

Coppicing Hardwoods for Renovation of Dairy Shed Effluent

Introduction

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 is used.

Poplars and Willows

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.

Potential Solutions

Trees offer a potential solution to 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.



Irrigation of effluent

The Proposed System



Livestock effluent washed from shed



Effluent pumped to irrigator



Effluent irrigated onto trees which take up nitrogen

Trees mechanically coppiced



Coppiced foliage fed to livestock



Regrowth from tree stumps further irrigated

Experimental Work

A 3-year demonstration trial incorporating 'Tangoio' willows, '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.

Intended Outputs

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.

Argyle poplars at the Arnold Farm



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