

Engineering, Economics Structures and Innovations

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Computer Use and Access by Maryland's Nursery and Greenhouse Crop Producers

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Nature of Work: The availability of horticulture information over the Internet has increased at an exponential rate over the past couple of years. Ornamental crop growers now have access to Extension publications, listservs, commercial information, association, and college course work over the Web. They can access this information on a time and location independent basis (Rhodus & Hoskins, 1996). They can also directly e-mail their production questions to discussion groups and to county, regional and state level Extension professionals (VanVranken & Cowgill, 1996). In 1998 the Maryland General Assembly passed the Water Quality Improvement Act (WQIA). This Act mandated nutrient management planning for all agricultural operations, including nursery and greenhouse operations, by the end of 2001. In addition, the WQIA required training of nutrient applicators. Also in 1998, the University System of Maryland created the Web Initiative in Teaching (WIT) project to encourage faculty to development Web-Based instruction. A team of Cooperative Extension and resident instruction faculty are using these two opportunities to create web-based nutrient management planning and training courses for Maryland's ornamental crop producers.

In the instructional design process for web-based instruction, creating an audience profile which details the characteristics of the potential learners (Schreiber & Berge, 1998), is a critical component. Information was needed regarding Internet access and use by Maryland's nursery and greenhouse crop producers. The Maryland team created and administered a mail survey to a list of 172 ornamental crop producers in September of 1998. The final mailing list came from the Maryland Department of Agriculture's Nursery Inspection Program and Extension mailing lists. Data was collected on hardware and software use and Internet access,

Results and Discussion: 75 of the 172 growers surveyed returned the questionnaire for a response rate of 45%. 75% of the responses were from the firm owners with the remaining 25% managers or other workers. 81% of the growers indicated computer access at work and 75% com-

puter access at home. 51% of the growers had Internet access at work while 51% had access at home. The majority, 52%, was using Pentium or Pentium Pro systems. Only 11% were using Mac or Apple platforms. Almost 1/3rd, 31%, had a computer speed of 251 or higher, with 40% at 151-250 and 29% less than 151K. Almost 3/4ths of the growers, 72%, who had computers indicated a CD-ROM, 26% had zip drives and 45% had sound cards in their systems. A surprising 53% of the responders indicated connections to the Internet at 56K with the next largest group, 42%, at 28.8 to 33K. When growers were asked what Internet browser they used, 24% indicated AOL, 46% Netscape and 28% Internet Explorer. Of the growers surveyed, 39% indicated that they have e-mail access at work and 47% indicated e-mail access at home. 51% of the producers indicated that they had used the Internet to access horticulture information and 36% responded that they had downloaded horticulture information from web sites. Only 2% (one responder) indicated participation in a web-based course. When asked if they would take a course over the Internet, 35% responded yes, 15% said no and 50% indicated maybe or were undecided.

Significance to Industry: The survey results give a snapshot of computer and Internet access by Maryland's ornamental crop producers. Not all nursery and greenhouse growers will avail themselves of the information accessing opportunities offered by the Internet. A certain segment of the industry, however, as they upgrade their current computer systems and Internet access becomes available over cable and satellite systems; will be able to become more efficient in accessing needed production information on a time and location independent basis. The Internet can be used by Cooperative Extension to deliver detailed and complex information to nursery and greenhouse growers. By accessing web-based instruction, growers will be able to meet government mandated training requirements, such as pesticide recertification or nutrient management, without having to leave the growing site or their homes. In the process of development of web-based information and courses, Extension professionals need to be aware of software, hardware and bandwidth constraints faced by nursery and greenhouse crop producers.

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Web-Based Educational Programs for Water and Nutrient Management Planning and Implementation

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Nature of Work: The primary objective of this education initiative is to reduce nutrient runoff from the nursery and greenhouse industries into surface and groundwater systems by providing relevant information to members of these industries. Specifically, we are developing one course that will enable nursery and greenhouse industry professionals to write nutrient management plans for individual operations, and a second course for nutrient applicators to implement those plans. Professionals within these industries provide a challenge as they have significant time commitments and are widely dispersed. Thus, to reach this audience effectively, we need to develop courses that are both time and location independent. Therefore, we have chosen to distribute this information through interactive web-based courses. A user skill level and technology survey of the Maryland nursery industry was completed in Fall, 1998. It indicated that approximately 40% of the managers and professionals within the green industry would be interested in, and were capable of, accessing a Web-delivered course. Web-based delivery also provides support to under-served groups, as internet access is available in many individuals homes, at most high schools, and at many libraries. Therefore, individuals whose circumstances (such as remote location, physical handicap, employment, or the presence of dependants) limit their ability to take courses in a classroom setting can also benefit from the course.

Results and Discussion: At present, no courses are focused specifically on the development of nutrient management plans and estimating the risk for nutrient leaching from the nursery and greenhouse industry in the United States. Almost all nursery crop production and greenhouse management courses at the University level include the core subject matter of soils, substrates, irrigation and fertilization strategies, but few require the student to formulate specific risk assessment and risk management strategies for individual nurseries based on that subject material. Some existing nutrient management certification programs, (e.g. in Maryland) focus primarily on agronomic and not horticultural production systems.

A multidisciplinary team that includes horticulturists, bioresource engineers and distance education specialists from the University of Maryland is in the process of designing and creating a Web-based resident and Continuing-Education program that will cover both training requirements for these industries. Both courses are being developed in conjunction with the University System of Maryland's Web Initiative in Teaching programs. A conceptual website that explains the course in greater detail can be found at <http://www.courses.umd.edu/public/HORT400>. The course is specifically designed to be easily accessed at any time or in any location by the learners, whether they are growers, extension educators or University students.

The courses will be delivered using WebCT, a web-based courseware package supplied and supported by the University of Maryland. The nutrient management planning course will consist of modules that cover subject areas crucial to understanding the complexity of nutrient management decisions, namely soils and substrates, plant nutrient use, fertilization, irrigation, storm-water management and risk assessment. These modules will be supported and enhanced by text resources, photographs, graphic illustrations, and video and audio clips. To minimize the download times, a CD-ROM containing high-resolution images, sounds, and digital videos that are used to support the course will be distributed to the students. The WebCT courseware allows for a seamless interface between the student's local CD-ROM drive and the materials on the web. Learners will apply the information from the content modules to real nursery or greenhouse case studies throughout the course. Students will be grouped (e.g. a resident student with a nursery professional and an extension educator) to work on a specific case study (perhaps the professional's own nursery) throughout the course. The groups will then develop nutrient management plans based on the various case studies using individual and group asynchronous WebCT fora that can be accessed by the whole class. In this way, groups working within different fields of the nursery industry (e.g. pot-in-pot field nursery versus a wholesale greenhouse) can see how nutrient plans are formulated for different operations. These plans will be used to build a database that will, over time, act as the basis for a broad decision-support system for creating nutrient management plans.

Course Objectives:

1. Learners will identify the basic components of nutrient management in the nursery industry and describe the relationship between these components.
2. Learners will understand the legislative and executive mandates regulating nutrient management that have been enacted by state,

regional, national and international governments and other regulating bodies.

3. Learners will define, describe and characterize the relationships between the composition, function, physical and chemical properties of soils and soilless substrates.
4. Learners will define and describe the basic properties of macro- and micro-nutrients and their function in plant metabolism; compare and contrast strategies for incorporating or applying nutrients to various soils and substrates; differentiate between forms of fertilizers and describe advantages and disadvantages of each under different production systems.
5. Learners will define and describe basic chemical properties of water and develop and evaluate strategies for irrigation, fertigation, and storm water management.
6. Learners will develop risk assessment strategies to apply to various production scenarios.
7. Learners will apply the knowledge they have acquired in the content modules to case-study scenarios, by analyzing alternative scenarios, and developing appropriate nutrient management plans and strategies for solving complex nutrient management problems.

The “applicators” course is a condensed version of the planning course that provides continuing education material for nutrient applicators and will meet training requirements of the State nutrient management law. It will be low-cost, and available either through 12-week access to the WebCT server or via a 2-day nutrient applicators short-course to be held twice a year. This two-day short course will be supported with printed materials. The content will cover material outlined in objectives 3-5, providing nutrient applicators with up-to-date information that will enhance their job skills and performance.

Significance to Industry:

In 1998, the state of Maryland legislated that all agricultural operations develop and implement Nitrogen (N) and Phosphorus (P)-based nutrient management plans by December, 2001 if they apply chemical fertilizers in any form. Given the diverse nature of the Nursery and Greenhouse industry, this task poses distinct challenges due to the wide range of production scenarios and the large number of plant species grown. Since this legislation requires that plans reduce N and P movement off the farm into streams and rivers that drain into the Chesapeake Bay, this task also involves the control of irrigation and storm-water runoff. In order to be sustainable, however, nutrient management plans will have to be site-specific and economically feasible. The immediate task is to train certified nutrient management planners who can write these plans. In

Many other states are considering implementation or have already implemented similar nutrient management mandates, particularly in light of the Federal Clean Water Act. The general perception is that many nurseries are intensive users of nutrients and water. All States require safe reliable water resources for public and agricultural use, so the pressure to reduce nutrient runoff will only increase over time, both at the State and Federal level. This requires that we create effective education programs to disseminate factual and practical information to these industries to ensure their economic survival.