

# **Plant Doctors: Critical Element for Secure and Sustainable Crop Production**

by

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## **SUMMARY**

Numerous challenges threaten the ability of U.S. and world agriculture to attain a secure and abundant food supply. However, effectively addressing these challenges and moving toward more sustainable agricultural systems will create opportunities for agriculture that will positively impact rural communities and extend throughout the national economy. Creating opportunities from these challenges will require greater management expertise, and thus, require a greater number of advisors and other professionals serving production agriculture with the comprehensive skills critical to the development and management of increasingly complex production systems. The mission of the Doctor of Plant Medicine program at the University of Florida and the Doctor of Plant Health program at the University of Nebraska is to produce plant practitioners with extensive advanced training in all disciplines involved with plant health. Plant doctors will be able to integrate the complex information inherent in comprehensive plant production systems that are necessary to maximize agricultural productivity and sustainability. Plant doctors are vitally needed now to keep American agriculture competitive while addressing the many challenges to sustainable food, feed, fiber, and biofuel production.

Just as a Doctor of Veterinary Medicine knows all aspects of animal health and care, a plant doctor knows all aspects of plant care, including genetics, traits, pest and disease management, water management, fertility, soils and other agronomic practices.



## Challenges for U.S. and World Agriculture

The U. S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) has identified five goals for their efforts in research, education and extension in the future. These goals also overlap extensively with the major issues described in a recent Council for Agricultural Science and Technology Issue Paper on Agricultural Productivity Strategies (CAST, 2010). The NIFA goals address major issues that not only affect agriculture, but also, the physical and economic health and well being of rural communities and the entire country. These goals include:

1. Keep American agriculture competitive while ending world hunger,
2. Improve nutrition and end child obesity,
3. Improve food safety for all Americans,
4. Secure America's energy future through renewable biofuels,
5. Mitigate and adapt agriculture to variations in climate.

Production agriculture and plant management in the United States face numerous challenges in achieving each of these important goals. However, surmounting these challenges will dramatically benefit society and provide agriculture with numerous opportunities in the future. This will require a large cadre of professionals who understand the interdisciplinary complexities of developing sustainable plant systems.

However, interdisciplinary training programs at land grant universities are currently uncommon. In many institutions, applied graduate training has given way to basic research programs in an effort to obtain the support available for basic science. There has been a concomitant decrease in the financial support for applied educational efforts. These trends have resulted in a shortage of broadly trained professionals who understand the complex day-to-day factors affecting plant management and production systems.

Agriculture faces a number of political, scientific, and societal pressures that magnify the need for advanced plant health practitioners including:

- Increasing crop inputs and production costs
- Volatile commodity prices
- Economic stability of rural communities
- Food safety
- Renewable bioenergy
- Climate change
- Diminishing water resources
- Growing diversity of crop inputs
- Pesticide and fertilizer stewardship
- Deployment of genetically modified crops
- Impacts of invasive species
- Crop biosecurity
- Rural-urban interface issues
- Increasing complexity of plant management systems

## **Advanced Training Essential for Agricultural Advisors**

These challenges have made U.S. agriculture's long term economic and environmental sustainability more complex. Agricultural producers are in need of a much higher level of expertise to effectively manage their operations. This trend will continue and accelerate as production needs and sustainability pressures increase. We simply do not have enough interdisciplinary practitioners to provide competent advice to the production sector.

At present, the U.S. has over 400 million acres in agricultural production (NASS, 2007). Many producers have expanded their level of expertise by relying on crop consultants to provide additional input into their production operations. The largest group of independent crop consultants, the National Alliance of Independent Crop Consultants (NAICC), only has about 500 members that consult on about 27 million acres, or less than 10% of the country's total crop land (Jones, 2006). It is anticipated that in the next 5-10 years the majority of these crop advisors will be lost through retirement and with them their expertise in sustainable crop production and food safety (Lin, 2007).

A second important group of agricultural advisors that promotes safe and sustainable crop production is the extension educators/agents. But due to budgetary constraints many states have cut the numbers of extension personnel. In addition, the increasing complexity of agriculture has put greater pressure on the remaining extension professionals with degrees mostly in a single discipline. Training in a single discipline, even at the doctoral level, does not prepare an extension advisor for the breadth of plant health management issues they face on a daily basis. As with crop consultants, seasoned extension agents who have developed interdisciplinary expertise over time are being lost through retirement at a higher rate than they can be replaced.

Another very important group of plant professionals are those employed in agribusiness. Of necessity these individuals also work extensively across disciplines, but their initial training most often is in a single discipline. Agribusiness has a huge stake in increasing the number of plant practitioners who can interpret, diagnose and help design sustainable plant systems in an ever increasingly complex production environment. The new technology used in crop production requires greater attention to product stewardship (e.g. optimum use recommendations, resistance management and minimization of non-target effects).

A final group of plant professionals critically important to U.S. agriculture are those in federal and state agencies that work to provide regulatory guidance and to prevent and/or mitigate the introduction of invasive species harmful to agriculture and natural resources. Managers in these regulatory agencies consistently voice the need for interdisciplinary educational programs to provide a more effective and efficient work force. More than half of the most experienced individuals in the regulatory community are expected to be lost through retirement over the next 5-10 years (Paul Hornby, State Plant Health Director – Florida, USDA-APHIS-PPQ).

The most knowledgeable of these professionals, whether they are in the public or private sector, have developed extensive expertise encompassing all plant disciplines. Most have received formal training through a bachelor's or perhaps M.S. or Ph.D. degrees in a single discipline. To be effective plant advisors they acquired additional plant health management expertise through the slow process of continuing education and on-the-job learning. In this way they became interdisciplinary experts and well respected plant health practitioners.

The need for an interdisciplinary program that focuses on training plant health practitioners in much the same fashion as medical doctors (MD) or veterinarians (DVM) has been expressed for decades (Agrios, 2001; Bradshaw and Marquart, 1990; Browning, 1983, 1998; Capinera, 2000; Kendrick, 1984; Merrill, 1979; Tammen and Wood, 1977 and others).

Recently this type of training program has gained more attention. In referring to the challenges of energy security, national security, human health, and climate change a 2009 National Research Council Report ([http://dels.nas.edu/ag\\_education/](http://dels.nas.edu/ag_education/)) called for significant changes in agricultural education ‘*to foster the next generation of leaders and professionals needed to address these challenges*’. The general need for professionals trained across science disciplines on the masters level has recently been recognized (Colwell, 2009; Musante, 2009).

We believe that broadly trained, interdisciplinary plant health practitioners are needed on the doctoral level to synthesize and apply the large quantity of complex information generated by ongoing agricultural research and the advent of new technology. Only such an advanced educational program can provide the depth of knowledge and real-world problem solving experiences necessary to produce effective plant doctors.

## **Plant Doctors as Practitioners**

In 1999, the University of Florida established the first such advanced agricultural science program, the Doctor of Plant Medicine (DPM) degree program. Since that time the success of this educational concept has been demonstrated by producing 50 practitioners who have gone on to employment in a wide array of plant health leadership positions in agriculture and closely related fields (see [http://dpm.ifas.ufl.edu/careers/jobs\\_held\\_by\\_graduates.shtml](http://dpm.ifas.ufl.edu/careers/jobs_held_by_graduates.shtml) ).

In this context of increasing demand for advanced interdisciplinary professional training, the University of Nebraska – Lincoln established the second professional doctoral program of its kind in the United States in 2009, the Doctor of Plant Health (DPH) degree program. The establishment of the DPH program involved numerous interactions and widespread input from agricultural industry, crop consultants, federal agencies, and extension personnel from across the country. The program is patterned closely after the University of Florida DPM program. The first students in the DPH program started in the spring semester, 2010.

The mission of the DPM/H programs is to produce plant practitioners with comprehensive interdisciplinary training in all aspects of plant health. These plant doctors are ready to provide the expertise needed to develop and manage complex crop systems in a way that maximizes their economic and environmental sustainability.

The DPM/H are professional degrees focused on developing plant health practitioners. The primary prerequisite for entrance to the programs is a B.A. or B.S. degree in an agricultural science, biological or related science. Those entering with an M.S. degree in one of the core disciplines of the program (agronomy, horticulture, entomology, plant pathology, soil science or weed science) receive credit toward graduate course work taken. Students can expect to earn a DPM/H degree in a minimum of 3 to 4 years, depending on their background and course load.

## Distinctive Features of Plant Doctor Education

The DPM/H degrees require a rigorous program of study that provides the student with comprehensive training across all agricultural-related disciplines. A total of 120 graduate-level credits are required for the degrees, 30 more credits than are required for most Ph.D. degrees. The distinctive features of DPM/H degrees include:

- 1) Comprehensive interdisciplinary ‘core’ of courses provides a depth of training across the plant-related disciplines (plant pathology, entomology, plant science, soil science and weed science).
- 2) Required internships target professional goals of the students and enable the students to integrate their ‘core’ training to solve problems and address diagnosis and management issues. Internships typically include projects with agribusinesses, crop consulting firms, extension specialists, or state/federal regulatory agencies.
- 3) Extensive training in diagnostics that emphasizes hands-on learning.
- 4) Elective courses give the student flexibility to reach individual career goals.
- 5) Required research methodology practicum to ensure an understanding of research methods and applied plant health literature.
- 6) Educational opportunities in problem-solving, communication, leadership, policy, conflict resolution, professionalism and ethics.

We believe that plant doctors are vitally needed now to develop and maintain sustainable plant production and management systems for agriculture in the U.S. and worldwide.

### Additional information on the DPM/H programs:

Doctor of Plant Medicine (UF)

Website: <http://www.dpm.ifas.ufl.edu>

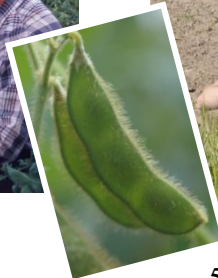
Curriculum: [http://www.dpm.ifas.ufl.edu/prospective\\_students/curriculum.shtml](http://www.dpm.ifas.ufl.edu/prospective_students/curriculum.shtml)

Careers of Graduates: <http://www.dpm.ifas.ufl.edu/careers/index.shtml>

Doctor of Plant Health (UNL)

Website: <http://dph.unl.edu/home>

Curriculum: <http://dph.unl.edu/curriculum>



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