CCEA Newsletter

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CCEA is a research organization dedicated to the improvement and vitality of the Controlled Environment Agriculture Industry. CCEA is funded by Industrial and Grower Partners who contribute a yearly partnership fee. Satellite partnership is available to growers for a modest fee. Information on CCEA is available from:
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Vision Statement

CCEA, The Center for Controlled Environment Agriculture of NJAES of Rutgers University, a partnership among growers, industry and researchers, will devote itself to research and transferring information required for an economically viable and environmentally aware controlled environment agriculture industry. We will particularly strive to identify future trends, critical issues, appropriate emerging technologies and provide leadership for opportunities which challenge world-wide controlled environment agriculture in the 21st century.

New Jersey Farm Bureau - Newest Partner in CCEA

Mr. Peter Furey recently announced that the New Jersey Farm Bureau has become a partner in CCEA. We welcome NJFB to CCEA and look forward to many mutually cooperative and exciting accomplishments together.

Farm Bureau has also given CCEA a grant to help fund the new Open-Roof Greenhouse Project. The grant is specifically aimed at the cropping system to be used in the greenhouse which is being built on Hort Farm #3 on the Cook College Campus in New Brunswick. (see photo below) **Dr. Steve Garrison** will be heading up this work. He plans to grow vegetable transplants this spring to get started and then to incorporate strawberry production in the Fall. It is anticipated that this type of structure will work very well with strawberry production because temperature control is much easier and more reliable during warm months.

Mr. Abe Bakker, a Director of NJFB from Shiloh, will serve on the Industrial Advisory Board and represent New Jersey Farm Bureau in the evaluation of current projects and planning for new research activity which is needed in the controlled environment industry.

Photo taken by Steve Kania December 1, 1998

Special CCEA Symposium: ACE-SYS III

On July 23, 1999 at the Cook College Center at Rutgers University in New Brunswick New Jersey a special symposium will be held. The Center for Controlled Environment Agriculture will present **"From Protected Cultivation to Phytomation" ACE - SYS III.**

Dr Gene Giacomelli is the meeting Chair and **Dr Tadashi Takakura** of Nagasaki University and **Dr. KC Ting** of Rutgers will be session chairs. The program will feature the following:

Topic	Speaker
♦ Automation	Naoshi Kondo Japan
♦ Culture	Merle Jensen USA
♦ Culture	Toyoki Kozai Japan
♦ Environment	Lou Albright USA
♦ Environment	John Sager USA
♦ Systems	Haruhiko Murase Japan
♦ Commercialization	Irwin Chu Taiwan
♦ Epilogue	David Mears USA

Dr Naoshi Kondo is from Okayama University and has just co-authored a book with **Dr. KC Ting**. (see next column) **Dr Merle Jensen** is well-known as a pioneer in Controlled Environment Agriculture. **Merle** is Associate Dean at the University of Arizona. **Dr Toyoki Kozai i**s an authority on plant propagation and Chairman of the Horticultural Engineering Department at the University of Chiba in Tokyo Japan. **Dr. Lou Albright** is a professor at Cornell University and an authority on environmental control. **Dr. John Sager** is an engineer with the NASA/Kennedy Space Center in Florida. **Dr Murase** of Osaka Prefecture University in Japan is an outstanding systems expert. **Dr Irwin Chu** is president of Taiwan Flower Biotechnology Inc in Taiwan. **Dr David Mears,** is world class expert in greenhouse design and distinguished professor of the Bioresource Engineering Dept. at Rutgers University.

In addition to the Forum, the program will include the annual CCEA business meeting and conclude with a retirement banquet in honor of Professor **William J. Roberts.**

For more information call Ruth Novak
1- 732 932 9534

K.C. Ting co-authors Robotics Book:

Robotics for Bioproduction Systems
Edited by
N. Kondo and K.C. Ting
Published by ASAE, 1998

Content:

1. Introduction
2. Robotics for Manipulating Biological Objects
3. Fundamentals and Basic Components of Robots
4. Design and Control of Manipulators
5. Machine Vision
6. Sensors for Bioproduction Robots
7. Traveling Devices within Bioproduction Environments
8. Robots Intelligence
9. Robots in Bioproduction within Controlled Environments
10. Robots in Bioproduction in Open Fields
11. Robots in the Food Industry
12. System Analysis, Integration, and Economic Feasibility

CCEA Successfully Hosts Glazings Workshop

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 a short lecture 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.

Gene is to be congratulated for his hard work in making this excellent workshop so successful.

Individual copies of the 34 page proceedings are available to CCEA partners and Scientific Advisory Panel members from the Director's office.

Simulation Analysis of Solar Sterilization Systems

Dr Tadashi Takakura, Stephen Kania
and William J. Roberts

Abstract: A two-dimensional simulation model of a greenhouse-type solar sterilization system, which consists of a small tunnel with mulching, has been developed. Several parameters in the model were adjusted through model verification with experimental data. The model was then used to analyze effects of thermal properties on temperature increases at various soil depths. Higher emissivities or absorptivities of both tunnel and mulch films can result in higher soil temperatures. Absorptivity of the soil has a positive effect on maximum and a negative effect on minimum soil temperatures. Degree-hours above a particular temperature which kills soil-borne pathogens can easily be calculated by the model.

Presented at 27th American Society of Plasticulture Congress in Tucson, AZ., February 1998.

Soil solarization to Eliminate Diseases from Greenhouses

Dr Wesley Kline[1], W.J. Roberts, S. T. Kania and S.A. Johnston.

Abstract: Greenhouse solarization was evaluated as a method to control soil borne diseases. A heated greenhouse (soil heating system) with infrared 6 mil plastic on the soil surface or clear 4 mil plastic on the soil surface was compared to an unheated greenhouse covered with infrared 6 mil plastic plus clear 4 mil plastic on the soil surface or black 6 mil plastic on the soil surface and a clear 4 mil plastic tent stretched above the black plastic. Maximum soil temperatures reached in the heated greenhouse were 156-159°F (63-64.5°C) for both plastic treatments at the 1 inch (2.54 cm) level and 4 inch (10 cm) depths. At 12 inches (30 cm) temperatures were 145-146°F (57.3-58 °C). Soil temperatures in the unheated greenhouse varied between 142-145 °F (56-57.5°C) at 1 inch levels (2.54 cm), 130-135°F (50-52.5°C) at 4 inches (10cm) and 108-112°F (39-41°C) at 12 inches (30 cm). Soil samples were collected at each depth and the soil tested fo *Rhizoctonia solani*. *Rhizoctonia solani* colonized beet seeds 11-85% in the control houses followed by the unheated clear 2-10%, unheated black plus clear 1-6%, heated clear 0-0.5% and heated infrared 0%.

[1]County Agricultural Agent, Rutgers Cooperative Extension of Cumberland County.

Presented at 27th American Society of Plasticulture Congress in Tucson, AZ., February 1998.

Development of the Basis for an Automated Plant-based Environmental Control System

Brian Sauser[1], Gene Giacomelli and Peter Ling

Abstract: The primary objective of the investigation was to evaluate the effects of induced perturbations in air temperature on the development of the tomato plant, while correlating a plant feature for use with machine vision non-contact sensing technologies, and allow for eventual integration into a non-invasive plant-based environmental control system.

Real-time information of plant growth responses to steady-state and changing air temperature regimes were measured (i.e. dry weight). There was a positive correlation of the profile machine vision images with dry weight. Therefore, machine vision could be used for plant developmental predictions and development of a control system for maintaining plant schedules.

[1]Senior Program Administrator
NJ-NSCORT Cook College, Rutgers University

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28th International Conference on Environmental Systems. Danvers, MA July 1998
