

Agri-Plastics Report

American Society for Plasticulture



April, 2004

Plastics Make it Possible®

The American Plastics Council (APC) advocates unlimited opportunities for plastics and promotes their economic, environmental and societal benefits. To accomplish its mission, APC shows the benefits of plastic products and the contributions of the plastics industry to the society. APC demonstrates that plastics are an efficient use of natural resources and that plastics and the industry are part of the solution to the public's environmental performance expectations.

APC is comprised of 18 of the leading resin manufacturers, plus one affiliated trade association representing the vinyl industry. APC's membership represents more than 80 percent of the U.S. monomer and polymer production and distribution capacity.

APC includes five business units and an affiliated trade association, comprised of APC members, other industry stakeholders, and customers whose purpose is to address issues specific to their products. The business units are:

Alliance for the Polyurethanes Industry, Polycarbonate Business Unit, Polystyrene Packaging Council, Expandable Polystyrene Resin Suppliers Council, and Rigid Plastic Packaging Institute (RPPI). The Vinyl Institute (VI) is the affiliated trade association.

To learn more about APC go to:
<http://www.americanplasticscouncil.org/>

ASP Forges New Relationship with APC

When Rod Lowman, President of the American Plastics Council, gave the keynote address at Plasticulture 2003 last August, both organizations learned from the experience. ASP gained a perspective on the relatively small place plasticulture has occupied in the overall "world" of plastics, and APC was exposed to a dimension of plastic use that it had not previously explored.

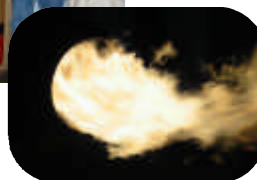
Since that time, through a series of meetings, a new relationship has been forged that is already proving to be mutually beneficial. For the first time, the pivotal role that plasticulture plays in feeding the world is being recognized by some of the biggest players in the industry. ASP has brought to the forefront a new message for APC to communicate about the positive value of plastics in society.

On a cold, rainy April 8th, ASP gave Rob Krebs, Director of Communications for APC, a hands-on experience with plasticulture that left him amazed and awed. At our invitation, Rob visited the Center for Plasticulture at Penn State and spent the afternoon learning how plastics are having a beneficial effect on the world's ability to produce food. . . from pre-planting to post-harvest. With Penn State's research on using ag plastics as a fuel source, we were also able to demonstrate how the use of plastics is being brought full-cycle.

After an "introduction to plasticulture" over lunch as the guests of Mark Jordan and Jodi Fleck-Arnold of Pliant Corporation, Rob was taken on a field tour of the Center for Plasticulture by Mike Orzolek, Director; Bill Lamont; and Jim Garthe. Also on the tour were ASP Executive Director Pat Heuser and Georgene Thompson, ASP's Director of Marketing and Communications.



Jim Garthe shows off the GRT boiler and the flame it can generate from burning used ag plastics.



Throughout the day, Krebs was exposed to greenhouses, irrigation systems, nursery flats and pots, containers, high tunnels, field mulch production, various types and colors of film mulch, row covers, plastofuel, and every conceivable use of plastics. He learned how use of plastic is increasing yield and reducing labor making possible greater productivity on smaller amounts of land. He was shown how plastics can make it possible to grow in poor conditions.

(continued on next page)



Rob Krebs, center, tours the Center for Plasticulture.

Stay in Touch with ASP at: www.Plasticulture.org

ASP MEMBERS

NEWS ABOUT ASP MEMBERS

ASP member Richard Bonanno chaired the banquet for the 2003 New England Vegetable and Berry Conference and New England Fruit Meeting in December. He also spoke at several sessions. Other ASP members on the program were: John Bartok, Bill Lamont, Anu Rangarajan, and Brent Loy.



Dr. Stephen M. Olson, recipient of ASP's 2003 Pioneer Award, was one of the editors for the 2003-2004 Vegetable Production Guide for Florida. ASP was represented among the contributors by George Hochmuth, Robert Hochmuth, and J. W. White.

ASP and APC Continued

ASP members were included among those making presentations at the January Mid-Atlantic Fruit and Vegetable Convention in Pennsylvania. Speakers included: Ted Carey, Bill Lamont, Michelle Infante-Casella, Mike Orzolek, Bill Tietjen, Bill Wolfram, and Richard Bonanno.

Among the research projects that caught Rob's eye were prototype green roof systems, high tunnel strawberries grown in drain gutters, fruit trees grown in high tunnels, and a natural water filtration system. A home gardener, Rob could easily appreciate the value plastics add to the growing process. He was especially impressed that as an industry we are dealing with disposal issues and that ongoing research will soon provide a way to recycle used ag plastics as a fuel source. (See related Research Update.)

ASHS will hold its 101st Annual International Conference in Austin, Texas at the Renaissance Austin Hotel from July 17-20, 2004. At this time, we are aware of the following ASP members who will be part of the program: Ted Carey, Juan Diaz-Perez, Michelle Infante-Casella, and Hank Taber.

As a result of the visit, the American Plastics Council has approached ASP with the idea of producing a plasticulture "webinar." We will work with APC to create a web-based seminar on plasticulture for the media that demonstrates the positive impact ag plastics are having on the global economy and the world food crisis. The proposed event will be an interactive session that will allow some of the leading experts in all areas of plasticulture to provide information and answer questions from the media.

We'd like to share your news in ASP's newsletter and on the ASP website. Please send your news releases to: ASP, 526 Brittany Drive, State College, PA, 16803 or email directly to Georgene Thompson, news editor, at: georgenethompson@comcast.net

We also welcome your articles and research updates.

Immediate plans call for APC to handle the logistics of the "webinar" as part of their mission to demonstrate the benefits of plastic products and the contributions of the plastics industry to the society. ASP will provide plasticulture expertise and create the program outline. Work is underway with a timeline that would see this event taking place during the Summer of 2004.

ASP Welcomes These New Members

Since December 1, 2003

James Gilbert
Grower
741 Club Road
Tyron, NC USA

Tom Stoebner
Raven Industries
1812 East Avenue
Sioux Falls, SD USA

Peter Tutini
AgriNova Corporation
12220 Maycheck Lane
Bowie, MD USA

If you are aware of researchers, Extension professionals, academics, growers, or manufacturers who share ASP's mission to improve the economic efficiency of agricultural systems through the use of plastics and to promote the use of agricultural systems in which plastic is used, this is an ideal time to encourage them to become members. ASP will be printing the new membership directory within a month and joining now insures the new member will be included in this permanent record over the coming year. We will also be adding a "Find the Expert" section to the website and only members will be included in this list that is certain to become a leading resource for those seeking information about plasticulture. A copy of the membership application is available on the ASP website. Share the web address with everyone on your list serves and help ASP continue to be "the place where people with ideas meet people who make things happen."

Now positioned as the leading resource on the use of plastics in agriculture and horticulture, ASP is already being called upon by APC to respond to the media and provide background information. ASP is now beginning to take its rightful place among the world's leading users, producers, and promoters of plastics.



Officers and Directors

These ASP Leaders will Serve for the Inter-Congress Period from August 2003 through March 2005

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Committee Appointments Announced

2005 Congress Planning Committee

Chair -- Hank Taber, Iowa State University
Local Tour -- Bob Dufault, Clemson University
Keith Williamson, Hilex Poly Corporation
Rich Hassell, SC Coastal Exp. Station
Social Event -- Gene Giacomelli, University of Arizona
Keith Williamson, Hilex Poly Corporation
Mark Jordan, Techmer PM
Session Chairs --
Juan Carlos Diaz-Perez, University of Georgia
Chris Gilmor, AT Plastics
Bill Tietjen, Rutgers Cooperative Extension
Laurie Hodges, University of Nebraska
Jon Conroy, Ampacet

Congress Sites Committee (Reviews options for future Congress sites)

Chair -- Bill Tietjen, Rutgers Cooperative Extension

Membership Committee

Commercial Subcommittee --

Chair -- Jodi Fleck-Arnold, Pliant Corporation
Bill Wolfram, Toro Ag Irrigation
Frank Fornari, AT Plastics

Academic Subcommittee --

Chair -- Mike Orzolek, Penn State
Gene Giacomelli, University of Arizona
Ted Carey, Kansas State University
David Martin, University of Maryland
Bill Tietjen, Rutgers Cooperative Extension
Bill Lamont, Penn State
George Hochmuth, University of Florida

Past President's Award Committee (Reviews papers submitted for congress and selects winner of Best Paper Award)

Chair -- Mark Jordan, Techmer PM

Sponsorship Committee (Solicits support from Commercial Members and non-members for the next Congress)

Chair -- Jay Ghosh, CIBA Specialty Products

Task Force on Electronic Proceedings (Evaluates and develops program to digitized past proceedings and make available on the web and/or by CD)

Chair -- Pete Bergholtz, Ken-Bar, Inc.
Members -- Ted Carey, Kansas State University
Bill Lamont, Penn State

Task Force on Membership Brochure (Review text and design for new membership brochure)

Chair -- Anu Rangarajan, Cornell University
Members -- Jodi Fleck-Arnold, Pliant Corporation
Jim Garthe, Penn State
Bill Tietjen, Rutgers Cooperative Extension

Your Representatives

ASP is your organization and the people who sit on the Board and Committees serve as your representatives. If you have ideas, comments, concerns, or suggestions, these people are your link to insuring that ASP is an organization that fulfills your needs. Please feel free to contact these ASP members or the ASP office. Additional Committee representation would also be welcomed.

WHAT'S HAPPENING WITH ASP

NEW ASP WEBSITE CONTINUES TO EVOLVE

ASP's revamped website was introduced in April with a new design that not only presents the Society appropriately to the world, but is more useful as a source of information. Take a look at: <http://www.plasticulture.org/>

Additions since going live include a list of the Commercial Sponsor Members, who are recognized for their high level of financial support for ASP. With the help of some members we are also fleshing out the "What is Plasticulture" section, which will serve as a resource for those outside the industry. We welcome any information to further enhance this area.

Our ultimate goal is to create a site that serves as the centralized source of information for those already working in plasticulture and for those who want to learn more about it. Members have been generous with their praise of the new site and also with their support. The "Photo Library," already growing, offers images that graphically display plasticulture in action, which can be downloaded for use by the media, in classroom situations, for articles, in slide shows, etc.

If the site is to truly serve as a center for exchange of information, we'll need to depend on the members to keep ASP in the loop regarding research, articles of interest, personal accomplishments, and plasticulture related news.

Click on "News" and look at "Research Updates," to see the kind of information ASP is now capable of sharing within the Society and with the world. To remain current, ASP needs your input for the Updates, as well as for the Calendar of Events, Member News, Publications, and related websites with which we should link.

By June the site will include a searchable member listing called "Find the Expert" so people within the industry can network more easily and others can locate an expert to call with a question. A classified section, also under construction, will allow you to post items wanted or for sale, and list job openings or positions sought.

A NEW FORMAT FOR PROCEEDINGS

Planning continues on an initiative to make publicly available the wealth of plasticulture research information contained in the Proceedings from the 31 past National Ag Plastics Congresses sponsored by ASP.

At this time limited funding is available for a project to convert the Proceedings to an electronic format with searchable features. ASP is grateful to Greg Whippo of ReflecTek Foils, who has contributed \$1,200, and to Ken-Bar, Inc.'s Pete Bergholtz, who pledged \$1,000, to begin the process of sharing this research with the world.

Because all papers have been submitted in electronic form since 2000, ASP will use Proceedings from 2000, 2002 and 2003 as the starting point. The initial funding will support placing abstracts from those years on the website where members and non-members can review them. Where available, people will be able to purchase the full paper for a reasonable charge.

This pilot will also allow ASP's board to gauge the interest in the availability of this research and will provide data which will give members information about areas where interest in research is greatest.

As funds become available, the remaining 28 volumes will be digitized and all 31 issues compiled in searchable format on one CD. As a service to ASP, member Steve Wiest did a test conversion on one printed volume of Proceedings, which indicated it could cost at least \$14,000 to do all the scanning and reformatting, prepare the master CD, make duplicates, package for distribution, etc.

Pete and Greg are hoping other companies will rise to the challenge and also pledge their support for this project. Contributors will be promoted on the ASP website, and in the CD when published, with our gratitude and with the gratitude of all future scholars of plasticulture. Contact the ASP office to contribute to this project or to offer your ideas.

REPORT ON MARCH 22 BOARD MEETING

President Anu Rangarajan conducted a Board meeting held by conference call on Monday, March 22. The board learned that the Society is doing well with its financial recovery, but were reminded that cash flow would be "tight" because there is no Congress to generate income in 2004.

The Membership Committee reported a major effort will be made to retain current members and recruit new members. Of immediate concern are those members who have not yet paid their dues for the current year.

Committee proposals which received Board approval include:

- ♦ Past presidents active in the industry will no longer receive a complimentary membership and retired past presidents will be asked to pay \$20 a year to cover costs.
- ♦ A two-year membership will be provided at a discounted rate beginning in 2005 in an effort to span the years when there is no Congress.

- ♦ Personal contacts will be made with members who have not renewed.
- ♦ A promotional piece will be developed that can be used by manufacturers and distributors to share with customers to attract new members.
- ♦ Efforts will be made to actively involve members in the Society through sharing of information in the newsletter and on the website.
- ♦ An outreach program will be initiated with Extension professionals.

The board also learned that work is proceeding on future Congresses. Hank Taber is seeking input on keynote topics and speakers for Plasticulture 2005, scheduled March 5-8 in Charleston, SC. Bill Tietjen is working with the Irrigation Association on the possibility of combining the 33rd Congress in 2006 with the Irrigation Show.

RESEARCH UPDATE

Used Agricultural Plastic as a Coal Fuel Supplement

James W. Garthe, B. G. Miller, R. S. Wasco, W. J. Lamont, and M. D. Orzolek*

At the 31st National Agricultural Plastics Congress in Grand Rapids, one of the leading edge presentations was on work being done at the Penn State Center for Plasticulture. A recent article in the Syracuse Post-Standard (NY) showed why this research will soon take on more significance.

Writer Hart Seely took a negative viewpoint of the use of plastics in agriculture focusing on problems with disposal of used products. He cited the plastic film used in fields, the plastic pots used by nurseries, and plastic used to cover silage as examples of the disposal problem.

While farmers told him, "they can't turn back" now that they've starting using plastic, he said: ". . . the plastic doesn't break down. Manufacturers say it can be recycled, if it's clean, but farms spread dirt, manure and silage. The plastic becomes too encrusted to even burn well." And even if it did, Seely's article said, "The smoldering mess from burning plastics can be dangerous." He told horror stories of "farmers storing the plastics in abandoned barns" and "burying them in far-flung lots."

That kind of information can create public outcry, which in turn lead to government actions that may be detrimental to progress in plasticulture.

While Seely's article is on target in pointing out that uses of ag plastics are expanding, it failed to cite the advances being made in plastics disposal. At the Agricultural Plastics Combustion Forum last May Mike Orzolek provided an overview of the worldwide use of plastics. According to 2001 statistics, 7,513,000 hectares of agricultural plastics are used yearly in the U.S.

United States Use of Plastics in Agriculture, 2003

Source: W.J. Lamont and M.D. Orzolek

Use of Plastic	Wt., Tons
Silage bags	1,600,000
Plastic soil mulch	46,000,000
Drip tape	30,000,000
Plastic pots and trays	3,600,000
Greenhouses and high tunnels	2,600,000
TOTAL	82,800,000

The work at Penn State is an example of environmentally conscious efforts aimed at finding not only safe disposal methods for ag plastics, but ones that are useful and ultimately economically advantageous. Since presenting their paper at Plasticulture 2003, the researchers have entered the initial stages of a test program designed to combust waste plastics for heat. The new technology, manufactured by GR Technology Company, Ltd. of Seoul, Korea, burns plastic pellets made from waste plastics of all sorts, initially from agricultural sources. William Bang of GRT arranged to ship one of these burner units to Penn State for testing. It was installed in January and February to heat a high tunnel and a greenhouse at the Penn State

Horticulture Research Farm.

Eventually the burner/boiler system will be modified to burn Penn State's Plastofuel fuel nuggets, which are significantly larger than the pea-sized pellets currently being used. The Plastofuel nuggets are made from waste plastics forced through a heated die, which melts the outer jacket of plastic to bind plastic pieces, dirt and plant debris within. Plastofuel consumes about 1/10th the energy of pellet production, hence making more heat available for heating structures.

Testing of the 120,000 kcal/hr heater unit in Korea showed the system meets US EPA emissions standards; however, to verify test results in a field setting, further testing is taking place and will continue for the next several years. Penn State's Energy Institute and College of Agricultural Sciences researchers will investigate combustion characteristics and efficiencies, air emissions, and overall system heat transfer using a wide array of waste plastic fuels. Fuels to be tested will include pellets from Korea, granulated plastic drums from Pennsylvania, and Plastofuel.

Reports on this ongoing research will be posted on the ASP website as they become available. Questions can be directed to Jim Garthe at: jwg10@enr.psu.edu



Plastofuel

"The 120,000 kcal/hr heater unit from GRT Ltd. of Seoul, Korea is shown immediately after installation at Penn State's Horticulture Research Farm for field testing."



Bill Lamont and Mike Orzolek view the flame generated by plastic fuel during a demonstration. Under operating conditions the flame would be inside the boiler.

RESEARCH UPDATE

Salad at the South Pole

For Information Contact: Gene Giacomelli at 520-621-1412 or email giacomel@ag.arizona.edu

Fresh produce doesn't come to mind when you hear the word "Antarctica." Researchers living there usually eat packaged food year-round indoors. They can suffer from seasonal affective disorder (SAD), a health malaise brought on by a lack of full spectrum natural light, and they long for the sight, taste and touch of plant life in the most isolated place on earth. They've also learned that having access to plants can raise morale and increase productivity.

Now, personnel based at the Amundsen-Scott research station at the South Pole will be growing and harvesting their own salad vegetables by 2004 in a special high-technology facility designed, built and tested by the University of Arizona. Scientists from the Controlled Environment Agriculture Center (CEAC) in the College of Agriculture and Life Sciences are collaborating on the project with Phil Sadler, of Sadler Machine Company in Tempe, Arizona.

"The main purpose for including the food growth chamber in the new station is the psychological effect that it has on the station personnel," says Gene Giacomelli, UA professor of agricultural and biosystems engineering, and director of the Controlled Environment Agriculture program at the UA. "They are totally isolated in a frozen, 9,000-foot elevation desert of snow, 800 miles from the coast of Antarctica, where temperatures can reach lows of minus 118 degrees Fahrenheit. For 7 to 8 months, temperatures are so low that aircraft cannot land and no one can come or go."

The self-contained unit will feature a food growth chamber equipped for raising leafy greens and fruiting vegetable crops hydroponically, separated by a transparent wall from a sitting room where researchers can relax and enjoy the sight of lush green plants. Lettuce, herbs, tomatoes, cucumbers, and sweet and hot peppers will be grown in a recirculating nutrient solution. Automated controls for air temperature, light, humidity, watering and nutrients will enable researchers to raise and eat their vegetables year-round.

The chamber is part of a new research station that will be officially commissioned in 2004 by the National Science Foundation (NSF), which directs activities of the U.S. Antarctic Program. The NSF is constructing a replacement for the existing station with the assistance of its civilian contractor, Raytheon Polar Services Company (RPSC). The South Pole Food Growth Chamber Project was initiated by the NSF, which RPSC competitively bid, and the UA ultimately won. The UA must build and deliver an operable unit to the South Pole and provide training for RPSC engineers who will be managing it.

Not only does the team want a diet they are accustomed to that includes fresh salads, they also need the visual and sensory stimulation offered by green plants, which are absent at the South Pole. The 20 by 30 foot chamber will give them the chance to see, feel and smell vegetable and herb plants year-round, but also provide them with a bright environment of enhanced spectrum lighting. The crop

yields will be adjusted to the size of the station population, which will include 200 people during the Antarctic's 3-month summer, and 30-40 people the remainder of the year.

The UA is no stranger to development of food production facilities within environmentally hostile areas. In the early 1970's controlled environment vegetable production greenhouses were successfully operated by the University in the deserts of the Middle East and northern Mexico using technological advances in horticulture and engineering. In Antarctica, the UA is combining its innovations in hydroponic food production and controlled environment agriculture with the engineering and manufacturing abilities of Sadler Machine Company.

The design of the sitting room in particular was based on the suggestions and experience of Phil Sadler, a former Antarctic construction worker and current designer of controlled environment facilities, together with Raytheon and other government engineers, scientists and technicians. By having a room with a big window where people can sit and look at growing plants while they play cards or socialize, they'll be able to experience the healthy effects of being around growing plants in a lighted environment that helps them flourish. Aside from the intensive hydroponic crops in the food growth chamber, station personnel will also have the opportunity to assist in caring for plants in the sitting area.

Sadler's expertise as a former biologist and current engineer and manufacturer, coupled with his experience in Antarctica, make him a natural partner with the UA on the project.

"Phil has lived and worked at the pole, and he built the first successful food growth chambers and greenhouse in Antarctica. He can build top quality, long lasting and capable equipment to furnish the food growth chamber," Giacomelli says. The current project will be the first officially commissioned food growth chamber for the NSF, replacing a small test greenhouse that proved successful.

"The lighting source he has designed, a water-cooled lamp, is of particular value. They are more than 10 times as powerful as a 40-watt light bulb, but are so cool you can touch them with your hand," he says. "They are practical to use in the confined space of a growth chamber where plants can get close to them and not be damaged by excessive heat."

The ultimate goal of the food growth chamber is to provide a better quality of life for researchers who live and work at the South Pole, and to help others understand how people can adapt to living in seclusion without seeing the sun for months on end.

"For five and a half months there is no sunshine, just total darkness," Giacomelli says. "The benefit is not only for fresh food at that time, but also for the high intensity light that mimics the sun, the high humidity, the aromas and flavors, that remind us that we're alive and that we enjoy eating. Psychologically it's very important."

The American Society of Plastics extends its gratitude to the following companies for the special level of financial support they offer to the industry and to the Society.

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Plasticulture 2005: Watch for the Call for Papers!!!

Early this summer, the American Society for Plasticulture will distribute a "Call for Papers" for the 32nd National Agricultural Plastics Congress being held in Charleston, South Carolina. The Congress dates are Saturday, March 5 through Tuesday, March 8, but you need to begin thinking now about presenting your research. The letter of intent will be due August 1, abstracts by September 1, and the deadline for full papers is November 1.

The Congress is a unique event. It brings together those that explore the uses of plastics in agriculture and horticulture with those that can put the research results to practical use. Our audience will include researchers, educators, growers, manufacturing and distributing company representatives, suppliers, and consultants to the agricultural plastics and crop production industry. Papers can include information related to agricultural and horticultural production systems using plastic products, as well as the characteristics and technology of plastic products themselves.

Begin thinking how you can benefit from presenting at Plasticulture 2005. Congress updates, registration materials, and the Call for Papers will be posted on the ASP website as they become available.

Calendar of Upcoming Events

JUNE 2004

June 15 - 17 Designing and Managing Greenhouses in the Tropics. Cameron Highlands, Malaysia.
Contact Dr. Rezuwan Kamruddin, MARDI Headquarters, Selangor Malaysia. Tel: 603 89437072.

June 19 - 23 5th IPI-NATESC Fertigation Course. Hebei Agricultural University, Baoding, Hebei, P.R. China.
For information and registration, click on <http://www.ipipotash.org/seminars/190604.pdf>.

JULY 2004

July 14 Vegetable and Small Fruit Field Day. Horticulture Research Farm, Rock Springs, PA.
Sponsored by the Pennsylvania Vegetable Growers Association and the Penn State Cooperative Extension Service.
Contact Mike Orzolek at mdu1@psu.edu.

July 18 - 21 ASHS-2004. American Society for Horticultural Science Annual Conference. Renaissance Hotel, Austin, TX.
For information, visit <http://www.ashs.org/conferences.html>.

July 24 - 31 Haygrove Tunnels North American Grower Tour of England
Sign-up deadline is May 15. For information, call Jessica Krueger at 1-866-HAYGROVE.

SEPTEMBER 2004

Sept. 18 - 19 Northeast Small Farm and Rural Living Expo, Ulster County Fairgrounds, New Paltz, NY.
For information, click on <http://www.smallfarmexpo.org>.

Sept. 24 - 25 Passive Solar Greenhouse Workshop: Design, Construction and Year Round Production. Sonnewald Natural Foods, Spring Grove, PA. Contact: Steve Moore at 717-225-2489.

Sept. 28 - 30 Plastics, USA. McCormick Place East, Chicago, IL. Sponsored by the Society of the Plastics Industry, Inc.
For information, click on <http://www.plasticsusa.org/>

OCTOBER 2004

Oct. 18 - 20 Northeast Sustainable Agriculture and Education Conference, Burlington, VT.
For information, click on <http://www.uvm.edu/~nesare/conf.html>.

NOVEMBER 2004

Nov. 14 - 16 17th International Pepper Conference. Naples Beach Hotel and Golf Club, Naples, FL.
For information, click on <http://conference.ifas.ufl.edu/pepper/>

Nov. 14 - 16 25th Annual International Irrigation Show Tampa, FL.
For information, click on http://irrigation.org/ia_show.htm.

DECEMBER 2004

Dec. 7 - 9 Great Lakes Fruit, Vegetable and Farm Market Expo DeVos Place, Grand Rapids, MI.
For information, click on <http://www.glexpo.com>.

FEBRUARY 2005

Feb. 10 - 12 North American Farmers' Direct Marketing Conference and Trade Show, Park Plaza Hotel, Boston, MA.
For information, visit <http://www.nafdma.com>, email info@nafdma.com, or call 413-529-0386. Registration begins Nov. 1.



Plasticulture 2005

Saturday, March 5, to Tuesday, March 8, 2005
The Francis Marion Hotel

Charleston, South Carolina

Watch for information on the web at: www.Plasticulture.org