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Ditch Systems for Biological Filtration of Recycled Irrigation Water[®]

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INTRODUCTION

GroeiBalans is a small company operating in The Netherlands supplying advice on sustainable crop management to nurseries. This paper describes a biological water treatment system that it has been developing with a number of nurseries in The Netherlands.

The Importance of Water Treatment. The health of the water used to irrigate the plants on the nursery is fundamental to the health of the soil or container medium in which the plants are growing. It is important for introducing and maintaining good soil biology. With healthy, biologically active water the introduction of beneficial microorganisms, including mycorrhizas, is more successful. Growers need to recycle irrigation run-off in order to meet government regulations and restrictions and because there is a limited supply of good quality water. It is important that recycled water is treated in a way that maintains or improves its biological quality.

Aims of Biological Water Treatment. Biological systems of treating and filtering irrigation run-off should:

- Improve water quality by reducing calcium bicarbonate $\text{Ca}(\text{HCO}_3)_2$ levels.
- Result in a more efficient and economical use of water supply.
- Prevent build-up of algae.
- Suppress disease.
- Improve capacity in comparison with other filter systems.
- Be adaptable to existing water storage.

These aims are achieved with the filtration ditch system through aeration and biological activity.

FILTRATION DITCH SYSTEM

Ideally the filtration ditch system is constructed at the same time as installation of a water recycling and storage system. The active components of the ditch are aeration, water movement, UV light (sunlight), *Iris pseudacorus*, waterweed (*Elodea densa*), predatory fish, and water snails.

The ditch is divided into compartments to contain the different active species. Arranging the compartments on a series of interconnected levels and allowing the water to flow from higher to lower levels over a weir results in more aeration. Aeration is important to maintain biological activity and reduce calcium bicarbonate levels in hard water areas. Allowing the water to run over a weir also improves its exposure to sunlight, which kills harmful organisms.

The water plants absorb the excessive amounts of nutrients, which would otherwise give rise to problems with algae. Electrical conductivity levels drop as a result so that it is easier to accurately manipulate liquid feeding in the resulting

irrigation water. The plants also help to maintain a good habitat for biodiversity, which is important for disease suppression. Active bacteria, which grow on the root systems, suppress pathogens. *Phytophthora* for instance is present in every water storage system, but biologically active water treatment prevents it from becoming a problem.

The waterweed is important for oxygenating the water, while the predatory fish are there to remove plant pests. The snails remove other sources of harmful organic matter in the system.

RESULTS OF INSTALLING FILTRATION DITCHES AT THE ROELANDS BROTHERS NURSERY

The soil and growing media on this tree propagation nursery has become more biologically diverse and has improved colonisation with ectomycorrhizae following inoculation into the growing media. With the improved mycorrhizal colonisation of the seedlings and the use of compost tea to stimulate other beneficial microorganisms in the root zone, the nursery has been able to reduce its use of fungicides dramatically and problems with damping off have been eliminated. For example the nursery has saved eight to nine chemical applications in its *Cytisus scoparius* crop, which is very sensitive for leafspot, phytophthora, and fusarium.