name and Entity
Cornell-Ithaca	Horticultural Science (Includes turf)
Iowa State	Horticulture (Includes turf)
Michigan State	Horticulture
Minnesota	Horticultural Science (Includes turf)
Ohio State	Horticulture and Crop Science (Includes turf)
Penn State	Horticulture
Purdue	Horticulture and Landscape Architecture

Faculty and Student Size

University	Faculty FTE					Student Enrollment		
	Total	Tch	Res	Ext	Other	4 year	MS	PhD
Cornell-Ithaca	19.00	3.80	9.50	5.70	0.00	54	14	34
Iowa State	14.70	5.08	6.51	3.11	0.00	164	12	12
Michigan State	33.00	9.75	14.07	5.20	3.98	126	15	21
Minnesota	19.27	5.78	8.90	3.59	1.00	84	7	6
Ohio State	37.70	7.90	19.95	9.85	0.00	51	13	24
Penn State	25.66	9.68	8.95	7.03	0.00	185	16	24
Purdue	25.84	12.50	10.75	2.59	0.00	114	4	34

Operating Funds to Faculty (\$)

University	Total	Teaching	Research	Extension
Cornell	559,450	0	318,450	241,000
Iowa State	19,300	18,000	1,300	0
Michigan State	90,000	0	90,000	0
Minnesota	---	---	---	---
Ohio State	---	---	---	---
Penn State	155,750	100,000	32,250	23,500
Purdue	148,850	61,800	47,900	39,150

External Funding (\$) 2006/07

University	Total (\$)
Cornell	2,580,892
Iowa State	1,097,351
Michigan State	3,618,286
Minnesota	2,222,485
Ohio State	2,318,875
Penn State	1,905,188
Purdue	2,651,313

Technical Support (FTE) Assigned to Faculty (State & Federal Formula funded only)

University	Teaching	Research	Extension	Total
Cornell	0.0	11.42	0.00	11.42
Iowa State	0.0	3.30	0.00	3.30
Michigan State	0.0	0.00	0.00	0.00
Minnesota	1.8	11.90	1.65	15.35
Ohio State	0.0	11.23	4.10	15.33
Penn State	0.5	3.50	1.00	5.00
Purdue	0.0	5.80	0.20	6.00

Graduate Support (FTE) Assigned to Faculty (State & Federal Formula funded only)

University	Teaching	Research	Extension	Total
Cornell	0.00	12.00	0.00	12.00
Iowa State	0.00	6.49	0.00	6.49
Michigan State	0.53	3.68	0.00	4.21
Minnesota	0.00	8.36	0.00	8.36
Ohio State	5.00	3.08	0.00	8.03
Penn State	3.00	7.50	4.50	15.00
Purdue	2.25	5.25	0.00	7.50