Strategic Vision of Container Nursery Irrigation in the Next Ten Years[1]

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Abstract

Visions of the future for container nursery irrigation were collected from twelve nursery irrigation scientists, growers and nursery organization leaders. The amount of water available for nursery irrigation unanimously is forecasted to decline over the next decade. Along with declining availability, the cost of water for irrigation is predicted to increase substantially for most nurseries. Limited availability, higher direct cost, and irrigation runoff issues are projected to compel the container nursery industry to adopt procedures and technology that will increase irrigation water use efficiency. Evidence in support of these prognoses, current solutions and suggested options are discussed.

Index words: economics, nursery production, overhead irrigation, water availability.

Significance to the Nursery Industry

This summary was developed to help nursery growers, the container industry and its leaders plan and prepare for what is envisioned for the future of container nursery irrigation. Some parts of this vision, such as increased water cost and decreased availability, are almost certain to occur. Other predictions and possible solutions will depend on the decisions made and actions taken now and in the near future by the nursery industry. This summary was also prepared to assist nursery allied industries prepare for future needs.

To develop a long-term strategic vision regarding the future of container irrigation in the coming decade, opinions from a wide range of nursery irrigation researchers, some nursery growers, and directors of nursery organizations were compiled. These opinions were in response to a single leading question of what is the future of container irrigation over the next ten years, asked of each author, either verbally or written. Our consensus is that the availability and consumption from groundwater or public surface waters by container nurseries will decline significantly in the coming decade. Reasons for this decline vary, but none are by choice of the container plant production industry. As availability of water from these sources declines, production cost will increase as nurseries adopt methods and technologies to increase water use efficiency, making more efficient use of water that is available. Support for this prediction can be grouped into water availability, laws and regulations, and economics.

Water availability. A majority of nurseries are located within the influence of urban centers. Expansion of urban areas through suburban development has brought both expanding business opportunities and increased competition for water resources. This applies not only to ground water, but also to public surface water, such as lakes and rivers. Without protective legislation, container nurseries are often expected to forfeit their current use of potable water for urban/suburban consumption. Even with such legislation, amounts permitted for nursery production likely will decline as demand increases for potable water by expanding urban centers. This has already occurred in Florida, where initial permitted amounts 12 years ago have been decreased by as much as 40% in some areas. Just 15 years ago, nursery irrigation was unregulated in these same areas.

Water availability also is limited by water quality. In coastal and arid regions, water quality, especially ground water quality, can be too poor for container production of many profitable landscape species. In coastal plain areas, excessive groundwater withdrawals induce saltwater intrusion into what were once fresh water aquifers. This lowers water quality below threshold levels for salt intolerant container plants. High salt content is a relatively common problem in many coastal states, some areas of the Midwest, and in arid regions. Treatments required to improve quality to a useable

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level substantially increases the cost of water, reducing the volume that can be applied to a crop while maintaining economic returns. In many areas, such treatments are uneconomical, forcing nurseries to rely on surface water, which often is stored on site. In these cases, storage capacity must be balanced against production area and production water volume requirements, since the land area for most nurseries is frequently limited by adjacent property owners. The use of re-circulated water has dramatically increased the presence of root rot inoculum in some container nurseries. Recirculating or recycling water also incurs additional water cost. These costs would be further increased if treatment is required to reduce pathogen levels or improve water quality.

Drought appears to occur annually, somewhere in the continental United States. Alone, sporadic drought lowers surface water availability and increases the need for supplemental irrigation. Due to lower uniformity and low droplet momentum, supplemental irrigation must be supplied in excess of the rainfall missed due to drought. During extensive drought, the proximity of many nurseries to urban areas results in additional competition for water and forced reductions in supplemental irrigation, either through legislative action or public opinion. An additional indirect strain on nursery irrigation caused by extended drought results from municipal regulations to reduce water consumption by homeowners. These take the form of reduced or zero landscape irrigation ordinances, and/or moratoriums on new landscape installation or irrigation. Reduced nursery sales result in accumulation of marketable sized plants, which have the highest water requirements to remain aesthetically appealing. If this crop is maintained in anticipation of the end of restrictions, growth of future crops will be reduced by water stress.

Laws and regulations. Laws and regulations currently limit container nursery water consumption in all or portions of California, Florida, North Carolina, Texas and Oregon, to name a few. Such regulations are expected to become more strict, further reducing annual water withdrawals from underground or public surface waters. Other states are also considering regulation of nursery water consumption from public sources (groundwater, rivers, public lakes). In addition to laws that limit water availability for nursery irrigation, nutrient management laws such as in Maryland, Delaware and California that restrict nutrient applications and the concentrations of nutrients in water leaving nurseries (nursery runoff) are becoming more wide spread. Stricter federal requirements for nutrients and other soluble chemicals will likely take effect in the next few years when many provisions of the Clean Water Act are fully enforced. To comply with these regulations, reductions in nursery runoff can be achieved in several ways. Two potential ways are through increasing efficiency and the consequent reductions in irrigation applications, and the construction of collection and storage basins (ponds and basins). As mentioned above, storage structure size must be balanced against loss of production area.

Economics. Economic forces will also push container nurseries to reduce annual irrigation volumes in the near future. In most areas, water is cheap; costs are associated mainly with the price of pumping, system depreciation and maintenance. Some California growers estimate that four to seven percent of the cost to produce each #1 container is the expense of the water. In areas with poor water quality, where a connection to municipal water sources occurs, this can increase the cost of water 20 to 40-fold, raising irrigation costs from an insignificant to a substantial contributor to total production cost. Where groundwater supplies are considered threatened, substitution of tertiary-treated sewage water (reclaimed water) for potable water allocations is occurring in limited circumstances. However this option is becoming more aggressively pursued by regional water managers and government bodies. In some regions, substitution with reclaimed water is considered a solution to both wastewater disposal and increasing potable water availability for urban use. Although less expensive than municipal potable water, the cost of reclaimed water often results in a noticeable increase in production cost, notwithstanding the added problems of higher salt levels that can often occur. But this is not true in all regions, in the Southwestern United States, reclaimed water is more expensive than municipal potable water. Currently, most reclaimed water is considered a disposal problem that will likely increase as the Clean Water Act is implemented fully. However, as demand increases, reclaimed water will be considered a revenue source, with its price rising substantially. This would effectively reduce consumption.

Solutions currently implemented to deal with shrinking water availability are few. For larger containers (#7 and larger), low volume (micro-irrigation) is increasing in use, often employing cyclic (several sub-volumes daily) application schemes for higher efficiency than single daily applications. Some nurseries have switched to reclaimed water. The numbers are few and appear limited mainly by access to distribution lines, although water quality and consistent availability can be problems. For most small container production (less than #7), overhead sprinkler irrigation is universally used. There are no foreseeable alternatives to the cost and ease of overhead irrigation of small containers in the coming decade. Many nurseries producing small containers use, or are installing collection structures, to collect runoff and rainfall from production areas for reuse. Pesticide accumulation, alkalinity and increases in disease inoculum are concerns in some areas, but not others. Effective water treatment technology is available to deal with these problems when considered necessary, although this will increase the cost of production. Recycled or re-circulated water from collection structures is a common water source in upland areas and where groundwater volume is limited or quality is poor. Such recycling of irrigation run-off is the only current remedy for reducing fresh water consumption in small container production areas. For substantial acreage of small container production, no improvement in irrigation efficiency or water conservation has been implemented.

In the coming decade, there are various predictions of what should or will be done to successfully meet the challenges of reduced public water consumption by container nurseries. Most of us concur that efficiency of nursery irrigation must and will be increased. Opinions vary as to how this will be accomplished. As a first step, implementation of effective irrigation management techniques and Best Management Practices (BMPs) must be practiced by the industry. In 1997, the Southern Nursery Association, published a set of BMPs for nursery irrigation and nutrient management. Many growers in the Southern United States have adopted these measures. Extensive use of these or similar BMPs will demonstrate a serious and concerted effort by the nursery industry towards water conservation and environmental stewardship. Abandonment of overhead irrigation of larger container sizes appears certain. While much attention is focused on cyclic micro-irrigation, development of expansive outdoor sub-irrigation facilities has been researched for decades. Such a functioning system is now commercially available, but is in its infancy. For small container sizes, installation and expansion of collection structures and recycling of water is the most mentioned solution. Collection structures not only serve to reduce nursery runoff, but also provide a renewable water supply and provide buffering capacity for reclaimed water and sporadic rainfall. However expansion of these systems is expensive. Production areas and collection structures located in porous or alkaline soils must be lined with water-impervious materials for water collection and storage, significantly increasing costs. Issues of groundwater contamination underneath unlined basins has not been addressed, but may be questioned in the future.

Other proposed ways to improve irrigation efficiency have been given little attention, but may be important on their own, or in combination with micro-irrigation or collection basins. Technology and procedures are under development for 'plant demand-based' irrigation management, where irrigation is applied only as needed and in the amount of water required. These approaches are investigating container substrate moisture sensors, and irrigation models based on reference evapotranspiration and effective rainfall measurements. Other solutions include modifications to containers or production areas used under overhead sprinkler systems to improve application efficiency and thereby reduce application rates. Limited research has identified several modifications that substantially reduce the amount of overhead irrigation required and are economically feasible. However, commercial availability of these options are currently limited or non-existent.

In addition to practical aspects of dealing with public water restriction, political avenues will be sought as part of the solution. These political agendas will be focused on softening the impact of restrictions, rather than preventing them. These agendas will need to focus not only on water availability for production, but also on landscape irrigation availability and reasonable use issues. The recent drought in the United States made local and state government entities keenly aware of water supply problems, with many posed to introduce far-reaching legislation in the very near future.

In conclusion, container nursery irrigation will be forced to become more efficient and water conserving in the coming decade. No one solution will be applicable to an entire nursery or all nurseries. Research is, and has been conducted to provide solutions to the problems of water use efficiency and nutrient management, and momentum is growing in this direction. Many solutions have already been researched and calculated to be economically advantageous, even at current water cost, but these solutions are awaiting demand from the nursery industry to be produced and made readily available. However, our consensus is that until water availability is restricted to the point where there is noticeable negative economical impact, there will be little interest on the part of most of the container nursery industry to use the research-based water conserving practices or become involved with policy makers. Yet, this negative impact will in all likelihood occur within the next 5 years in regions where groundwater withdrawal is the major irrigation water source, most prominently in coastal and arid regions, or where environmental issues take precedence.