

Coppicing Hardwoods for Renovation of Dairy Shed Effluent

Dairy farming is a rapidly expanding land use and in some regions farms have streams flowing through them into significant waterways. Re-use of dairy shed effluent by irrigation onto paddocks provides a valuable nitrogen source for pasture production. However, this practice can lead to unacceptably high concentrations of nitrogen in drainage water if the irrigation rates are too high or when too much rain falls. Contamination of ground or surface water bodies can be reduced significantly if an alternative system for removing nitrogen from the effluent and providing an additional source of feed is used.

Poplar and willow trees are used extensively in New Zealand for soil conservation and riverbank plantings. These trees grow quickly in wet areas, establish extensive root systems, and remove large amounts of water. Because they can be repeatedly coppiced and will rapidly produce biomass again, these trees are promising candidates to utilise the nitrogen in dairy shed effluent. The foliage can be cut and fed to livestock. Another Sustainable Farming Fund project is examining poplar and willow feed quality and effects on animal health.

Trees offer a potential solution nitrogen contamination of ground or surface water if drainage from effluent irrigated pasture is captured by a tile drainage system and re-used by irrigation onto poplars and willows planted at high densities. Alternatively the effluent can be directly irrigated onto the trees and their ability to utilise the water and nitrogen exploited to maintain low subsoil nitrogen concentrations.

A 3-year demonstration trial incorporating 'Tangoio' willows (Fig. 1), 'Argyle' poplars and a pasture control has been established on the Arnold dairy farm in southern Wairarapa. Effluent is directly irrigated onto the trees at either a high rate (5 mm every 10 days), or a low rate (2.5 mm every 10 days).

Measurements include the amount of nitrogen:

- in the effluent irrigated onto the pasture and trees,
- removed in the coppiced trees and harvested pasture,
- accumulated in the soil, and
- leached from the pasture and tree systems.

Tree growth, development and fodder quantity will be assessed. Tree management and feed quality issues for dairy herds will also be examined.

The first coppicing of this trial was done in March 2002. We observed dramatic increases in tree growth (Fig. 2) despite the comparatively small amount of effluent added and the wet summer of 2001/02. Figure 3 shows the measured dry matter accumulation in the trees over the 6.5-month period, again showing statistically significant differences in growth following irrigation with effluent. The nitrogen analyses of the biomass are not yet available but are expected to show that these trees have a significant capacity to accumulate nitrogen and reduce leaching.

One of the outputs of this project will be a decision support tool to enable farmers to assess the usefulness of such a system for their particular circumstances. The tool would supply such information as how to match the area of trees to herd size, tree management information and potential uses for the coppiced foliage, as well as outlining practical management issues in relation to soils and climates.

With the large range of poplar and willow ecotypes available, should this effluent treatment system prove effective, it could be extended to cover all the major dairying regions of New Zealand. A website outlining the progress of this trial is under construction. Please check www.hortresearch.co.nz/products/poplars for updates.



Figure 1. The willows, nearly ready for coppicing in January 2002, being irrigated with dairy shed effluent.



Figure 2. Tree from the un-irrigated control on the left and from the high treatment on the right.

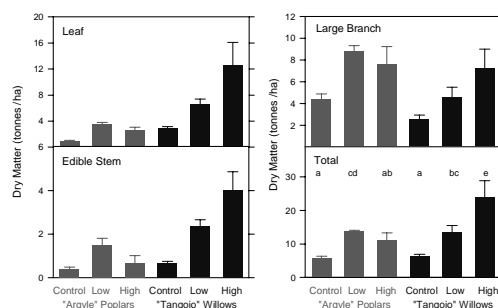


Figure 3. Dry matter accumulation in the six tree treatments subdivided into leaf, edible stem, and large stem and also shown as total dry matter. Also shown on the "Total" plot are the treatments which are significantly different: treatments with the same letters are not significantly different.

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