

GREENHOUSE BMP'S: NOT JUST FOR BREAKFAST ANYMORE

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Each year, growers throughout North Carolina and the rest of the U.S. must face more and more environmental issues. Federal, state, and even local regulations are addressing concerns such as surface and groundwater contamination, water usage, pesticide usage, solid waste disposal, and energy consumption. Many of these regulations have affected and will continue to affect both business and cultural practices within the greenhouse industry. Ted Bilderback addressed one that hits us at home in the previous article concerning the Neuse River.

Unfortunately, many of us are trying the ostrich routine to deal with this issue. For example, at the 1997 Southeast Greenhouse Conference, Don Wilkerson (Texas A&M University), Ted Bilderback and I put on a 4-hour program on best management practices for greenhouses. We had seven attenders in the room. Thus the title above -- not just for breakfast anymore. It's time for growers to wake up and smell the BMP's.

Most floriculture producers have a deep commitment to the environment. Our products enhance the quality of life for our customers as well as increase the quality of the air we breath. Horticulturists by nature and by training are good stewards of the environment and posses an appreciation for the value of natural resources. The commercial floriculture industry has been a leader in establishing and implementing production practices such as integrated pest management that help protect the environment.

This article was prepared to assist growers in continuing their efforts of environmental stewardship by reviewing the concept of Best Management Practices (BMP's). Through

proactive behavior, greenhouse growers can continue to set an example for other facets of agriculture.

What Are BMP's?

Best management practices can be defined as practices, schedules of activities, maintenance procedures, and structural or other management decisions that have been found to be the most effective and practical means to prevent or reduce the discharge of pollutants into the environment (*whew!*). The scope of BMP's can be expanded from pollution control practices to also include procedures or production choices that address other current environmental concerns such as water conservation and energy use.

BMP's are practices; something you intentionally do or avoid doing in order to positively affect the environment in your business. They are proactive. BMP's are implemented prior to a problem rather than after a problem is observed and some type of "fix" is needed. Think of BMP's as preventative rather than curative treatments.

The BMP philosophy emphasizes environmental stewardship yet it does not sacrifice crop quality. Individual management practices are freestanding rather than a set. In other words, growers can implement as many as possible and still be effective without implementing each and every practice that has been documented.

Safeguarding the environment comes with a price, and producers should be aware of the potential economic impact of implementing BMP's. As you evaluate specific practices you should be asking: ❶ can I afford to implement this procedure; ❷ would my customers be willing

to accept some of the added costs; and ③ can I afford NOT to implement this procedure?

What Are the Issues / Types of BMP's?

This article concentrates on only three (of many more) major issues that BMP's can address: ① surface and ground water contamination; ② water conservation; and ③ alternative resource utilization (use of man-made waste products). Other issues that BMP's can address include solid wastes generation; and energy and natural resource consumption. However, the scope of this article only allows for a few examples of many possible BMP's. An example of a specific BMP addressing water conservation would be: "irrigation should not be based on a fixed daily schedule but based on plant water needs." An example of a BMP addressing water contamination would be: "whenever possible, select 'biorational' pesticides that are less persistent in the environment, less toxic, and / or less mobile in the environment than alternative pesticide choices."

There are two major categories of BMP's that can address the above three issues, structural BMP's and cultural BMP's. The following section outlines types of BMP's that greenhouse owners should consider employer. Remember that this is merely a list (and not a complete list) of BMP's rather than a required set. For more BMP's, refer to the suggested readings section at the end of this article. I encourage each of you to acquire (at the very least) the BMP publication from SNA; you can purchase a copy from the NC Association of Nurserymen (call 919.266.3322).

Structural BMP's

Structural BMP's are recommendations involving physical structures, such as building placement, type of irrigation system used, and ditch / drainage system placement. Four subcategories of structural BMP's are listed below: ① site selection criteria; ② pest exclusion systems; ③ runoff prevention systems; and ④ "closed" irrigation systems.

Site selection criteria. If you are planning on building on a new site, these BMP's should be considered. Many of them are difficult to employ, once a site has been selected and buildings have been placed. Site selection BMP's address issues such as proximity of your buildings and land to aquifers and surface waters; flood plain location and flooding potential on your site; the possibility of using some of the land for effluent distribution; and the potential for on-site effluent containment (a reservoir or wet detention basin). Examples of site selection BMP's are: ① do not locate buildings or production areas over shallow underground aquifers; and ② avoid building or growing on a high risk flood plain.

Pest exclusion systems. One way of reducing the potential for release of pesticides into the environment is to find alternative means of pest control rather than applying pesticides. Practices such as screening and utilizing quarantine areas in your greenhouse are examples of pest exclusion systems. Examples of pest exclusion system BMP's are: ① screen open vents on greenhouses to prevent entry of flying pests and weed seed; ② attach a screened antechamber onto greenhouse entries to help reduce pest transfer from outside into the greenhouse; ③ establish pest quarantine areas where newly received material is examined for infestations; and ④ avoid pest-attracting apparel, such as yellow and blue clothing (*is clothing a structure or a cultural practice?*).

Runoff prevention systems. Runoff includes effluent (water / fertilizer solution used for irrigation) as well as storm water that drains from buildings and paved areas. Ideally, all drainage water should be contained on site (no runoff from property boundaries). Examples of runoff prevention system BMP's are: ① grade construction sites for erosion control and planned precipitation collection; ② establish vegetative buffer zones (vegetative filter strips of sod or other plants that remove sediment, nutrients, and other pollutants from runoff by filtration, deposition infiltration, absorption, and decomposition); ③ construct a wet detention

basin to store effluent and reuse for irrigation purposes; ④ utilize natural or constructed wetlands as an effluent filtration unit; ⑤ disperse nutrient-rich effluent onto utilization fields (crops such as oats that will absorb and scrub nutrients out of the effluent); and ⑥ pump effluent through a bioreactor or biofiltration system to remove nutrients and other chemicals prior to effluent discharge.

Closed irrigation systems. A truly "closed" irrigation system does not allow any water or fertilizer solution to escape from the production facility into the environment. Containment and recirculation of effluent is an excellent technique to prevent runoff of any kind. The following irrigation systems are examples of closed irrigation system BMP's: ① ebb and flood tables; ② recirculation delivery troughs; and ③ flood floor + sump (a catch basin to hold solution between irrigations) delivery. It is possible to dramatically reduce the potential for runoff by using quasi-closed systems that are not completely closed, yet contain all effluent on-site. The following quasi-closed irrigation systems are considered BMP's, when used in conjunction with a wet detention basin: ① individual catch pans; ② closed tray systems; and ③ solid floor production areas with directed drainage.

Cultural BMP's

Cultural BMP's are practices used in the production of plants; how you grow your crop and cropping decisions made during production. Three subcategories of cultural BMP's are listed below: ① substrate management practices; ② pest management practices; and ③ the optimization of the production environment.

Substrate management practices. One way of reducing the potential for runoff is to reduce the number of irrigations and the amount of leaching during production. The substrate you select can have an effect on the watering requirements of your crop. The mix you choose and how you manage it can (how water and fertilizer are applied) can affect runoff potential

from your greenhouse. Examples of substrate management BMP's are: ① grow in "tighter" mixes that have greater water holding capacity than alternative mixes; ② decrease the leaching fraction of irrigation events to reduce effluent volume; ③ make fertilizer applications based on nutrient monitoring and plant needs rather than temporal scheduling; and ④ utilize man-made waste materials such as coir fiber and composted yard wastes in substrates rather than relying solely on somewhat limited (bogs do regenerate with time) natural resources such as peat moss.

Pest management practices. The concept of integrated pest management has been preached and practiced for years in the greenhouse industry, but it never hurts to review environmentally friendly pest management practices. The following are examples of pest management BMP's: ① scout and monitor pest populations or incidence of diseases for judicious timing of pesticides; ② employ cultural practices rather than sole reliance on pesticides for pest and disease control (e.g., practice good sanitation to reduce the potential of diseases in the greenhouse); ③ integrate biological controls when appropriate into your pest management program; and ④ when pesticides are required, use biorational pesticides with lower toxicities than alternative pesticides.

Optimization of the production environment. Just as pest exclusion can reduce the need for pesticides, so can proper environmental controls during production. In many cases, the environmental conditions can directly affect the potential for production problems (and subsequently pesticide applications and crop quality). Examples of production environment optimization BMP's are: ① supply adequate spacing for plants during production (better spacing = more light and lower relative humidity = less need for chemical height control and less disease potential); ② use DIF as an alternative to chemical height control when possible; and ③ employ night ventilation and reheating for reduction of relative humidity (lower

relative humidity = less disease potential and less need for chemical control).

Closing Comments

This article does not contain an exhaustive listing of BMP's. It does give you concrete examples and a starting point for development of a total BMP production plan. Review your current practices. List the best management practices currently employed at your business. Evaluate ones that you have not implemented and incorporate as many as you can.

One final note about BMP's and environmental stewardship: brag about your efforts! A positive attitude will be noticed by employees. When you show concern, the attitude will be transferred to those around you. If we don't talk about our industry in a positive light, who else will do it for us?

Suggested Readings

Anonymous. 1992. Water quality action manual for greenhouse and nursery operations. Horticultural Water Alliance. (*This publication is the result of a joint effort between the: Society of American Florists, American Society of Nurserymen, Professional Plant Growers Association [Bedding Plants International], and Roses, Inc. The manual seeks to answer the most important question a grower can ask: "what can I do?" Beginning with guidelines on how to conduct a thorough environmental audit of your operation and facilities, the manual provides recommendations for the most environmentally sound approaches to greenhouse and nursery production.*)

Bailey, D.A. 1997. Height control of commercial greenhouse flowers. NC State University Hort. Info. Lflt. #528. (*This publication outlines biological, physical, as well as chemical control measures for height control*

of floricultural crops. It lists alternatives to using chemical height control in an effort to convey best management practices for height control of crops. The publication is available at <http://www2.ncsu.edu/floriculture/>)

Bailey, D.A. 1997. Best management practices for plant growth regulators. NC State University Hort. Info. Lflt. #529. (*Not all pgr's used in floriculture are height control chemicals. This publication details BMP's for use of all plant growth regulators labelled for use in the greenhouse. It is available at <http://www2.ncsu.edu/floriculture/>).*)

Wilkerson, D.C., B.M. Drees, D. McWilliams, and J.M. Sweeten. 1991. Water management guidelines for the greenhouse industry: a guide for protecting and conserving our natural water resources. Texas Agr. Ext. Service Bul. Hort 4-5. (*This guide provides information on how to establish a variety of cultural and structural BMP's for the production of greenhouse crops. Also included are procedures for conducting an in-depth environmental audit and techniques for developing a long-range environmental plan for your operation.*)

Yeager, T., C. Gilliam, T. Bilderback, D. Fare, A. Niemiera, and K. Tilt. 1997. Best management practices: a guide for producing container-grown plants. Southern Nursery Association. (*This guide provides growers with valuable information on the "how-to's" of establishing best management practices. It was a cooperative effort among states throughout the Southeast. Growers can select from 120 listed site-specific BMP's to develop a voluntary environmental stewardship plan. Copies can be purchased from the North Carolina Association of Nurserymen. Call 919.266.3322 for ordering information.*)