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 13 No. 6 November 1998

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

"Floriculture in the Global Village Where Do We Fit into the Picture?"

On November 5 about 100 growers, greenhouse industry representatives and researchers and educators attended the Greenhouse Grower meeting and Trade Show at the Cook College Campus Center and were welcomed by Dr. Peter Day, renown Biotechnologist and interim Director of the New Jersey Agricultural Experiment Station.

They heard Bill Miller talk about the "Home Depot Syndrome" occurring in the greenhouse industry and how it might affect growers in New Jersey, going along with the theme of the Conference.

Steve and Leslie Barlow described the intricacies of their exceptional greenhouse and marketing operation in Sea Girt, NJ. and Dr. Robin Brumfield discussed the options associated with owning or leasing equipment and some of the questions asked when deciding to upgrade with expensive equipment.

Production techniques are always popular and Ralph Freeman, Dr. George Wulster and Hank Bukowski talked about specific recommendations to produce better, more salable crops.

Recycling is an important part of the greenhouse industry and Karen Kritz who has spear-headed the New Jersey program for the last few years gave an update on the effectiveness of the program. An article appears on page 5 which describes the 1999 program recently announced by Secretary Brown.

Support Buildings Design

Post-Frame construction offers many advantages to the grower who needs a functional and economical support building such as a headhouse. NRAES-1, Post-Frame Building Handbook presents in a clear, easy-to-follow style the latest design considerations and construction methods for post-frame buildings. There are 60 illustrations and 31 tables which enhance the handbook. It provides essential information for the preliminary design of modern post-frame structures. The 78 page publication is major revision of a 1984 publication entitled Pole and Post Buildings. This publication is available at modest cost from;

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

For more information about NRAES and its publications visit their website;

Http://NRAES.ORG

New England 1998

The 1998 New England Greenhouse Conference, held this year at Worcester Massachusetts was a tremendous success. Nearly 2000 people registered for the meeting which was highlighted by a three-day program of excellent speakers capped off with a trade show which featured over 100 more exhibitors than were able to be accommodated at the facility in Sturbridge. Your editor enjoyed the presentations and the opportunity to meet so many industry leaders. Congratulations to the organizing committee.

Your Editor

Open – Roof Greenhouse Design Scenario
William J. Roberts Director CCEA

Growers have for many years known the value of growing outside in the spring to harden off plants and to make room for crops which need the more valuable greenhouse space. Cold frames were an important but labor intensive part of that system.

The next development in hardening plants was developed by Jack Van de Wetering at Ivy Acres in Long Island and consisted of a system of transportable benches which moved in and out of the greenhouse utilizing traditional Dutch pipe-handling systems. During the day, weather permitting, in the spring the plants would be moved outside on the transportable benches. At night they would return to the greenhouse space. In most instances another crop was grown on the floor using soil heating in the same greenhouse space. This effectively doubled the heating efficiency because two crops were heated in the normal space of one. The difficulty came when there was a weather problem and the plants under the bench would suffer from lack of light for a few hours. Another problem was the amount of labor and attention required to move the plants in and out of the greenhouse. Some of these growers have now substituted the open-roof design for the transportable bench system.

The next step in this process was the development of moving thermal screens which could be closed at night to protect the crop and opened during the day to allow the crop to grow in full sunlight. Most of these structures resemble greenhouses without the superstructure required to support any type of glazing. Some of these structures use horizontally moving thermal screens and others use a structure similar to a greenhouse where the actual screen material follows the shape of a traditional a-framed greenhouse. There are at least three manufacturers of this type of open-roof structure.

Open Roof continued

About 10 years ago, Mr. Aart Van Wingerden showed me a greenhouse which he called his MX greenhouse, patterning the name after the missile silos in the west which were designed to have the roof open and the missile emerge upon command. The roof opened on only one side. This concept was the precursor to many roof designs which are being sold today. The names and addresses of some of these companies are listed on the back of this handout.

The fully articulating roof greenhouse has become a reality. There are at least 6 companies which manufacture this type of open-roof greenhouse. Four of these use fully articulating roof sections which hinge at the gutter and open to various stages of opening from the ridge. Two of the manufacturers utilize articulating roof sections which hinge at the ridge and open at the gutter line and move across the greenhouse bay.

In addition to the articulating roof greenhouse there is the design which utilizes moving polyethylene roof sections. There are at least two manufacturers who feature this design. A few years ago I saw a similar single glazed structure design in Japan which featured a rolling pipe upon which the glazing material rotated, opening the roof of the greenhouse as it rolled up.

Currently at Rutgers, CCEA is constructing a 55’ by 60’ open-roof greenhouse which will be used to measure ventilation performance as well as crop performance featuring the open-roof design. Dr Sadanori Sase has developed a computer model which will predict ventilation performance and this greenhouse will be used to gather data and determine the accuracy of the model. We hope to be operational before this winter.

A partial list of current manufacturers is listed on page 3.

Open Roof Greenhouse Manufacturers

Articulating roof sections:
Rough Brothers Cincinnati, Ohio
The Open Air series.

Van Wingerden Greenhouse Co.
MX Operable roof greenhouse

X.S. Smith Co.
Sun Roof Greenhouse

Westbrook Greenhouses
Skyline Open Roof Greenhouse

Ver Bakel/Bombas De Lier
The Netherlands
Cabriolet Greenhouse

Private Garden Inc.
Cabrio

Retractable Roof Greenhouses
Cravo
Retract a Roof Greenhouse (2 styles)

Hired Hand
MegaFrame Retractable Roof

X.S. Smith Co.
Outside Shade System

Moving Polyethylene Film Roofs
Jaderloon, Irmo South Carolina
Roll-a-Roof Greenhouse

Agra Tech, Pittsburg California
Inflatable Retractable Roof

Addresses:
Agra Tech Inc.
2131 Piedmont Way
Pittsburg CA 94565 Tel 510 432 3399

Addresses continued

Cravo Equipment Ltd.
White Swan Road RR #1
Branford, Ontario N3T 5L4
519 759 8226

Hired Hand Green, Inc
PO Box 98
Bremen, AL 36033
205 287 7777

Jaderloon Co, Inc
PO Box 685
Irmo, SC 29063
803 798 4000

Rough Brothers Inc.
PO Box 16010
5513 Vine Street
Cincinnati, Ohio 45216
513 242 0310

Van Wingerden Greenhouse Co.
4078 Haywood Road
Horse Shoe, NC 28742
828 891 7389

Ver Bakel/Bomkas B.V.
PO Box 41
De Lier, 2678 Zg
The Netherlands

Westbrook Greenhouse Systems
PO Box 99
270 Hunter Road
Grimsby, Ontario L3M 4G1
905 945 4111

X.S. Smith Inc
Drawer X
Red Bank, NJ 07701
732 222 4600

Private Garden Inc.
10 Allen Street PO Box 600

Greenhouse Design and Environmental Control Short Course

January 11-12, 1999

This short course features one and one half days of technology transfer and a one-half day tour to several state-of-the-art greenhouse operations. Topics for study and discussion include, greenhouse heating and cooling, space utilization, glazing choices, crop production systems, irrigation systems and design of floor heating systems.

Speakers include; **Ralph Freeman,** well-known Floriculture Specialist with Cornell University at Riverhead, Long Island, **John Hoogeboom,** CEO of Agronomico International Inc., Hendersonville, North Carolina, **Dr Gene Giacomelli,** Horticultural Engineer in the Bioresource Engineering Department at Rutgers University, and **Dr. George Wulster,** Floriculture Specialist at Rutgers University. Your **editor** is Faculty Coordinator and also makes several presentations on the program.

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.

Additional information is available from your editor or from **Kirsten Olsen** at The Office of Continuing Professional Education 732 932 8451.

Program

Design of Greenhouse Systems and Environmental Control

January11 and 12, 1999

Monday January 11, 1999

8:00 AM Registration
8:30 AM Greenhouse Design and Glazing Choices
Professor William Roberts
9:30 AM Potting Media, Nutrition and Watering
Dr. George Wulster
10:30 AM Break
10:45 AM Principles of Environmental Control
Dr Gene Giacomelli
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 Mechanization and Space Utilization
Dr Gene Giacomelli
3:15 PM Break
3:30 PM Irrigation/Watering Systems for Greenhouse Production
Mr. Ralph Freeman
4:15 PM Transplant Production at Kube Pak
4:40 PM Adjourn

Tuesday January 12, 1999

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
10:45 AM Controlled Environment Agriculture in Mexico
Mr. John Hoogeboom
10:55 AM Ventilation and Cooling of Greenhouses
Dr Gene Giacomelli
11:35 AM Getting Started in the Greenhouse Business.
Professor William Roberts
12:15 PM Greenhouse Bus tour
Lunch on the bus
5:00 PM Tour returns and adjournment

NJDA ANNOUNCES 1999 RECYCLING PROGRAM FOR GREENHOUSE/NURSERY FILM

New Jersey Agriculture Secretary Art Brown, Jr., has announced that the 1999 greenhouse and nursery film collection and recycling program will run from February 1 through June 1, with at least two collection sites already approved in Cumberland County. The two facilities are East Coast Recycling in Millville and the Cumberland County Improvement Authority in Deerfield.

"We are giving growers plenty of advance notice about the 1999 film collection program so they can plan their participation in this film recycling effort," Brown said, noting that some growers are removing greenhouse film now and need details about how to properly bundle and store the material in anticipation of the program's early start-up date.

"Once again, the department will provide growers with written collection and bundling guidelines to follow when wrapping and storing the film," Brown said, "Getting the information out now will help nurserymen decide how they want to manage the film when it is removed from hoop houses in the spring."

Both white and clear films used in nurseries for over-wintering plants, as well as clear multi-season (two-year, three-year and four-year) greenhouse covers can be recycled. The used film must be free of lathing, staples and saran tape. Loads containing other agricultural plastics, such as bags, mulch film, shrink film, stretch film or ground cover, will be rejected at the collection site.

"We work throughout the year to help recycling centers find new markets for recycled film," Brown said, "but the global economy has a significant impact on markets for used film, which sometimes makes it difficult for recycling centers to find buyers for the product."

However," he added, "our nurserymen and greenhouse operators have developed good quality control programs and our recycled film is very clean so we are optimistic that our film will ultimately be marketable."

New Jersey's greenhouse and nursery growers remove and dispose of almost one million pounds of film each year. In 1997 NJDA implemented the film collection program to keep the plastic out of New

Recycling continued

Jersey's landfills and more than 450,000 pounds of film were recycled around the state.

Last year, another 285,000 pounds of film was collected at six approved collection sites in Atlantic, Burlington, Cumberland, Monmouth and Passaic Counties. The lower amount was attributed to the early spring, which forced growers to remove film before recycling sites had been established.

Almost 90 percent of the film collected in 1998 was generated by growers located south of Camden County, leading the department to locate the 1999 collection sites in the southern part of the state. However, NJDA will closely monitor the program throughout the season in order to determine whether additional collection sites are required elsewhere in the state.

With a 1998 grant from the New Jersey Department of Environmental Protection, NJDA was able to offset a portion of the program's operating cost. During the 1999 program, approved collection sites will again be partially reimbursed for their costs based on the volume of film recycled by New Jersey growers.

For more information or copies of the Growers Collection and Bundling Guidelines, contact NJDA at 609-984-2506 or e-mail agukrit@ag.state.nj.us, or call the New Jersey Nursery & Landscape Association at 609-291-7070 or AT Plastics, 1-800-661-3606.

1999 APPROVED COLLECTION SITES FOR GREENHOUSE & NURSERY FILM

CUMBERLAND COUNTY SOLID WASTE COMPLEX 169 Jesse Bridge Road
Deerfield, New Jersey
(609) 825-3700

Prior to delivery of the film, all growers MUST call the Authority to establish an account. In addition, growers using a licensed solid waste hauler MUST inform the Authority prior to delivery in order to maintain proper billing and documentation.

Hours of Operation: Monday-Friday 7:30 am - 3:30 PM, Saturday by appointment only Tipping Fee:

10.00 per ton Drop-off requirements:

Film must be rolled into manageable bundles. If grower chooses to tie the bundle (not required), the tie MUST be made of greenhouse film. Material **Recycling continued from previous page** MUST be free from all debris including wood, shrink wrap, nails and any other material foreign to said film. Film which is dirty or not properly prepared will be rejected.

Additional Services: Additional services are available on a case-by-case basis. Contact the Authority with special needs.

EAST COAST RECYCLING ASSOCIATES
Millville Industrial Park
1801 Eden Road
Millville, New Jersey (609) 327-8888

Hours of Operation: Monday - Friday 7:30 am - 4:00 PM Tipping Fee: $0.00

Drop-off requirements:
Film must be bundled and tied (the tie MUST be made of greenhouse film) OR placed in boxes on pallets. Material MUST be free of any debris including, but not limited to, wood, stones, dirt, etc. Film which is dirty or not properly prepared will be rejected. At the time of delivery, or as soon thereafter as practical, the material will be weighed and a ticket issued stating the weight, less any pallets and boxes.

NEW JERSEY NURSERY & GREENHOUSE FILM 1999 RECYCLING PROGRAM

GROWER COLLECTION & BUNDLING GUIDELINES

Growers must maintain a high quality control program when removing the film and preparing it for storage or delivery to the regional collection sites. Through the demonstration program we learned ways to collect, bale and market the film. Now we must move forward to implement measures to improve the program. In order to market the film, we must be able to provide an ample supply of quality material. Grower cooperation is imperative in order to continue the success and future of the program. Below are steps which MUST be followed for the 1999 film recycling program.

QUALITY CONTROL
Film should be cut just above the lathe board in order to insure that no staples or wood are co-mingled with the film. The film MUST be rolled. For ease of handling, the film should be rolled up as soon as it is removed from the structure. The rolled **Recycling continued**

film must be no wider than 4-5 feet (like a sausage). It may be necessary to cut the length of the film for ease of handling.

The bundled film MUST be tied and ONLY the same type of film in the roll should be used to tie it. DO NOT use twine, wire, non-nursery/greenhouse film, etc. If anything other than nursery/greenhouse film is used to tie the bundled film, the load will be rejected.

Every step should be taken to avoid picking up excess soil when the film is removed from the structures, rolled, stored or prepared for delivery to the regional collection site.

Only nursery and greenhouse film will be accepted at the regional collection sites. No bags, mulch film, shrink film, stretch film, or ground cover film will be accepted.

Film MUST be free of foreign material: lathing, wood, staples, paper, stone, saran tape, etc. Any loads which contain material other than nursery or greenhouse film will be rejected by the approved collection sites.

STORING THE FILM OVER THE WINTER FOR FUTURE OFF-SITE RECYCLING

New Jersey has one collection period, namely during the spring/early summer months. Collection dates may vary by region. The rolls of film can be stored over the winter and delivered to the collection sites during the next regionally scheduled
collection period. In order to assure that the material will maintain its quality over the winter months, the steps listed below must be followed.

The rolls can not be in contact with the soil or placed on stone. They MUST be stored on a concrete pad or on pallets. Storing the film on soil or stone

Let the Sun Shine Into Your Greenhouse..…. Have you checked your PAR today?

Twenty-eight, greenhouse glazing and related industry representatives sincerely interested in learning the facts, and debating the issues met at the Hilton Hotel and Conference Center in East Brunswick, New Jersey on October 1 & 2 to participate in the Greenhouse Covering Solar Radiation Transmission Workshop, which was organized through CCEA, Center for Controlled Environment Agriculture, by Dr. Gene Giacomelli of the Dept. of Bioresource Engineering---Horticultural/Phytomation Engineering Program of Rutgers University.

Light transmission in greenhouses! It is difficult to measure, and a challenge to understand. Even the language of light sounds foreign..PAR, NIR, UV, Red/farRed, diffuse & direct light, reflectance/absorptance/transmittance properties of glazing.

Glazing transmission affects the greenhouse climate cooling and heating, as well as, plant quality, growth rate, and uniformity of growth. Combined, these parameters represent the grower's profits, or the difference of production costs and the sale value of the crop. Yet many decisions of glazing selection are based solely on the price of the film!

What **are** the proven facts, the known fiction, and what is under debate about greenhouse glazing alternatives?

Representatives from Armin Plastics, AT Plastics, Inc., Duragreen Marketing USA, Inc., Flex-O-Glass, Inc., Green-Tek, Inc., Huntsman Packaging, Klerk's Plastics, and Ludvig Svensson, Inc., participated in the workshop program which included 4 parts: Engineering aspects, Biological aspects, Industry capability and concerns, and Sensing equipment demonstration; each part was presented as short lectures and followed by a discussion session.

The engineering and plant biological presentations included the complexity of solar radiation within the greenhouse environment [Professor William Roberts, Rutgers University], and the primary effects of the greenhouse covering on the light environment [Dr. Gene Giacomelli, Rutgers University] and heat environment [Dr. David Mears,] of the crop. Dr. Dennis Decoteau, Pennsylvania State University presented the basic plant physiology and bio-responses to the plant's environment. He emphasized the needs of the plant, how the plant uses the light energy, and how to manipulate plant growth with radiation. The use of electronic sensors for glazing transmission tests, and interpretation of the measured data were demonstrated and discussed [Stephen Kania, Rutgers University], and contrasts between laboratory and greenhouse measured transmission were discussed.

The goals for the workshop were focused on education, which helped to develop a common level of understanding, so that an effective dialog about the future potential of film covering materials could be achieved. Clear lines of communication between the plastic film manufacturers and the researchers were established at this international workshop. The use of these glazing materials for greenhouses is international in its scope, thus when the manufacturers with a clear understanding, utilize the information in their companies, and with the growers they work with, we see the beginning of change and improvement in the greenhouse industry.

Recycling continued from page 6

the accumulation of water in the rolls, they MUST be covered with some type of tarp or plastic. The film which is removed from the structures can be used to cover the rolled film and the covering can then be bundled and tied and recycled when the material is delivered to the regional collection site. If a tarp or non-greenhouse/nursery film is used to cover the rolls, it MUST be removed prior to delivery of the rolls of film to the collection site.

All quality control measures outlined earlier MUST be followed.

TRANSPORTATION

Film may be transported to the collection sites by the grower or a commercial contractor. If a trash dumpster is used to transport the rolls of film, remember that only nursery and greenhouse film is allowed - no other plastic material or refuse. If there are any contaminants in the load, the entire load may be rejected by the regional collection site.

A solid waste transport permit from the New Jersey Department of Environmental protection is NOT required to transport recyclable materials to the collection site.

FOR ADDITIONAL INFORMATION, contact Karen Kritz, New Jersey Department of Agriculture at (609) 984-2506, e-mail agukrit@ag.state.nj.us or AT Plastics at 1-800-661-3606.

Open-Roof Greenhouse

A 48' by 60' open-roof greenhouse is nearly erected by CCEA on Hort Farm #3 on Ryders Lane. The footings are in place and the super-structure is now erected. We are waiting for a container which is coming from the Netherlands to complete the roof sections. We hope to learn more about the performance of this type of greenhouse throughout the growing seasons. Data acquisition systems will be installed to monitor the environmental control of the system. We will keep you posted on this new and exciting project.

HORTICULTURAL ENGINEERING

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