H o r t i c u l t u r a l E n g i n e e r i n g

Volume 14 No.6 November 1999

Website: www.cook.rutgers.edu/~roberts/

Website Technology

Many have responded to the request for receiving this publication via the internet. For those of you who would like to do that and have not so-indicated we would be happy to accommodate you.

www.cook.rutgers.edu/~roberts/

We are maintaining a list of those who desire to do so. When the latest Horticultural Engineering Newsletter is available then an e-mail notice will be sent out indicating its availability.

The use of the website seems to be a growing desire among growers and researchers alike. Watch the popular greenhouse publications for listings of other helpful websites.

Website of Interest

This Issue of Horticultural Engineering like previous ones is available on the web at:

www.cook.rutgers.edu/~roberts/

Our hope is that many of you will want to make use of the website and eliminate the need for us to send you a hard copy.

Thanks for helping us save the duplicating, postage and handling costs in our department. We will send an e-mail announcing the Horticultural Engineering Newsletter.

DR. AREND-JAN BOTH JOINS THE FACULTY OF COOK COLLEGE AS EXTENSION SPECIALIST IN CONTROLLED ENVIRONMENT ENGINEERING

Dr. Tom Orton
Chairman Specialist Department

We are pleased to announce that Dr. Arend-Jan (A. J.) Both has accepted an offer to join the Cook College faculty as of January 3, 2000. A. J. will hold primary and secondary appointments, respectively, in the Departments of Extension Specialists and Bioresource Engineering. The focus of A. J.'s program of research and extension will be on agricultural structures and controlled environmental factors of phytomation systems.

We look forward to A. J.'s leadership in the development of new technologies to make controlled environment agriculture in New Jersey more profitable and sustainable. A. J. comes to us from Cornell University, where he is Research Associate and Project Coordinator for the construction and operation of a commercially scaled hydroponic lettuce production greenhouse facility.

He received his Ph.D. in Agricultural and Biological Engineering from Cornell in 1995. A native of the Netherlands, A. J. received his B.S. and M.S. degrees in Agricultural Engineering from the Agricultural University

TECHNOLOGY

Farmers —-Internet Use

The following is an an interesting news tidbit about farmers use of the internet from @Griculture Online.

Farmers double Internet use, but rural areas run behind in Web access USDA National Ag Statistics Service says 65% of US farms with sales of $250,000 or more use a computer for their farm business, and 52% have Internet access. Computer use by farms with more than $100,000 ran 47% in 1997, compared to 53% in 1999, while Internet use more than doubled, from 20% in 1997 to 43% in 1999.

Even so, a group called the Advance Coalition has identified twelve rural states, dubbed the "Disconnected Dozen," that are falling behind in deployment of Internet backbone hubs. This means they are "at serious risk of being denied the end-to-end broadband Internet access their citizens require to stay competitive in the emerging digital economy," the group says.

An Outstanding Year

The year 1999 will go down in the books as an outstanding year of plant sales for the entire horticultural industry. Sales were up, demand up and profits up. We can expect an expansion of the industry as a result of the positive increases in sales during the past several years. Unlimited opportunities exist for aggressive entrepreneurs in the horticultural industry.

Ralph Freeman Editor
Long Island Horticulture News
October 1999

Greenhouse Vegetable Industry Booming in Ontario, Canada

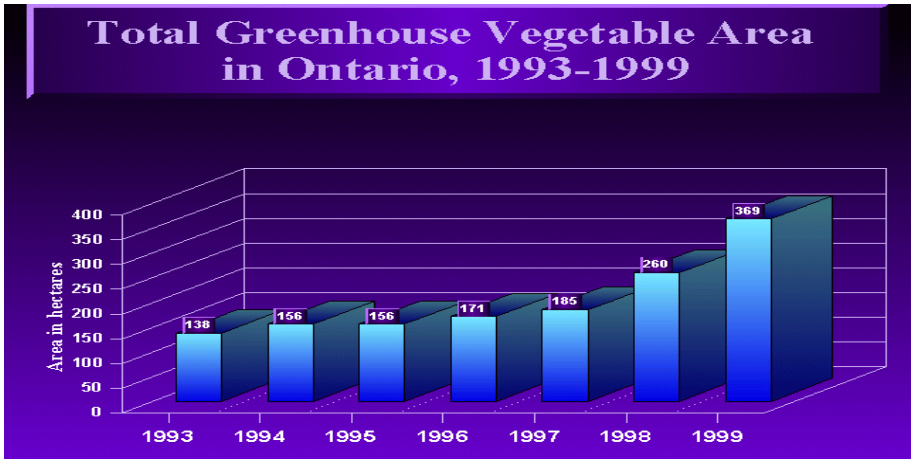
The total greenhouse vegetable growing area in Ontario Canada has risen nearly two-fold in the last three years. This growth has not only been in the total area of greenhouse vegetable production but also in the average size per greenhouse operation.

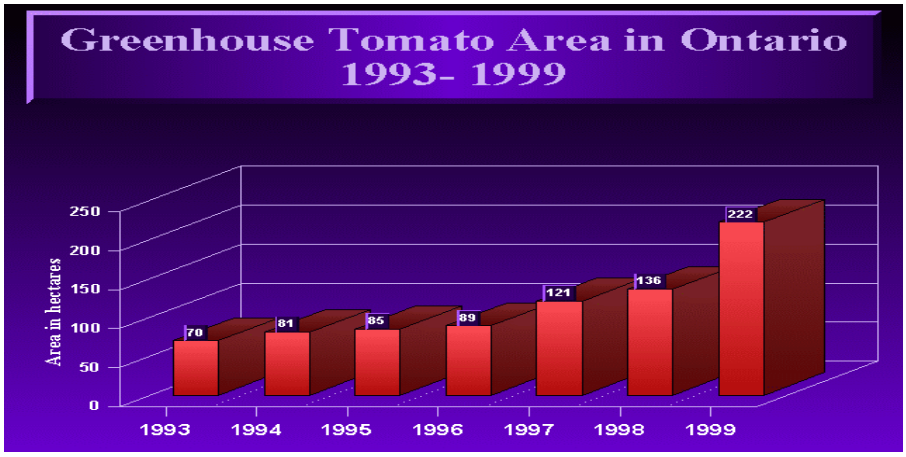
Ms. Gillian Ferguson, Greenhouse IPM Specialist Ontario Ministry of Agriculture, Food and Rural Affairs at Harrow, Ontario, Canada recently presented a paper at the Canadian Greenhouse Growers Convention. She has kindly supplied the figures on page 3 and the text for this column. The figures clearly indicate this tremendous growth in the greenhouse vegetable industry.

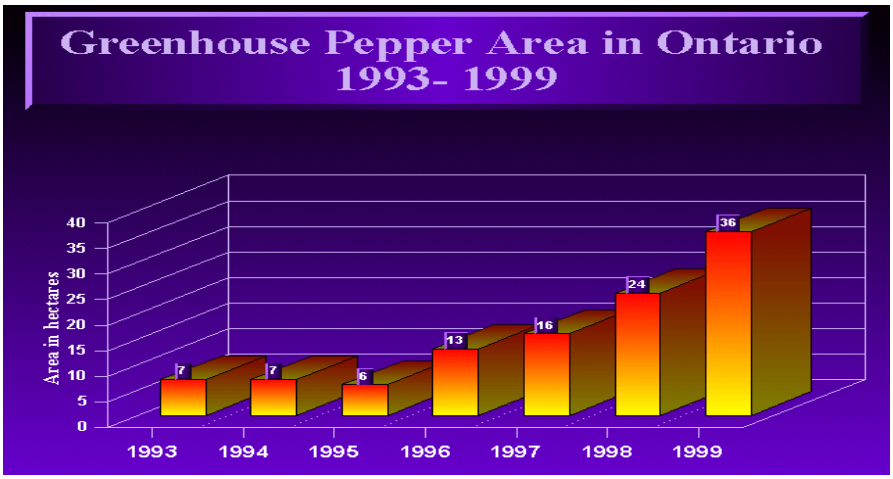
The average greenhouse range has also increased in size from about 1.25 acres (0.5ha) to 6.25 acres, (2.5 ha). Tomatoes have supplied much of this increase with peppers showing a significant increase as well.

Dr Ferguson gave these figures at the recent Canadian Greenhouse Growers conference at the University of Guelph with over 2780 attending.

The main thrust of her paper was the occurrence of new or previously insignificant pests which have accompanied this intensive expansion in the industry. To combat these problems new management strategies had to be developed. Her paper, entitled “Pest Management Trends in Greenhouse Vegetables in Ontario is available from the author as well as from your editor who appreciates Ms. Ferguson’s sharing of this information on the dramatic growth of the greenhouse vegetable industry in Ontario. growing area in Ontario Canada has


Total Greenhouse Vegetable Area in Ontario, 1993-1999
Area in hectares
400
350
300
250
200
150
100
50
0
138
156
156
171
185
260
369
1993
1994
1995
1996
1997
1998
1999


Greenhouse Tomato Area in Ontario 1993- 1999
Area in hectares
250
200
150
100
50
0
70
81
85
89
121
136
222
1993
1994
1995
1996
1997
1998
1999


Greenhouse Pepper Area in Ontario 1993- 1999
Area in hectares
40
35
30
25
20
15
10
5
0
7
7
6
13
16
24
36
1993
1994
1995
1996
1997
1998
1999

Guidelines for Producing Safe Fruits and Vegetables

A recent newsnote from Rick Van Vranken, Rutgers Cooperative Extension discussed the new guidelines to minimize microbial food safety hazards for fruits and vegetables. The 'Guide' is intended to provide "Guidance for Industry" to help fruit and vegetable growers and shippers assess their operations.

They worked closely with the USDA and the EPA to identify potential areas where food borne disease organisms might contaminate fresh produce from the field to the table.

Five area raised the greatest concern and provide the basis for Good Agricultural Practices (GAP's) described in the Guide.

- **Water-** from the irrigation source and water used in packing lines, to water used to clean transportation vehicles, handling and preparation systems.
- **Worker Hygiene** humans carry pathogens and any contact with fresh produce creates the potential to contaminate it. Good hygiene by all workers who handle fresh produce, from the field to the packing house to the kitchen, is a must.
- **Manure** manure, biosolids, are the most likely sources of pathogens than can cause food borne disease.
- **Transportation** proper care and handling of fresh produce dictates the use of clean refrigerated transportation equipment, supplies and facilities
- Traceback FDA needs a way to find the likely source of contamination, if an outbreak occurs.

The FDA has begun work with the USDA to reach out to growers and shippers through Extension and industry trade associations. Presently the Guide represents voluntary efforts to help the industry assure the safey of fresh produce, but the market will demand it.

Information on food safety can be found at **www.foodsafety.gov**

The **Guide** can be found on the following website.

www.foodsafety.gov/~prodguid.html

The mail address is:

FDA Food Safety Initiative Staff
HFS-32
US Food and Drug Administration
Center for Food Safety and Applied Nutrition, 200 C Street SW
Washington DC 20204
202 260 8920.

The following information on the safety and engineering considerations for cooling produce during holding and shipping were taken from the website listed above. The engineering implications of this are clear and will help in the battle to improve and maintain our food supply.

2.4 Cooling Operations

Various methods are available for cooling produce, including water, ice, and forced air. The method used depends on the fruit or vegetable and the resources of the operator. In most instances, cooling with air (such as vacuum coolers or fans) will pose the lowest risk.

Water and ice used in cooling operations should be considered a potential source of pathogenic contamination. Further, reuse of water to cool continuous loads of produce increases the risk of cross-contamination. For example, contaminated produce from a single container going through a cooling process may result in the build-up of pathogens over time in the cooling water supply. Operators should follow good management practices to ensure that chilling does not introduce food

Maintain temperatures that promote optimum produce quality.

The benefits of chilling to remove field heat and the temperature requirements for optimum keeping quality vary for different types of produce. Adequate refrigeration, in conjunction with crop characteristics, such as pH, is an important safeguard against many pathogens. Further, good quality, intact produce is most resistant to microbial contamination and growth. Thus, maintaining temperatures that promote optimum product quality may reduce the risk of microbial hazards.

Maintain air cooling equipment and cooling areas.

Air cooling equipment and cooling areas should be periodically cleaned and inspected. Potential sources of contamination should not be located near air intakes.

Consider the use of antimicrobial chemicals in cooling water.

Antimicrobial chemicals in cooling water may reduce the potential for microbial contamination of produce.

Keep water and ice clean and sanitary.

Consider periodic microbial testing of chilling water and water used to make ice. Operators should contact ice suppliers for information about the source and quality of their ice. Water in hydrocoolers should be changed as needed to maintain quality.

Manufacture, transport, and store ice under sanitary conditions.

Equipment should be clean and sanitary.

Chilling equipment, such as hydrocoolers, and containers holding produce during chilling operations should be clean and sanitary. Field soil should be removed as much as possible from produce and containers prior to chilling. Interiors of hydrocoolers should routinely be cleaned and sanitized.

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The following information is also from the **Guide** and concerns the handling of water in cooling and packing and processing operations.

Follow good manufacturing practices to minimize microbial contamination from processing water.

Water quality needs may vary depending on where the water use falls within the series of processes and whether a particular process is followed by additional cleaning processes. For example, water quality needs may be greater for water used for a final rinse before packaging compared with water in a dump tank where field soil from arriving produce quickly mixes with the water.

Water quality consistent with U.S. EPA requirements for drinking water, or similar standards, is recommended

Where water is reused for a series of processes, it is recommended that whenever possible, water flow counter to the movement of produce through the different unit operations. For example, water might be used first in a final rinse then reused in an earlier unit operation, such as a dump tank.

2.2 Antimicrobial Chemicals

Prevention of contamination is preferred over corrective actions once contamination has occurred. However, antimicrobial chemicals in processing water are useful in reducing microbial build-up in water and may reduce microbial load on the surface of produce. Thus, antimicrobial chemicals may provide some assurance in minimizing the

Opportunities for Greenhouse Engineering Programs

Greenhouse engineering technology is changing rapidly. It is often beneficial to take courses which will help keep abreast of the industry and its new technology challenges and opportunities. Following are two programs which are designed to help the researcher, extension worker, greenhouse grower and manager keep stride with the changes, not all of which are appropriate to every grower. Although retired, your editor will be conducting the Environmental Control and Design of Greenhouse System Short Course on Jan 10-11, 2000. Dr. A.J. Both, (see page one) the new horticultural engineer will also be teaching during the conference.

Dr Peter Ling has provided the program for the Ohio growers to be held in Wooster,

Environmental Control and Design of Greenhouse Systems

January 10 and 11, 2000

Supplemental lighting and the importance of media composition have been added to this popular short course which explores the important parameters for the design of efficient and environmentally friendly greenhouse systems. These parameters include; choices of greenhouse glazings and re-glazing options, concepts for environmental control including heating, floor heating and systems for ventilating and cooling growing areas.

Other topics include: Planning for expansion, materials handling systems, irrigation and watering systems, mechanization concepts and benching design and layout as it relates to space utilization. Some new aspects of growing systems will be discussed including, supplemental lighting for photosynthesis and composition of soil media to ensure adequate and proper moisture movement when using ebb and flow type of irrigation systems for crop production. **Both of these topics are new to the course this year**.

The course also features a one-half day tour to three greenhouse operations, including a one-acre research/ demonstration greenhouse located at the Burlington County Resource Recovery Facility. This greenhouse features the use of methane gas for co-generation to produce electricity for supplemental lighting for tomato production and heat for environmental control of the facility. Our second stop is Kube Pak Corporation, a 14 acre, family-owned bedding and pot plant operation, and Carl Blasig's operation, a family-owned, two-acre glass greenhouse complex. The tour highlights and illustrates information presented during the classroom part of the course, including several glazings, floor heating, transportable benching, fog cooling, insect screening, supplemental lighting, and irrigation systems..

Who Should Attend?

The course is designed for greenhouse owners and managers, growers, extension and research workers, nurserymen and industry representatives. Benefits include the ability to understand, environmental control and its limitations, the important relationships involved with water quality as it affects fertilization programs, a logical expansion planning process and the importance of greenhouse glazing in efficient production systems.

Call and register for this great opportunity to enjoy the company of your friends and gain new information. **Registration is handled through the Office of Continuing Professional Education at Cook College. Earlybird registration will be helpful to us and beneficial to the participants. The phone number is 732 932 8451 and you may speak**

with Margaret Stegmann

Environmental Control and Design of Greenhouse Systems

January 10 and 11, 2000

Monday January 10, 2000

8:00 AM	Registration
8:30 AM	Greenhouse Design and Glazing Choices Professor William Roberts
9:30 AM	Ventilation and Cooling of Greenhouses Dr Gene Giacomelli
10:30 AM	Break
10:50 AM	Supplemental Lighting for Greenhouse Production Dr. A.J, Both
11:30 AM	Tour of Research Greenhouses Dr Gene Giacomelli Professor William Roberts
12:15 PM	LUNCH
1:15 PM	Greenhouse Heating Systems Professor William Roberts
2:15 PM	Soil Media Composition as it Relates to Soil Warming and Ebb and Flow Watering Systems. Dr. George Wulster
3:15 PM	Break
3:30 PM	Irrigation/Watering Systems for Greenhouse Production Mr. Ralph Freeman
4:15 PM	Mechanization and Space Utilization Dr Gene Giacomelli
4:50 PM	Adjourn

Tuesday January 11, 2000

8:30 AM	Soil Heating for Floor and Bench Systems Professor William Roberts
9:30 AM	Developing a Master Plan for Greenhouse Expansion and Orderly Growth Mr. John Hoogeboom
10:30 AM	Break
10:50 AM	Getting Started in the Greenhouse Business Professor William Roberts
11:30 AM	International Controlled Environment Agriculture Mr. John Hoogeboom
12:00 PM	Greenhouse Bus tour

Lunch on the bus

5:00 PM Tour returns and adjournment

Environmental Control and Design of Greenhouse Systems

January 10 and 11, 2000

Course Coordinator

Professor William J. Roberts
Professor Emeritus, Rutgers University

Faculty:

Dr Gene Giacomelli
Professor Bioresource Engineering Department Rutgers University

Mr. Ralph Freeman
Floriculture Specialist Cornell University, Riverhead, New York

Mr. John Hoogeboom
Agronomico, International Greenhouse Consultant, Hendersonville, NC

Dr. A.J. Both
Specialist in Bioresource Engineering, Rutgers University

Dr George Wulster

Greenhouse IPM Notes

This Newsletter, a joint publication of Cornell University and Rutgers Cooperative Extension is edited by Jim Willmott, of Rutgers Cooperative Extension of Camden County and Ralph Freeman Floriculture Specialist of Cornell University at Riverhead, (Long Island) New York.

This publication is designed to assist the grower in determining and overcoming common production problems dealing with integrated pest management in the greenhouse industry throughout the Northeast. The publication is available from either of

Ralph N. Freeman
Cornell Cooperative Extension
246 Griffing Avenue
Riverhead, NY 11901
516 727 7877

James D. Wilmott
Rutgers Cooperative Extension
152 Ohio Avenue

An Overview of the Southern European Greenhouse Industry

At the recent Canadian Greenhouse Growers Conference Pedro-Florian Martinez from Valencia Spain gave an excellent presentation on the extent of the horticulture industry in the Mediterranean basin. Parts of his talk are excerpted here. His mailing address is at the conclusion of the article. Your editor spoke with him and asked permission to summarize his excellent presentation which he graciously granted.

One of the biggest concentrations of protected crops in the world can be found in the Mediterranean region, with around 400,000 hectare (1,000,000 acres) out of which 100,000 hectare (250,000 acres) correspond to greenhouses and the rest to low tunnels and mulching.

The largest greenhouse areas are found in Spain with close to 46,000 ha and Italy, close to 25,000 ha. In France there are some 9,500 ha, in Greece 3,800 ha and in Portugal close to 2,000 ha. Turkey is the non-European country with the highest greenhouse industry, 14,000 ha.

Within the European Union the highest concentration is between 36^{o}N in Southern Spain and 44^{o}N in France and the Northeast of Italy.

Around 4000 ha are of soilless culture, mainly with inert substrates that can be different depending upon the country. Sand, perlite, rockwool, puzolans and volcanic gravels are the most used. The soilless crop area is increasing, in general, in the Mediterranean countries. France has an estimated 1600 ha for vegetables and flowers, Spain around 1000 ha and 30 for Greece mainly for cucumber and tomatoes.

courtesy of

Pedro-Florian Martinez
Instituto Valenciano de Investigaciones Agrasias
Apartado Oficial,

Greenhouse Engineering Workshop-
Pesticide Application Technology

Workshop Agenda
February 29 - March 1, 2000
Ohio Agricultural Research Development Center
Wooster, Ohio

Tuesday, February 29, 2000

9:30 AM	Registration
10:00 AM	Welcome address (OARDC or OFA administrator)
10:05 AM	Keep pest away from the plants – environmental considerations (Dr. Peter Ling)
10:30 AM	Air circulation and pest distribution in greenhouses (Dr. Ted Short)
11:00 AM	Keep pest away from the plants - scouting and cultural practice considerations (Dr. Steve Nametz and Dr. Richard Linquist)
12:00 PM	Lunch
12:45 PM	OARDC and USDA pesticide application research facility tour (Dr. Peter Ling)
1:30 PM	Where do chemicals go after spraying (Dr. Richard Linquist)
2:00 PM	Effective pesticide application – delivery, targeting, and quality (Dr. Richard Derksen)
2:40 PM	Coffee break
3:00 PM	Effective pesticide application – droplet size and biological efficacy (Dr. Erdal Ozkan)
3:30 PM	Effective pesticide application – new nozzles and adjuvant (LPCAT)
4:00 PM	Performance of commercial spraying equipment (Dr. Richard Linquist)
4:30 PM	Regulatory considerations -IR-4 program and worker safety and fate of spray (Dr. Charles Krause)
5:00 PM	Panel Discussion (Moderator: Dr. Richard Linquist. Panel members: Dr. Erdal Ozkan, Dr. Richard Derksen, Mr. Justin Murata, …)
5:50 PM	Leave for dinner at a local restaurant

Wednesday, March 1, 2000

7:15 AM	Continental breakfast at the Fisher Auditorium lobby
7:45 AM	Greenhouse bus tour (Dr. Peter Ling)

- Possum Run greenhouse with commercial application technology demonstrations
- An update on Possum Run's positive flow greenhouse design and construction

11:50 AM Tour return/ADJOURN

Posters on emerging pest management techniques will be on display and researchers will be available for questions during breaks on the first day of the program. Topics to be covered include "Painted Pot for Pesticide Application", "Use of Composting Material to Strengthen Plants' Self-defense System", "Use of Adjuvant to Improve Pesticide Deposit", "Water Quality Issues for Spray Mixing, ….

Contact Person: Dr. Peter Ling 330 263 3857

Extension Specialist in Floriculture,
Rutgers University,

Professor William Roberts
Professor Emeritus Rutgers University

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suggestions are welcomed.
Phone 732 932 9534
email

Publications on Drinking Water Available

Two popular publications from **NRAES (Natural Resource, Agriculture and Engineering Service)** can provide key information on the quality of drinking water. You might be concerned about the quality of water at your production facility and these might be of help to you.

NRAES 47, Private Drinking Water Supplies: Testing, and Options for Problem Waters, is a 60 page publication dealing with drinking water supplies. It was awarded a blue ribbon at an ASAE Educational Aids Competition and provides information on US Environmental Protection Agency drinking water standards, water testing and options for insuring a safe drinking water supply. The cost of NRAES 47 is $8.00 plus sales tax, shipping and handling charges.

NRAES 48, Home Water Treatment, is a 120 page guide describing home water treatment devices and methods. This publication will help homeowners decide if water treatment is necessary and which treatment device or system is appropriate for a particular problem. It is also a valuable reference for extensions agents, regulators and industry representatives. NRAES 48 is available from NRAES for $15 plus shipping, handling and sales tax.

More than 14 million households nationwide depend on their own well, spring or cistern to supply water for home use. Ground water quality can be threatened by many sources including industrial pollution as well as private sewage disposal systems.

Growers, extension workers and those concerned with private water supplies may want to add these books to their library. Both of these excellent and helpful publications are available from;

NRAES
Cooperative Extension
152 Riley Robb Hall,
Ithaca, NY 14853-5701

Additional information on these two publications is available at the website: