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Sustainability: Attainable? Or an Elusive Goal?

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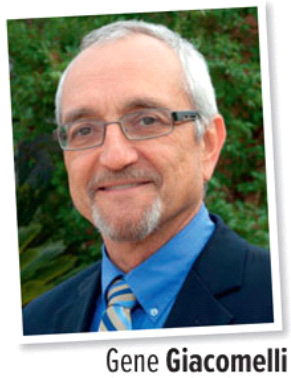

Sustainable is a moldable word capable of fitting in numerous situations, somewhat like the expectations of “user-friendly” and, as such, not always achievable. The word offers a sense of positive direction with both contemporary and futuristic value that enhances economic production systems, the environment and the good of the community.

In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.” It has goals utilizing sustainable development processes as the driving force. Sustainability has typically been a predominant aspect of production agriculture. Whether specifically stated or not, efforts were employed to maintain the future of farming.

However, help was necessary on a grand scale when land practices combined with unfavorable climate in the 1930s created the wind erosive soil conditions that destroyed farms in the high plains of the West. The U.S. began programs to improve farmland soils and water quality with modern farming practices (for example, cover cropping and limited tillage).

Fast forward to the 1970s with CEA greenhouse crop production tenuously established in the U.S., mostly as producers of floral products with some vegetable production. The industry suddenly experienced multiple unexpected problems to overcome—one being natural, resulting from long-term drought, the other a politically motivated oil embargo to the U.S. and other countries. Growers’ response was forced. It was do or die.

From 1973 to 1980 fuel for energy, suddenly an expensive resource, prompted massive amounts of energy conservation research efforts. Researchers primarily from the mid-central and northeast land-grant universities’ agriculture science and engineering programs responded to support the economic sustainability of the industry. Their efforts not only reduced heating fuel consumption, but also ultimately influenced environmental sustainability. CEA engineers and plant scientists’ efforts supported by the CEA industry resulted in a potential 89% reduction of heating energy (from 2.6 in 1973 to 0.29 gal. per sq. ft. of greenhouse annually) in 1980 for a greenhouse in the northeast U.S. during winter when using the newly formulated designs and systems.

The multi-targeted approach to technology of energy conservation and hardware efficiency resulted in modern greenhouse structural design (gutter-connected, double-layer glazing, insulated glass), inside night energy screens, improved heater fuel efficiency and heat distribution systems (bottom heating benches and floors), and plant cultural practices using reduced night air temperature.

In addition, there were several successful commercial greenhouse reject (waste) heat and solar energy system demonstrations supported by the industry and U.S. Department of Energy, such as Northern States Power Sherco Power Plant (Minneapolis, Minnesota) and the Kube-Pak, Inc. hot water solar energy heated greenhouse (Allentown, New Jersey). Subsequently, the digital computer would operate greenhouses by the mid-1980s, providing improved control for energy conservation.

Despite the good outcome, there remains concern for the future of other valued resources. The energy crisis was an imposed hardship that forced evolutionary change toward sustainable productivity. Economists label it “Directed Technical Change,” which impacts environmental sustainability and can induce harsh difficulties by loss of resource availability. The substitution of labor resources with mechanized and roboticized production practices has remained in progress for many years, but isn’t complete. The critical water resource may be the weakest component of all production systems viability and ultimate sustainability.

Sustaining the future food production is a formidable goal, but is it an elusive reality? All systems require multiple resources, and if they’re diminished or lost, the system must adapt or fail.

Consider your science class of long ago where you may have learned about entropy. For my purpose, entropy is a natural physical decline towards disorder—that is, all systems will fail. Energy is required to maintain operational and physical order, or else an object or a system degrades into fundamental components without a chance to return to original form. Consider a favorite item, such as a cellphone: if left abandoned in nature it would return to metallic, glass and plastic dust after many years. Entropy assures that it could never return to its original state.

This awareness of tendency toward disorder should focus our efforts on the knowledgeable “sustainable” practices that will slow its ultimate arrival. **IG**

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