

Riparian zone coppicing of hardwoods for reduction of nitrate leaching from dairy farm effluent discharge

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Contract Grant 01/126

Final report
Innovative Dairy Effluent Action and Solutions
(IDEAS) Group

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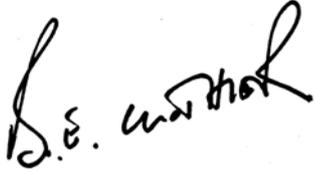

Sector Leader
Date: 22-September -2004

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Report compiled by Project Manager, Ian McIvor,
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Sustainable Farming Fund Project (Contract Grant 01/126): Riparian zone coppicing of hardwoods for reduction of nitrate leaching from dairy farm effluent discharge

Final Report (including the quarterly report to 30 June 2004)

Innovative Dairy Effluent Action and Solutions (IDEAS) Group

1 OBJECTIVES

This project was focussed on determining the efficacy of using poplars and willows in a self-renewing, coppicing system to reduce the amount of nitrate leaching from dairy shed effluent that would normally be applied to pasture.

Secondary to this objective was the determination of the potential nutritional value of the coppiced plant material for dairy cows and/or other livestock classes.

These objectives were expected to aid in:

- *Benefiting the environment* (through reduced levels of nitrate contamination)
- *Making a difference* (to the increasing problem of dairy effluent discharge in many regions)
- *Improving profitability* (compared with other conventional riparian plantings as land still remains productive)
- *Sharing results* (as this system can be applied across many regions which contain dairy farms)
- *Enhancing social sustainability* (by contributing to regional community enjoyment of waterway ecosystems)

2 APPROACH

2.1 The On-Farm trial

A suitable trial site was identified on a dairy farm near Carterton, in the southern Wairarapa. The soil at the site is a gravely silt loam and is excessively well drained. The ground was prepared by pre-plant spraying with Glyphosate and Terbutylazine and ripping and the trial coppice block of 'Argyle' poplars and 'Tangoio' willows were planted as stakes in September 2001. Sections of the block were irrigated with dairy shed effluent at high (5mm per week), low (2.5 mm per week) and nil rates during the milking season (November to March). The coppice block was harvested annually at which time total and edible biomass measurements were taken for the three treatments, and the samples of the edible material (leaf inc. petiole and small side stems, edible stems) were assessed for N content using a LECO CN analyser. The coppiced material was 'cut and carry' fed to the dairy cows.

The trial site was sprayed once during each winter to reduce weed growth within the treed areas.

2.2 The Dissemination of Findings

Numerous communication pathways were used, including press releases to a number of newspapers throughout New Zealand, more detailed articles in industry magazines, detailed quarterly reports to SFF (and selected project participants), local field days, talks given at a tree use workshop held in Palmerston North in October, 2003 jointly sponsored by the NZ Grasslands Association and the NZ Farm Forestry Association, a poster presentation at the Fertiliser and Lime Research Centre workshop in February, 2003, a talk at a workshop in Balclutha hosted by ORC, and a website hosted by HortResearch (<http://www.hortresearch.co.nz/projects/dairyeffluent>).

3 OUTCOMES

3.1 Summary of results

The harvested biomass in tonnes of dry matter per hectare is shown in below. Growth was variable over the three years of the trial. Poplar yields were affected by rust in 2001-02, and all yields were reduced in 2002-03 by an unusual number of October frosts followed by a dry summer. Nitrogen stored in the harvested biomass as measured by the LECO CN analyser is shown below also. Leaf N varied between 2.3 and 3.7% and in all years and treatments showed a trend of increasing concentration with increasing effluent application. No plateau in leaf N was observed with these application rates. Typical N concentrations for the edible and large stems were 1.1% and 0.6%. Overall N removal in the trees per hectare was greater than would be expected from grazed pasture.

	Typical (grazed)	Coppice block (cut and carry)	
		Low Range	High Range
Harvestable biomass (t DM	12-18	7	24
N in biomass (kg N /ha /yr)	500	100	440
Returned to site (kg N /ha /yr)	350	10	44
Removed from site (kg N /ha	150	90	400
Area need per 100 cows (ha)	4.0	6.7	1.5

Growth was considered insufficient to warrant two coppices per season. Time of harvesting is important. The earlier harvest in 2002-03 and 2003-04 allowed for some regrowth before the winter and it was considered that this management approach resulted in greater fodder production and better weed suppression.

Harvesting was done using a scrub saw and cutting at 200 mm above ground. In the first year the cut trees were carried to a feeding paddock where the cows ate the edible portions. The uneaten remains were removed and burnt. In the second year the trees were cut as before and then were mechanically chipped, fired into a silage wagon and fed out to the cows in another paddock. The management of harvesting and feeding still requires a more economical 'cut and carry' solution.

3.2 Extension of Results

There has been considerable interest in the project concept. The booklet titled 'Reuse of Farm Dairy Effluent' has just been released and distributed to Regional and District Councils, and to industry groups.

3.3 Further Plans for the Project

N loss into drainage under pasture and coppiced trees was not measured in this study. It was recognised that this should be a component of a future project particularly where this drainage could be captured and recycled as in a tile drainage system. Shrub willows may take up greater amounts of N, produce a greater edible biomass and be easier to harvest.

This is a natural extension of this project. Uptake by farmers will depend on ease of harvest and how well this system complements their current operation and recommendation by regulatory authorities will benefit from N uptake/drainage data. A Generation II SFF project that will be largely driven by farm consultants in Balclutha will increase interest in using coppiced trees as a means of managing N loading from effluent on dairy farms.

4 FINANCIAL

	year ended 30.06.02	year ended 30.06.03	1.25 year ended 30.09.04	Total
Income				
SFF	40000	25000	29870.18	94870.18
Fonterra, WPRC	16500	5000	7171.88	28671.88
	56500	30000	37042.06	123542.06
Expenses				
Personnel	21860.29	8507.48	10013.33	40381.1
Admin	7703.6	4073.81	5540.88	17318.29
consult and contract			2812.5	2812.5
Overheads	20868.73	10908.98	9699.88	41477.59
Travel	41.6	0	162.3	203.9
Dissemination costs	284.62	91.6	1820	2196.22
Materials, site maintenance	3823	1078.05	2706.08	7607.13
GWRC	2477.55	945.42	48.76	3471.73
Analyses	2162	4394.66	1905.24	8461.9
	59221.39	30000	34708.97	123930.36
Balance	-2721.39	0	2333.09	-388.3

5 INFORMATION DISSEMINATION

Project findings were disseminated in numerous ways.

Project publications have been posted and will continue to be accessible for the foreseeable future on the HortResearch website (<http://www.hortresearch.co.nz/projects/dairyeffluent>).

Date	Details
October 2001	Sarah Hurst – overview presentation to horizons.mw
13 Feb 2002	Val Snow - FLRC poster presentation at “Dairy Farm Soil Management” workshop
15 Feb 2002	Val Snow – featured as part of presentation “Environmentally-Focussed Nitrogen Research at HortResearch” at a workshop run by horizons.mw on nitrates
April 2002	Dairy Exporter - magazine article “Willows and poplars as effluent sponges”
7 Mar 2002	Kevin Steel (MAF SFF), Barrie Wallace (MAF Policy), Harold van Es (Cornel University) Brent Clothier (HortResearch) - site visit and project review
6 May 2002	HortResearch Media Release “Trees used as effluent sponge”
6 May 2002	Tim Fulton (Dairyman, NZ Rural Press) - telephone interview and follow-up through Environment Waikato
7 May 2002	Kevin Ikin (Radio New Zealand) - recorded telephone interview, aired 15 May 2002
8 May 2002	Marlborough Express, p8 - Newspaper article “Trees soak up shed waste”
9 May 2002	Franklin Country News – Newspaper article “Trees used as sponge for dairy shed effluent”
14 May 2002	Manawatu Evening Standard - Newspaper article “Trees utilised as effluent sponge”
14 May 2002	Timaru Herald, p4 – Newspaper article “Dairy shed effluent: Trees to rescue”
18 May 2002	“Country Life” (Radio NZ) replayed the Kevin Ikin interview
22 May 2002	Phone call from Murray Hunter, Stix Poplar requesting more information, response to “Country Life” segment
14-20 May 2002	Coast and Country, Ruapehu Press, Wairarapa News, Clutha Leader, Hawke’s Bay Today, Northern News, Taupo Times, Rural Advertiser – Newspaper article “Trees used as effluent sponge”
May 2002	NZ BioScience – p5 – magazine article “Trees To Mop Up Dairy Run-Off”
28 May 2002	Rodney Times – “Rodney farmer leads the way in effluent control”

June 2002 The Dairyman, p 25, 50 - "Trees tested for leaching"

11 June 2002 Te Awamutu Courier – "Willows, poplars trialled"

July 2002 Water and Wastes in New Zealand, July/August 2002, p 41 "Trees used as effluent sponge"

5 Sept 2002 The Dominion Post – "Poplar choice to solve effluent problem"

17 Sept 2002 Northland Advocate – "Trees used as effluent sponge"

22 Oct 2002 Southern Rural Life – "Trees on trial as effluent sponge"

Nov 2002 Submitted article to RM Update

22 Feb 2003 Evening Standard – "Poplars, willows centre of attention"

04 Mar 2003 Field day at Carterton – attended by 45 people

March 2003 The Dairyman – "Poplars lower nitrate leaching"

April 2003 Country-Wide, p73 – "Effluent sponge role for poplars and willows"

April 2003 Country-Wide, p74 – "Potential for tree silage"

2 May 2003 Central Districts Farmer – "Trees create a 'sponge'"

17 Oct 2003 Presentation at the "Using Trees of Farms" SFF/Grasslands workshop

Dec 2003 Tree Grower article "Using poplars and willows to ease the nitrogen load on dairy pastures"

Feb 2004 Dairy Exporter, p?? – "Summer fodder resource in willow and poplars"

16 March 04 Presentation at workshop at Fernglen

23 July 04 Met with Barrie Wallace and MAF project audit manager to discuss the project

22 Sept 04 A booklet titled 'Reuse of Farm Dairy Effluent' and sub-titled *Coppiced poplars and willows show promising potential for use in effluent irrigates systems* was published and distributed to regional and district councils