The 1976 New England Greenhouse Conference

Jay S. Koths

The largest meeting of greenhouse operators in New England history met at Chicopee, Massachusetts on October 2. Registrations of nearly 800 make this one of the largest meetings in the country devoted solely to greenhouse operations.

The New England Greenhouse Conference is co-sponsored by eight greenhouse-oriented growers associations and the six New England Extension Services. The two day program with 29 speakers was assembled under the direction of Co-Coordinator Dr. Roy Judd, Jr., University of Connecticut and Coordinator Professor Charles Williams, University of New Hampshire assisted by more than 30 association and extension personnel. The host organization was the Connecticut Florist Association.

The rising cost of heating is of utmost concern to the New England greenhouse industry. It now comprises up to 20% of the cost of production for cut flowers and potted plants, 15% for bedding plants and up to 45% for vegetables. Agricultural Engineers John Bartok, Jr. of The University of Connecticut and William Roberts of Rutgers presented many concepts of increasing heating system efficiency including:

1. Building a solid wall on north sides (or ends) of greenhouses, insulating and covering with reflective material can save up to 10% of the heating bill and actually increase light on the north side of the greenhouse.
2. A windbreak on the windward side can reduce both infiltration and convection heat loss. Remember that a 15 MPH wind can double air infiltration in a glass house.
3. Double glazing of plastic houses with air inflation can reduce heat loss 30 to 40%. Plastic linings or thermal curtains can effect similar savings in glass houses but the status of insurance is in doubt unless this insulation is retractable and not in place in the event of damage from snow. Black cloth for shading mums and other crops can serve a dual purpose as a thermal blanket.
4. Be certain that heat controls are functioning properly. Aspirated thermostats for both heating and cooling increase efficiency.

5. Solar radiation collectors are being developed that have promise in greenhouse heating. These should reduce costs during sunny periods but will not replace the heating plant during dark midwinter weather.
6. Mr. Arthur Fox, Massachusetts Electric Co., Clinton, Massachusetts, added another thought, the heating of greenhouses with waste heat from electric generating plants. The conclusion reached is that the technology is not yet at hand but this heat source may become feasible in the future.

Professor Ray Sheldrake, Cornell University, is vivacious, knowledgeable and, like most innovators, a tiny bit controversial. But when he gives his views on bedding plants – A to Z, there is little left to say. His concepts on nutrition control, media variation and automation will continue to be a boon to bedding plant growers everywhere.

Douglas Carey, manager of Bay State Florist Supply, E. Windsor, Connecticut, faced the problems of the wholesale market. Growing up "in a greenhouse," Doug ably presented the wholesalers viewpoint in serving both growers and retailers while contributing to the viable state of the flower producers of New England.

When a flower grower is successful, other people like to hear about it. Sharing ideas is the name of the game for Arthur Bezdex of Marion, Iowa. All through his "Something You Should Know About Greenhouse Management" he illustrated ideas that were innovative, efficient and interesting. Everyone who listened should have taken a workable idea or two home.

The only triple-time speaker at all three Conferences, a biennial event which began in 1972, is James Mikkelsen. The breeder of the long-lived poinsettia, as well as several mums, geraniums and kelanchoes and the introducer of Riegar begonias, Jim described cultural techniques for several crops including the increasingly popular kelanchoes.

Soil-less mixes are becoming an increasingly important item in greenhouse management with expanded use. Professor Charles Williams spoke on bark as a component. And while uniformity of the mix is extremely important, bark varies with the species, time and method of harvest and how it is stored and handled.

In his experiments at UNH, mixes of bark, sphagnum peat and vermiculite with limestone and fertilizer gave excellent results.

Another component of soil mixes for greenhouse use is compost. Stanley Bulpitt, Brookside Nurseries, Darien, Connecticut, has been using composts for 32 years. As a consultant he has started more than 140 towns in programs of composting leaves and recycling brush. Leaf compost

is a desirable soil component providing slow release fertility and buffering. Stan suggests 25-35% composted leafmold in a mix that might contain 10-20% decayed hardwood bark, 10% composed cow manure, 10-15% sphagnum peat, a little heavy soil (no sand), up to 25% styrofoam (instead of perlite) and peanut hulls if available.

To the above materials he adds limestone as necessary, superphosphate, a bit of calcium nitrate and an assortment of organic fertilizers such as bone meal, blood meal, hair tankage, hoof and horn meal, pulverized New England granite, greensand marl and langbeinite ore. This mix is heavier than a conventional peat-lite mix and Stan feels that the quality of plant produced and their extended life for the consumer justifies the care exercised in the preparation of the soil.

Dr. Alan Gotlieb, University of Vermont, stressed the dangers of overpastuerization of soils since soil diseases may be more severe. Do not exceed 180°F for 30 minutes. For optimum results in chemical fumigation of soil, the temperature should be 70 - 80°F and the moisture level just right for potting while large clumps of soil and plant debris must not be included since the gas may not penetrate them.

Soils for greenhouse use are generally analyzed by the Spurway system. But in New England the Morgan system is used in several states. The six specialists from these states formed a panel that explained the differences and how to devise a fertilization program according to the results obtained from these analyses.

European growers produce beautiful flowers and foliage. A conductor of many tours, Professor James Rathmell, Penn. State Univ., Norristown, shared many outstanding slides in the banquet address. He provides inspiration to all to grow finer quality and greater diversity. Jim has widely advocated minor crops that will increase the variety of plants available to the consumer.

Dr. Charles Conover is director of the Agricultural Research Center, Apopka, Florida. He is a prolific writer and researcher on foliage plants. And he brings a caution to northern foliage producers, to specialize in plants that are not well adapted to southern production. Florida has expanded to the point where the seller's market is shifting to a buyer's market. Florida will soon be able to bury the north in green.

But along with this caution, Dr. Conover proceeded to suggest how to proceed with profitable operations in the north. He told of multilayering in Europe under light conditions worse than here. He stressed the use of internal shading rather than on or over the roof. He then listed many plants that could be grown profitably in the north.

Kenneth Peterson, S. A. Peterson, Inc., Tewksbury, Massachusetts had a somewhat different view. His comment suggested that if you aren't

making it now, something is wrong. A neat, clean and efficient greenhouse is profitable. Use more than 100% of the space with shelves and hangers. Trial new plants continually to keep customers coming. And remember that PROFIT is not a four letter word. LOSS is.

Another success story was portrayed by William Claussen, Claussen's Greenhouses, Colchester, Vermont. Enlarging from 2 to 17 greenhouses in 4 years, Bill detailed how foliage plants were a significant factor in expansion in the limited marketing area of Burlington, Vermont.

With $4.95 hanging plant specials to maintain a low price image to balance elite New York 5th Avenue merchandising, a new vitality was provided for his area. Many of his techniques were appropriate for those listening to apply to their own operations.

In another session, Dr. Elton Smith, Ohio State University introduced the subject of nursery greenhouse operation by telling of minimum heat usage in overwintering structures. Most of these overwintering greenhouses are now glazed with white polyethylene. Introducing minimum heat to maintain 30 to 34°F will reduce damage resulting in injured roots, split stem tissue, chlorophyll breakdown leaf drop or flower bud damage. His projected cost for overwintering a 1 gallon can in Ohio is 6.7¢ On many crops this is a wise investment.

Dr. John Havis, University of Massachusetts, described how low temperatures may damage roots. Some plants may be damaged by temperatures as high as 23°F when the fine roots are damaged. For example, at 15°F Pieris and Daphne fine roots may be killed. The plants look normal until time for new growth or flowers to appear. They may then turn gray-green and stand still or, if new roots do not form, they will die. This is a serious problem since many plants may be sold in the spring before the damage is obvious. This reinforces the advisability of minimum heat in overwintering structures advocated by Dr. Smith.

Another facet of nursery greenhouse use is forcing mature plants for show. Mr. Alex Heimlich not only defined conditions for forcing including timing and temperatures, but showed many fine slides portraying how these plants may be utilized in designing exhibits for shows.

Vegetable production was another topic presented at the 1976 New England Greenhouse Conference. Tomatoes and cucumber production has declined severely in New England since fuel has increased to as much as 45% of the cost of production. Professor Ray Sheldrake, Cornell, presented thoughts on management systems that may serve to keep the industry going. High density production and precise fertility programs were stressed.

Professor Robert Young, University of Massachusetts, Waltham, continued the subject by suggesting that direct sales should be considered. The profit on a tomato crop may be no more than that collected by the wholesaler. Lighting tomatoes increases production. But the cost of lighting in this part of the country which has the highest power rates in the country is not practical. He stated that if we had natural gas, at half the cost of our oil, we would still be in business.

Calculating production costs is a very important phase of greenhouse management. It doesn't determine the selling price, that is regulated by supply and demand, but it does tell which crops are profitable to produce. Professor Alvi Voight, Penn. State Univ., showed how production costs can be calculated and interpreted. Presenting figures from typical operations, it was possible to correlate these with individual greenhouses to better plan production schemes.

A few years ago, imports of flowering pot plants from Nova Scotia, Canada, upset the New England market. Mr. Brian Toms, Greenhouse Specialist from Nova Scotia, told how it happened. Conversion of a range from vegetables to pot plants prompted a search for new markets. It was not inexpensive heat or operating costs. Labor, oil and power (the highest rate in Canada) are comparable to New England. But no exports from Nova Scotia are expected this year. Other markets have been found and New England growers can relax.

An industry on trial, the non-registered (illegal) use of pesticides in greenhouses, was addressed by Mr. Nathan Chandler, Agricultural Consultant to EPA. Reviewing the changes in laws and their interpretations since 1972, he described the problems imposed on the industry and attempts made to provide reasonable regulation. It appears from his statements that it is fortunate that the paperwork involved is staggering and that enforcement is delayed. In the meantime, more appropriate regulations may be forthcoming for the industry.

In response to a question regarding the application of wettable powder insecticides and fungicides using air as the dispersal medium rather than water, Mr. Chandler reminded us that it is not legal. It seems regrettable that a long establishment commercial procedure such as this is not being considered for approval by EPA at present. This concept also applies to many concepts such as preventative sprays before a target pest is present and application of a pesticide to a greenhouse containing non-labelled plants. Mr. Chandler voiced some hope that such practices may receive approval in the near future.

Dr. Judd closed the 1976 New England Greenhouse Conference with a critique and a hope that the 1978 New England Greenhouse Conference will be as instructive, entertaining and as well attended as this one.

Overwintering Nursery Stock With Minimum Heat

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Nursery stock, historically, has been stored in many types of structures ranging from barns, mulched cold frames, to cellars or pits in the earth. Most have been acceptable methods with below ground cellars proving quite satisfactory with good moisture from 32 - 40°F according to Havis (6).

A significant increase in production of container grown ornamentals in the northern United States coincided with the advent by the plastics industry of white or milky plastic. The use of these white films was the stimulus to increase production because growers finally had a low cost, practical and fairly reliable means of overwintering their stock.

Currently the standard procedure for overwintering container grown and many fall dug field grown woody ornamentals is under quonset shaped, pipe-frame structures covered with white film. Some smaller hoop or flat structures 3 to 4′ high are also used for deciduous stock and reliably hardy evergreens.

Plant damage, however, still occurs under these structures depending on the severity of the winter weather, plant hardiness, condition of plants entering storage, film and structure characteristics among other factors.

Research by Havis (6) has shown that severe root damage occur on some plants at temperatures of +23°F and temperatures between +15 and 20°F will kill plants. Flower bud damage, bark splitting, stem dieback and leaf drop or necrosis are common types of winter injury.

Evaluations by Good et. al. (4) in New York, Davidson et. al. (2) in Michigan, Reisch (7) in Ohio and Gartner et. al. (3) in Illinois has shown that plants stored under white poly structures overwinter in better condition than those under clear plastic. Plants stored under a double layer, white plastic covered structure, inflated 2-3 inches overwinter better than those in a single layer structure (10). Higher night temperatures and lower day temperatures along with reduced light transmissions in the double layer white covered structure explain improved plant condition.

Plant damage can be significantly reduced in storage in walk-in storage structures if supplemental heat is directed into the house at a temperature high enough to maintain temperatures above the injury point for root tissue (12). Heating the structures will prevent or reduce damage caused by low temperatures which injure roots, split stem tissue, cause chlorophyll breakdown and leaf drop. In addition, supplemental heat which normally prevents the media from freezing, reduces the changes of desiccation injury which often accompanies frozen media.

Growers utilizing thermostatic control attempt to maintain minimum heat between 30 to 34°F. Several types of heating units can be utilized, however, one of the most common types is the Universal Heater 150,000 BTU Model FA 150 unit suspended 5-7′ from the ridge pole at one end of the house. These heaters are L.P. or natural gas fired units which are reliable, effective and represent similar to an insurance policy, the added protection that's sometimes needed. These units prorated over 5 years together with labor, gas and electricity consumption resulted in additional costs of 6.7¢ to overwinter 1 gallon cans in the winters of 1972-74 in Columbus, Ohio (9).

Since heating raises storage costs nurserymen use the heaters on high value stock such as broadleaf evergreens and on plants most likely winter injured or susceptible to storage molds. Heating storage structures will require additional plant watering during the winter so additional labor is required. Since 1974, the number of heating units has increased in the nursery trade, however, the energy crisis has cast a doubt in the minds of some producers as to whether this is the direction to expand.

Alternative methods to heating overwintering structures include the application of microfoam over the plants in the houses or in beds outside. Microfoam has been used successfully in nurseries and in research in Maryland (5) and Ohio (1, 8, 11). Management of the environment under microfoam is critical and growers must learn to: 1) control diseases, which are most prevalent in moist conditions, 2) control mice which will eat microfoam, 3) ventilate to reduce leaf water soaking potential, and most important 4) remove the microfoam early enough in the season to prevent growth advancement.

A polyethylene blanket (6) or poly liner (11, 13) terms used interchangeably, have proven effective in research and by commercial nurserymen to improve plant quality by reducing dessication damage and possibly low temperature injury as well, through the entrapment of ground heat. In this instance, the poly film is suspended just over the tops of the plants, avoiding foliage contact and tucked in at the sides. To avoid excessively warm temperatures this liner or blanket must be lifted during warm periods.

Supplemental heat from non-fossil sources may some day within the not-too-distant future have application in the overwintering of ornamentals. Currently research is being conducted in many states on solar energy (including inexpensive sources), solar ponds and plastic water beds or sandwiches. Any one of these heat sources, combined with methods of conserving the heat generated during the day may some day be all that's necessary to successfully overwinter at an economic level.

In summary, several methods can be used for storage of woody ornamentals with the walk-in quonset shaped, white poly covered

structures the most prevalent type in the trade. Additional protection is available, if the houses are double covered, inflated and supplemental heat added to maintain temperatures of 30-34°F. Other options to increase storage temperatures include the use of microfoam, or poly liners over the plants within the storage structures.

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COMPOSTS AND ORGANIC FERTILIZERS

By Stan Bulpitt
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Over half a century ago a scientist, Albert Howard was knighted by the British Government for his research in developing the Indore method of composting in Indore, India. Yet, inorganic chemists are still inclined to pass off the value of organic matter in gardening as a myth.

If you are so inclined lets start out today on the premises it is a myth; even scientists accept myths. For example, Aspirin is made from ground bark of the Swamp willow. Quinine comes from cinchona bark and I understand there is no scientific reason why they relieve headaches and cramps. But, they do and millions of these tablets are swallowed each year without question.

In the next 32 minutes I have 32 years experience to review with you. 32 years experience in composting organic matter. Let's see if a better perspective of the organic to the inorganic can be drawn. I feel present day soil management techniques has put undue importance in only the inorganic. As important as the inorganics are plant roots do more than suck water and nutrients from the soil. Organic matter does not have to be reduced to simple mineral compounds before it is of benefit to the plant. From composts of manures, leaves, and other organic wastes come hundreds of compounds that are taken up by the plant root system.

In the darkness of soil there is health giving life. Billions of microorganisms ingest carbonaceous matter, building it into a colloidal form of humus. To do this they consume minerals held by absorbtion on the acid clays of the soil.

To keep renewing this complex exchange of elements in the soil, use dolomite limestone as a calcium-magnesium fertilizer. We do not think of it only to neutralize or sweeten soil. When the soil pH is high enough gypsum rock will supply the needed calcium and sulphates without

changing the pH. In fact lime and gypsum are good companions. For every pound of lime needed add ½ pound of gypsum. For phosphates and other minerals use colloidal phosphate rock. For potash, pulverized granite rock from New England or greensand marl from New Jersey and langbeinite ore from New Mexico.

These are the main inorganic fertilizers – slow to break down but good stabilizers.

Now to the illusive nitrates from natural organic fertilizers. Our favorite is blood meal. Relatively fast availability and gives good foliage color. Hair tankage or hoof and horn meal for longest feeding life and all of them have 14% nitrogen. We call them illusive because they are relatively unavailable at soil temperatures below 50 degrees Fahrenheit. It is interesting to note when all nitrates are derived from natural materials the resulting food crop has a higher content.

We count on bone meal for a natural organic phosphate more available than the mineral phosphate rock. All composts are low in phosphates and we have learned to add this nutrient to composts before the potting soil formula is made up. Sort of like baking a cake. There is much to learn about the order of adding the ingredients.

Final ingredients are the chemical or acid treated fertilizers we feel are necessary not because they have something not found in natural fertilizers but the nutrients are available when the potting soil is cold. They are calcium nitrate 17% (which makes little ammonia), superphosphate and a little manganese, zinc and copper, but only an ounce to the cubic yard.

These are highlights on fertilizers, what about the soil itself when we can no longer get topsoil? The University of California and Cornell offer as a solution peat moss mixes with artificially prepared vermiculite which quickly loses its form and lightness. It's also expensive with the best grades being imported as is perlite. They both require high heat to manufacture and long miles of transportation. With higher dollar cost for the future we started to investigate composting in 1944 but soon found it costly to collect materials and space consuming to pile and compost one's own. At the same time municipalities were at their wits end, since they can't burn, on what to do with leaves, digested sludge, garbage and the like.

We then realized that someday their problems and ours would be solved simultaneously by one solution.

In 1968 the town fathers of the Village of Scarsdale were the first to venture into true recycling of leaves. Now 8 years later that village of 20,000 people on 9 square miles of land finds composting only their leaves saves them over $100,000 annually over what landfilling leaves would cost. Also, landfill locations are not available.

We have found leafmold to be a very stable product. Mixed leaves have a very consistent analysis, quite high in potash and almost a constant pH 6.8. With relatively high analysis goes high salts. This is the only disadvantage, so leaching rains to remove excess salts are better than covering the pile. Salts can build-up in stored composts when working with thousands of cubic yards with piles 15 to 20 feet high. It is my guess in the old days before composters knew about salts build-up they established a rule of never piling higher than 4 feet. Leaves are a natural to pile by themselves; they have an average 40 to 1 carbon to nitrogen ratio when 28 to 1 is about ideal. This only means they take a little longer to decay or about 10 months.

This is fast enough for municipalities so they can shred them to clear the area for the next years batch. Turning the pile once or twice while composting will speed the process but always shred after decay. Each additional operation is labor so let the microbes do the work; they don't demand a weekly paycheck.

In the immediate future we hope to have a machine to straddle the pile which looks like a lumber carrier. As it drives through the pile of leaves are turned quickly and composting would be finished in half the time. There will be a big industry springing up to process wastes especially when agriculture realizes their soils are diminishing and learns that fertilizer alone will not keep soil in good tilth.

That is a big subject in itself. Today we are concerned with potting soil. Pot plants need a much higher fertilizer application, 5 to 10 times more than in field culture. Potting soil should be lighter in weight with much higher water holding capacity and still have good drainage. Waste materials can meet these specifications with fertilizer amendments.

The soil mix might start with 25 to 35% composted leafmold. Now don't compare composted leafmold with leafmold from the woodland. Nature's leafmold is acid and low in nutrients because woodland roots have removed all the fertility. Composting, on the other hand, conserves the elements in leaves, many of them micro-elements from deep rooting trees. Microbial respiration of the thermal bacteria in the compost pile generates heat, destroys nematodes and pathogenic organisms as well as killing weed seeds. I have always thought composting is like wine making. Grape juice is a good beverage but when aged and fermented properly it has additional medicinal value.

To the 25 or 35% improved leafmold by composting you can add 10 to 20% decayed hardbarks as the next ingredient. Bark that may have protected a tree from infection for a century can add an antiseptic value to potting soil, possibly through the heavy metal content in barks, another 10 to 20% to the soil mix might be composted cow manure. The antibodies in

cow dung are quite active. The old-timers used it as a poultice and while it may only have an analysis of 1-1-1 it will produce more crop per pound than any other comparable fertilizer.

In potting soils the old practice was to use sand for air and drainage. Possibly, because sand is now not the quality it once was it does not work well for us. Personally, I think it is too fine textured. In the old days a sand-pit was a welcome operation in a community and the quality of sand was better. Today, pits are not acceptable to zoning so the operator can sell anything he can call sand. With light ingredients like composts and peat we feel sand is too heavy and tends to compact and compress the light weight materials.

In the old days with heavy topsoil sand accounted for up to 30% of the mix, our suggestion for a practical drainage material today, a waste product generally known as styrofoam more accurately named polystyrene. This is the formed block material electronic equipment and appliances are packed in. We collect the manufacturer's scrap and reprocess it into what is called styrofoam beads. It looks somewhat like perlite but only one quarter the weight, is completely inert and we feel it is the ideal light-weight substitute for sand.

A nine cubic foot plastic bag weights 18 pounds and sells for $11.25. Three bags make a cubic yard with a total weight of 54 pounds. If an ultra-light soil mix is desired use up to 25% of the styrofoam beads. We find 10 to 15% is good without making the mix too light.

Another material we used which may be considered patriotic next year is peanut hulls. They weigh one third less than peatmoss, decay slowly and have 1½% N, almost 1% each of potash and iron. Peanut hulls may be very popular in outer space container growing in the future. We are doing experimental work with a group under guidance of Dr. Scheld, chief space biologist with N.A.S.A. Half of this soil mix could be peanut hulls and styrofoam beads.

We have tried many other waste materials. Sawdust, if well composted and available to you, is acceptable. A material called auto waste consists of plastic seat cushions and automobile insulation. We have even tried tire waste. There are other waste materials, possibly far in the future but they are there to be considered.

There is another old dependable we still use, peatmoss at 10 to 15%, which helps to give soil a good texture. Our whole philosophy, mix together some of the old materials such as leaves, manures and peats piled and treated by the new concept of composting. Add some of the new waste materials such as bark, peanut hulls and styrofoam for moisture and air to keep the mix light without being too light in weight and you can

have a potting soil weighing 700 to 900 pounds per cubic yard, including proper moisture content for growing.

I started giving this paper on the premise that composting to make soil is a myth. Now, to have this method accepted in scientific circles we have to consider scientific criticisms. Why is composting not an accepted practice? What are the problems? Let me review them as briefly as possible.

It is said that composting causes objectionable odors. *Proper* composting does not, I repeat, does not cause objectionable odors. When standing between piles covering acres of ground the generally accepted description of any smell would be a light tobacco odor.

I've been told that composting draws flies or rodents. No way! Only odor attracts flies and there is no odor in proper composting. Any food scraps in compost do not attract rodents because the pile is too hot. You cannot keep your hand in the pile for a minute–therefore no rodents. As the compost cools the food scraps are decayed.

Compost is acid . . . I have never known aerobic composting, the Indore method to make any kind of acid material. Leaves, pine needles, sawdust, woodchips, hay, paper, cornstalks, most of these are carbonaceous. Nitrogenous wastes have consisted of grass clippings, food wastes, manures from birds to zebras, even digested sewage sludge. The most recent composting being started is in the Bronx, New York using Bronx Zoo wastes, etc.

Compost has high salts . . . this is so, but it is not from highway salts. Any compost has a relatively high salt reading because it is relatively fertile. Let rains leach out excess salts in the pile, better still composted potting soil mixes should have occasional heavy waterings or salts will build up in the plant container anyway.

We have enjoyed much cooperation from the U.S.D.A. in Maryland where at their field day in 1973 they promoted the concept of waste to resource. Some 2 years before that we had a young man by the name of Grove Teats visit us from Wheaton, Maryland who after seeing the Scarsdale, New York composting operation went back to Maryland and got a whole county composting program started. He has the largest leaf operation on the east coast under the name of Leafco. Proof there is no vermin in composting is to see ducks in the area nesting in the compost; if eggs are safe there are no rodents. Nearby there is a woodchip and sludge composting operation under the direction of U.S.D.A.

Dr. Jay Koths of The University of Connecticut demonstrated the extreme buffering action of leafmold in a soil mix. With a 1800 ppm of nitrogen the plant in the composted soil tolerated this excessively high reading. Those in peat mixes with the same high reading did poorly and in

sand the plants died. New Jersey Extension Service leaf compost test reports stated no lime or fertilizer needed for building golf greens. Nematode control and other benefits have been reported by greenskeepers at several New England golf courses.

Dr. Roy Flannery at Rutgers University did growing tests with hardy Azaleas in pure leafmold but plants did poorly by comparison to peat mixes. However, when bark was added to improve the porosity of the leafmold along with some readily available inorganic N, P, K, equally good plants were produced. His work helped to convince me a little readily available inorganic N. P. K. has its merits even in a good high organic soil mix.

In 1976 the important experiment with leafmold was done by the Connecticut Experiment Station. The Day Waverley garden in New Haven was planted to food crops; ¾ acre sandy, rubble-covered city lot was cleared and plowed. Necessary soil chemistry corrections were made and 60 gardens planted. One area however had a 3 inch deep application of leafmold compost rototilled into the soil. Dr. David Hill conducted the experiment and reports this composted area produced 30 to 150% more crops. An estimated $5,500 to $7,000 worth of produce was raised on the project. Mr. Dickman, the photographer, documented the work with many slides. Next year Dr. Hill will continue this experiment by starting leaf composting close by.

Much work has been done on composting at the Connecticut Experiment Station and a wealth of knowledge can be collected here. Dr. Ray Poincelot's bulletin #754 on the biochemistry of composting is a complete reference. At the Lockwood farm in 1976 many demonstrations with leafmold and composting were done by Drs. Norvell, Sawhney and other work by Dr. Day. I Have had much help from Dr. Frink and others on the staff. The interest in this approach to making potting soils is widespread in New England and I feel sure there has been much work done at the other universities. I should have liked to be able to report what all the New England Universities were doing.

The examples in the following slides show (1) An ultra-light soil mix did not grow as good a plant as the relatively heavy soil. (2) Using different forms of light aggregates such as 10% styrofoam beads did better than styrofoam flakes and 10% vermiculite was the poorest quality of this test. (3) Substituting 10% styrofoam for 15% sand in the mix proved sand did not do as well and it suggests sand will be going out of the mixtures. These percentages are by volume not weight. (4) Because horse manure, sawdust and woodchips are readily available in our area we found even using 10% made for poor growth and using horse manure in place of leafmold made for a really stunted plant. The best plants were in a heavy

soil mix even without bark. (5) Composted horse manure and sawdust contributed nothing to plant quality and results were disastrous when the compost was not completely decayed. (6) Soap manufacturers and many others are entering the amateur small package soil market. As we find new products we compare them to professional mixes and have yet to find any to beat the compost mix. (7) Not only do we watch for new products but we keep checking other possible waste materials. Even testing for filler materials such as using 10% subsoil or feldspar waste or oxidized iron waste. The poorest result was what we called auto waste which is composed of cushions, upholstery, padding and insulation. This auto waste accumulates at 200 to 300 cubic yards per day just in Connecticut.

This testing will have to continue. Back in the 1940's and 50's we had the finest mixtures we used for flower show exhibits at the International Flower Show in New York. Exhibitors were never too ready to share their formulas with you. I go back to the old days of the English Clays fertilizer. In those days we didn't have peat moss and didn't care how heavy the soil was. For several years we installed the Eastman Kodak Photo gardens with models and all. Now the picture has changed even if heavy soil grows the best plants, peat moss, styrofoam, bark and peanut hulls are here. We have to accept the challenge and grow the best we can. For the sake of our environment and for economic reasons horticulture and agriculture must use organic wastes because it must go back to the land or we won't have any fertile land or water either. Thanks for inviting me to your convention.

Four years ago, most greenhouse operators were law-abiding citizens. Now, most of them are law breakers. They haven't changed. The laws have!

Mr. Nathan Chandler is Consultant to the Administrator, U.S. Environmental Protection Agency. An apple grower, he was Commissioner of Agriculture, Commonwealth of Massachusetts, for six years as well as Selectman, Trustee of the University of Massachusetts and an officer of many organizations.

The expertise of men like Mr. Chandler is broadening the scope of EPA beyond simply making and interpreting laws and regulations. For this reason, he was invited to address the problems of the greenhouse industry.

The status of the pesticide usage laws has been altered since the regulations were first published. Certain enforcement schedules have been delayed. Some regulations for greenhouses have been reinterpreted. The industry, using some of the most toxic pesticides ever labelled, has an excellent safety record, both to humans and the environment.

To gain insights into the present status of greenhouse pesticide regulation and find out what the future may hold, Mr. Chandler was invited to speak on "An Industry on Trial - Pesticides."

Your editors

AN INDUSTRY ON TRIAL – PESTICIDES

by Nat Chandler*

It is always good to be back in New England, and especially here in Massachusetts. Beyond that, I welcome this opportunity to talk to a group such as this on the important subject of pesticides.

We in the U.S. Environmental Protection Agency are fully award of how important this subject is to you folks in the greenhouses business. We are aware that you could not survive businesswise without the use of pesticides. You know pesticides. You use them. And many of you are quite familiar with the legislative history of pesticide regulations.

For that reason, I'll go over very briefly the background for pesticide laws and spend more time on where we are today in our programs to carry out the mandates of the Federal Insecticide, Fungicide and Rodenticide Act as amended by Congress in 1972 and 1975.

When Congress passed the amended FIFRA in 1972, it made it clear that it expected to accomplish some basic changes in pesticide regulation. The 1947 FIFRA was principally a registration law affecting pesticides sold in interstate commerce.

The 1972 amended FIFRA is a regulatory law, affecting pesticides sold in both interstate and intrastate commerce. It also addresses pesticide use, making misuse of a federally-registered pesticide unlawful, and includes a number of other provisions involving federal-State cooperation in the training and certification of applicators, enforcement, and state *registration* of pesticides for special local needs.

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This latter area is one that I know is important to most of you and an area that I'll deal with in depth later.

First, let's look at where EPA is today in carrying out the programs mandated by the amended FIFRA.

The amended FIFRA requires that the agency reregister all of the 35,000 Federally and 15,000 Intrastate registered pesticide products now on the market. During this process, the agency is required to classify products and uses as either restricted to a use only by certified private or commercial applicators - or by persons working under their direct supervision - or for general use by anyone who follows label directions.

Restricted use products will be those that could cause harm to the environment or to people - including the applicator - unless used by or under the supervision of a competent person. General use products will be those considered safe for use by anyone who follows label instructions. We still expect that most products will fall into the general use classification.

Reregistration of pesticides, and classifications of them into the restricted and general use areas, has created a number of problems for EPA. Without additional resources, our Office of Pesticide Programs has been endeavoring to maintain a reasonable response capability to continue handling applications for new registrations, tolerances, and experimental use permits. At the same time, it has been attempting to meet the Congressional deadline to reregister Federally registered products and register for the first time intrastate products by the October 21, 1977 deadline.

It is not surprising that data gaps and other problems have been discovered in this process, with resulting delays. Material in EPS's registration files includes some that goes back nearly 30 years which was developed by EPA's predecessor agencies such as the U.S. Department of Agriculture and the Food and Drug Administration.

The enormity and scope of the material to be reviewed is staggering. So, EPA's Office of Pesticide Programs (OPP) has been forced to set up new processes to review data, develop priorities, and handle other problems. As a result, we are behind schedule in the reregistration process.

These new processes should make it possible for us to complete reregistration of restricted use and other problem pesticides by the October 1977 deadline. It is important to note that products currently on the market will keep their registration until such time as they are reregistered (even though this reregistration action may extend beyond the October 21, 1977 deadline) unless they are removed from the market through appropriate cancellation or suspension actions.

Such actions are geared to the Rebuttable Presumption Against Registration (RPAR) process. RPAR means that if a pesticide shows

potentially dangerous characteristics, it is subjected to intensive scientific review and public comment before a decision is made on whether to allow continued use or begin the process of removing it from the market.

The advantage of the rebuttable presumption is that it allows EPA to gather extensive scientific information about the effect of a chemical *before* a decision is made on whether to allow continued use or begin the process of removing it from the market. It ensures that benefits and risks are given full consideration.

RPAR is not the same as banning a pesticide. Whether this occurs will depend upon the type of information received by EPA and judgment as to whether benefits appear to outweigh risks or vice versa.

The RPAR process may last up to 180 days. During this time, the pesticide in question may continue to be sold. At the end of this period, EPA will announce that the pesticide appears safe for continued use or that it may cause unreasonable adverse effects on the environment. If the latter occurs, additional investigation into benefits and risks begin. This includes consultation with scientific and economic experts and the opportunity for further comment from the general public. We certainly invite your comments during this review period.

To date, EPA has issued five RPARs: against kepone, chloroform and chlorobenzilate, endrin and BHC.

By now, the message should be clear that EPA will probably miss the October 1977 statutory deadline for reregistration. Our current resources will not permit us to meet the deadline and we will, therefore, be working on the basis of these priorities:

1. Classification and reregistration of those product uses to be restricted.
2. Classifications and basic registration/cancellation decisions on those products triggering presumptions against registration on the basis of potential chronic health effects.
3. Making the basic registration process more workable by such efforts as improving data cataloging, data validation, and regional support to help small firms properly make application, particularly when minor uses are involved.
4. Reregistration of products destined for general use.

OPP expects to complete the first three of these goals by October 1977; the latter—completion of product reregistration for general uses—will take perhaps until 1979 to complete. However, by accomplishing classification of major restricted uses, review of pesticides potentially causing unreasonable adverse effects, and getting the registration mechanisms working, we believe we will be meeting the essential goals of the statute, even though missing the technical completion date.

Again, bear in mind that products not reregistered by the October 1977 deadline do not automatically become cancelled. Instead, all currently registered products remain registered until EPA takes action to cancel, restrict or modify their registration by reregistration or cancellation notice.

Thus, all those products not acted upon by the October 1977 deadline will remain on the market and available for your use. On balance, we think it is much better to follow the course that I have just outlined than to move on products with inadequate data. That would only result in long term confusion about what will be available a year from now and what will not.

Also bear in mind that there is no such thing as a permanent restricted use list. Conditions change. New data is discovered. The risk/benefit equation can be shifted either way. All of us have seen enough changes in the pesticide area over the past decade to readily see that risks and benefits must both be constantly reviewed as conditions change.

However, this can and will be done in an open process. As I mentioned earlier, the rebuttable presumption process allows the collection of data, notification of interested parties and the public of agency intent, and opportunity for us to obtain your input *before* decisions are finalized.

Let's look now at the second major leg that the amended FIFRA stands on. I refer, of course, to training and certification of applicators who wish to use restricted pesticide products.

We see certification as a major boon to pesticide users. For one thing, it allows a reasonable alternative between the old ones of cancellation of a product or throwing it open for use by everyone, regardless of his training, experience, or expertise. For another, it allows for increased professionalism among the users of those pesticides classified as restricted because of potential environmental or human hazards.

I believe that we can reasonable expect to keep certain pesticide product uses available to competent persons that would otherwise be lost. We may even be able to bring back into use some products - or limited uses of some products - that have been withdrawn from the market because Administrator Russell Train had no alternative except to either cancel or allow unrestricted use of the product involved.

Therefore, I look forward to all of us working together in the certification area to strengthen this important base upon which a major element of the pesticide program stands.

Certification of applicators will, of course, be performed by the States under programs that they develop within broad federal standards.

Applicators are divided into "commercial" and "private" applicator

groupings. Private applicators are those who produce agricultural commodities, which, of course, includes this industry. The law and legislative history is specific in that it provides that the private applicator group shall be producers of agricultural commodities applying restricted use pesticides on their own property or on that of another producer of agricultural commodities if no compensation is involved other than exchange of services between two producers of agricultural commodities.

All other users of restricted pesticide products must be certified in the commercial applicator group, whether they are using or supervising use of restricted pesticide products on their own property or on that of another person.

I stress this, because there has been some confusion in this area. The Agency, however, was not given discretionary authority in this area. The definitions were written by Congress and amplified in the legislative history of the Act.

However, I would expect that most of those attending this meeting would be in the private applicator category unless there are members in the audience who plan to apply pesticides on other people's property for pay.

I am happy to be able to report that the States are moving forward well with their certification programs. To date, 21 of the 54 States and Territories have received either final approval of their plans or final approval contingent upon formulation of needed regulations. An additional nine States' plans have been published in the Federal Register with notice of EPA's intent to approve them. Another 11 States have plans that have been signed by their governors and are being finally reviewed by EPA. These should be published shortly in the Federal Register.

These three groups total 41 States and Territories. An additional nine are in final stages of their State plan development. This adds up to 50 States and Territories, leaving only four that are not yet in final stages of state plan development as we approach the October 21, 1976 date when States are supposed to have plans ready under the amended FIFRA. None of these four are among the New England States, I'm happy to add.

Within the six New England States, New Hampshire has received final contingency approval of its State plan; Maine's has been published in the Federal Register with notice of EPA's intent to approve the plan; Vermont's has been signed by the governor; and the State plans of Massachusetts, Rhode Island and Connecticut are in final stages of development prior to being submitted to their governors.

Training of applicators has begun in the New England States and across the country in preparation for certification when State plans and all regulations are final. The Northeastern states have developed extensive

training materials for private applicators, and EPA has made available to the States basic training materials, including a core manual for private applicators.

Across the country, the Cooperative State Extension Services are deeply involved in training of private applicators under funding agreements with EPA. To date, some 135,000 private applicators across the country have received training for certification, including 4,500 in the New England area.

About 90,000 commercial applicators, including approximately 1,500 in the six New England States, have received training for certification to date. We expect training efforts in both the private and commercial applicator areas to move forward rapidly this winter as States gear up to take advantage of the winter season now that the bulk of training materials have been developed.

Thus, we are now mounting a major effort in the training and certification areas, and progress is heartening. Out of this effort we fully expect to achieve greater professionalism in the entire pesticide use area.

But as with all nationwide programs, we have the matter of special, local needs, together with requirements for special methods to meet special situations. Many of these are involved in the greenhouse area. Let's look at some of these concerns which generally fall in the area of minor uses.

The availability of pesticides for so-called "minor uses" has been a subject of discussion for many years. There are many definitions for "minor use." In general, a pesticide use is considered minor if its market potential is insufficient to economically justify the manufacturer developing the data required for registration. A pesticide use on a major crop such as corn or soybeans may be a minor use because it is needed infrequently or because it is applied only in certain parts of the country. A use needed universally on greenhouse crops may be a minor use, because the total acreage of the crop is small. In both cases, the volume of pesticide required is not large enough to justify the costs of registration. Another factor of concern with respect to the sales potential for particular pesticide applications is that of potential high liability risk where damage losses may be great even though total pesticide use is small, and the greenhouse industry tops that list.

The minor use problem was influenced substantially by the pesticide use restrictions established in the 1972 amendment. Prior to 1972, FIFRA did not require all uses to be Federally registered and did not include penalties if label directions were not followed. The Act now makes it unlawful "to use any registered pesticide in a manner inconsistent with its

labeling." The Act also affected the minor use problem by modifying State pesticide control authority. The earlier FIFRA did not regulate intrastate products, and many minor use needs were met with such pesticides. This problem is partially alleviated by Section 24(c) of the Act. States are again now registering pesticides for special local needs. In New England, Connecticut, Maine, New Hampshire and Vermont have this authority.

As part of the reregistration process, many registered pesticides may not be submitted for reregistration if substantial new information is required to fulfill present data requirements as dictated by the new law. These are expected to be the small-usage pesticides which involve minor crops and uses where the manufacturers cannot justify the additional costs to produce the required information.

A great deal has been accomplished in the past few years to improve minor use and minor crop pesticide product registrations. There has been a cooperative effort between the Interregional Research Project group (IR-4) at Rutgers, sponsored by USDA and EPA. Just a few years ago discussions indicated there were thousands of minor use pesticide products that needed to be registered. After working cooperatively with IR-4 liaison representatives at the various State Agricultural Experiment Stations, clearance requests for registration of needed minor use pesticides were solicited. These requests were consolidated and submitted to IR-4 for action. The actual list, for agricultural uses, which constitutes the major part of minor use requirements, includes about 700 requests. This list is being refined and categorized.

If a manufacturer is unwilling to register a product for a minor use, either because of the cost or the potential liability, what will happen?

One solution which we are exploring is the possibility of having a grower association or user group become the registrant. This group would work with a manufacturer to develop an expanded label to cover whatever the minor use need might be. The label might read "for use only by members of this association" and might include a statement limiting the liability of the manufacturer. It might further add the desired uses as recommendations of the association acting as the knowledgeable expert for that crop or crops.

Another solution which might be more realistic would be a further amendment to the basic law to cover the minor use problem. As you know the Congress will hold oversight hearings in the spring of 1977 on the administration of FIFRA by EPA, and the greenhouse industry would be well advised to participate in these hearings in a constructive way.

One other point on this subject: The Administrator's Pesticide Policy Advisory Committee held a series of forums last summer in the Southern States and in California to get input from the public on its impressions of

EPA's Pesticide Program. Several recommendations surfaced from the greenhouse industry. The most significant one to me was that an EPA/Industry Task Force be created to deal with the specific problems of pesticide regulation and minor uses by American Florists. I hope that the Agency will respond quickly to this suggestion and I will do what I can to see that it is implemented.

In an event, the Administrator has made it very clear to his program offices that they are to involve the public in this kind of problem solving. For too long, the Agency has attempted to develop programs, guidelines, rules and regulations without public participation. The results in many cases have been disastrous both for the Agency and for the involved industry.

Finally, let me talk about Integrated Pest Management. An integrated pest management concept is also being explored, where an IPM protocol will be developed for a particular grower in a particular State. By following the IPM protocol, which is developed by a team of "knowledgeable experts," the grower may be free to expand the label to include the site/pest combinations included in the protocol.

We are exploring this concept with the Society of American Florists and officials in a particular State to determine the feasibility of the approach. The basic notion would be as follows:

- A cooperative effort between USDA, EPA, State Officials, the State Grower groups, several grower participants and the SAF
- Agree to the basic approach
- Develop an IPM protocol for the participating growers who would be free to extend the label to cover needed site/pest combinations as long as they followed the approved protocol
- Monitor the project in cooperation with participating growers
- Conduct research as necessary
- Adjust protocol as needed
- Publish results
- If successful, replicate the program

These potential solutions to minor use problems are being offered for your consideration. We have not gone forward to seek agency endorsement—and will not do so until we can gain the benefit of your suggestions.

By working together, I am sure that we can find ways to make available to competent applicators the pesticide products that your industry needs under conditions that will be beneficial to our long-term goals of serving the public while providing the necessary protection for people and the overall environment.