MAF Sustainable Farming Fund

PWNews

Managing poplars and willows on farms

Issue No 3 http://www.hortresearch.co.nz/index/page/549 **December 2005**

From the Project Leader

Peter Gawith

Welcome to this issue of *PWNews* and as a participant in our SFF Project concerned with managing poplars and willows on farms in various ways. The Project team has continued its effort to achieve the milestones set for the project and this newsletter updates the progress made so far. Being midway through is very relevant. The planting and management plan is coming together for review by farmers at a field day next autumn.

We also thought it would be worthwhile telling you about progress made in the lower North Island following the major flooding in February 2004, and Horizons Regional Council soil conservator Kevin Rooke is featured in the article on this topic, expressing his experienced views on the topic. The continuation of extreme weather events in different regions may be sporadic but they should be a cause for concern for all farmers. The idea that "it won't affect me" is too late when it happens, and we are never sure how long the government will continue to pick up the pieces.

The Otago team is also making steady progress, working on effluent management with willows at Wharetoa and evaluating the pollarding system with poplars on John Prebble's farm near Dunback. I hope you find this issue of *PWNews* of interest and wish you well for the coming year.

Peter Gawith, Gladstone, Wairarapa

Progress Report

From Project Manager Grant Douglas, AgResearch, Palmerston North

Grant Douglas

We are now halfway through the second of the three years of our project and a number of participants have been busy in the last six months in the many facets of the project. These include:

- Development of a Planting and Management Plan, which is a practical guide on how to establish and manage poplar and willow trees in the main types of tree-pasture systems. Drafts are now being circulated to more participants in the project to invite comment, and to ensure the final document will have wide applicability.
- How to deal with "monster" trees. Trial work has commenced in Manawatu/Rangitikei to determine the effect of application rate and application time of herbicides on killing large trees, which are a liability to farmers, livestock, and infrastructure.
- Economic analyses of tree-pasture systems based on previous and current work in the southern North Island and Otago. Several drafts have been prepared and more participants will be approached for comment within the next six months.
- Riverside Farm (Wairarapa) grazing trial using willow fodder blocks for sustainable control of parasites in mated hoggets. This is the second trial in the series. The trial protocol has had to be revised because of funding issues, but it is expected to commence early in 2006. Preparation of the established blocks is progressing well.
- Environmental benefits of willow fodder blocks compared with pasture (control) are being determined at Riverside Farm with respect to water quality in runoff, and other attributes.
- The spring growth of pollarded poplars on an Otago sheep and beef farm has been determined, and effluent spraying via K-line of a block of willows on an Otago dairy farm is continuing.
- Several media releases and popular articles have been distributed to newspapers/magazines.

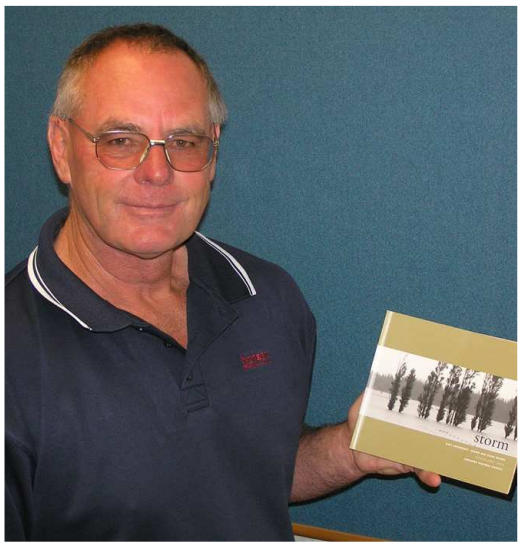
You'll read more about some of these items in this issue of *PWNews*. As always, if you wish to comment on anything mentioned in the project's newsletters, or offer a contribution for a future newsletter, please contact one of the project participants listed at the end of this issue.

I wish to acknowledge the contribution of staff of several regional councils who have, and continue to provide, valuable information to parts of the project, particularly the Planting and Management Plan, and the economic analyses. This is appreciated very much and along with farmers, ensures that in this project we build on existing information, rather than going (too much) over old ground. I hope you enjoy this issue.

Planting after the Floods

From Deric Charlton, Greenfields Communications, Palmerston North

After the serious flooding in the lower North Island in February 2004 much was made about trees protecting the hills far more than pasture. While this may well be an established fact it is also the case that very little increased planting of poplar and willow poles or other soil conservation techniques was undertaken since the severe storm, according to Horizons Regional Council environment management officer (soils) Kevin Rooke.



Kevin Rooke

Kevin now has 30 years of experience with the regional council, starting in June 1975 when he began as a soil conservator with the Rangitikei-Wanganui Catchment Board. His area extends from the Turakina Valley through to the Manawatu Gorge, including the Pohangina Valley and the Rangitikei Valley as far north as Ohingaiti.

"Farmers hit by the weather focus on restoring their infrastructure first," explains Kevin. "Renovating damaged pastures and access tracks are naturally given top priority, and soil conservation planting is put on the back burner. Many of them then tend to forget about pole planting the further we get away from the storm.

"Severely damaged areas are beyond pole planting," he continues. "These should either be planted for forestry or allowed to revert to native bush. Reversion will happen relatively quickly given protection by fencing from grazing stock and a robust pest control programme, to prevent damage by possums, deer and goats."

After a massive storm event like that of February 2004 further events in the following year were just as destructive as the original storm, he says. This "after-storm" weather tends to be the "straw that broke the camel's back" and causes further slipping during the year after the main event. Sometimes a significant snow dump, as occurred in August 2004, can also cause severe damage, so it's a rather longer-term problem than expected for the landowners.

When controlling such damage on hills, a landowner should plant the gullies first and then work up the hill. Poles are best planted on the Class VI land – moderate to steep hillsides where the erosion risk is greater. Other options include using forestry (up to 1,000 stems/ha) and agro-forestry (100 stems/ha), but still planting the gullies with willow or poplar poles, recommends Kevin. Oversowing hill pastures should also go hand-in-hand with pole planting, as pasture is also an erosion controller and the livestock need it for feed in any case.

"Since the February 2004 storm weather conditions have been good," says Kevin, "and this has allowed landowners to complete fencing repairs and earthworks like track clearing. Slip oversowing has been successful and generally the countryside is healing very well and is looking remarkably green. However, it isn't time to be complacent and wait for the next big storm – and it surely will occur," he warns.

"Landowners need to consider storm-proofing their properties by applying recognised sustainable land and soil conservation practices. There is an abundance of free advice and sometimes financial assistance towards the work, if they wish to avail themselves of it. A step towards storm-proofing their property is to consider a comprehensive environmental farm plan, which they will soon hear more about from the regional councils."

Controlling parasites in weaned lambs on browse blocks

From Carolina Diaz Lira, Tom Barry, Bill Pomroy and Eileen McWilliam, Massey University

Three groups each of 60 weaned lambs grazed the experimental treatments at Massey University's Riverside Farm, near Masterton from early December 2004 until mid March 2005.

The three treatments were:

- Control perennial ryegrass/white clover pasture.
- Grazing willow browse blocks all the time (referred to as the "full access" group).
- One week in browse blocks, followed by 3 weeks on control pasture (called the "restricted access" group).

All lambs were drenched with anthelmintic at the start of the experiment. Thirty lambs in each group were then drenched again at four-week intervals; the remaining 30 lambs in each group were never drenched again. On each treatment, drenched and undrenched lambs were grazed separately, giving six groups each of 30 lambs in the experiment.

All six groups were given weekly feed breaks in a rotational grazing system. The feed allowance given was the same for all six groups, starting at 4 kg DM/lamb/day and increasing to 6 kg DM/lamb/day by the end of the experiment. All ewes were grazed at least twice during the rotations.

Feed in the browse blocks comprised a mixture of trees and volunteer pasture. The browse blocks had been planted in 2001 on 6 ha of wet, rush-infested land. Planting the trees (6,000/ha) has notably dried the browse blocks and allowed good pasture to develop. During the first half of the experiment the herbage in all six treatments remained green. During the second half the herbage in the control pasture groups (including the restricted access group) turned brown during the dry summer, whilst herbage in the browse blocks remained green.

Results

The lambs readily ate the trees, with the average diameter of leader shoots eaten increasing with time from 3.3 mm to 3.9 mm. The most important findings were:

- Control pasture eaten contained 9.7 MJ ME/kg DM (Table 1) and only traces of condensed tannin (CT). Herbage in the browse blocks contained a similar ME concentration but a higher CT concentration, due to the presence of volunteer lotus (containing 7% CT). Tree material that was eaten contained a higher ME concentration (10.5 MJ/kg DM) and much higher CT concentrations.

- Liveweight gain (Table 2) was close to 200 g/day during the first half of the trial and was similar for all six groups. Dag score during this time steadily increased and was also not different between groups. Liveweight gain of all groups declined in the second half, with the reduction being much more marked for control and restricted access lambs than for full access lambs. Lack of drenching also reduced liveweight gain in the second half, with the reduction for full access lambs being much less than for the other two groups.

- The final liveweight of full-access undrenched lambs was similar to that of control drenched lambs.

- Differences in dag scores became apparent by the end of the Experiment, with higher values for all undrenched groups and lower values for full access and restricted access groups. Undrenched lambs grazing browse blocks had similar values to drenched lambs grazing control pastures.

- FEC in all groups showed cyclic rises and falls. Drenching was obviously effective in reducing FEC to zero, but these always increased until the next drenching. FEC in all undrenched groups increased with time, especially in the second half of the Experiment. There was some indication that this rise was less for lambs.

- In the undrenched groups, the principal parasites established at slaughter were *Teladorsagia* sp in the abomasum and *Nematodirus* and *Trichostrongylus* sp in the small intestine. Relative to undrenched control lambs grazing pasture, undrenched lambs grazing full access browse blocks had lower numbers of *Nematodirus* and *Trichostrongylus*. Lambs grazing browse blocks with restricted access had lower numbers of *Trichostrongylus* and *Teladorsagia*.

Table 1. Composition of the sheep diet

	Control Pasture	Willow fodder block (full access)		Willow fodder block (restricted access)	
		Herbage	Trees	Herbage	Trees
Protein (% DM)	17.4	15.4	10.3	14.8	9.6
ME (MJ/kg DM)	9.7	9.4	10.4	9.6	10.7
Condensed tannin (% DM)	0.6	1.2	4.2	1.1	5.1

Table 2. Liveweight change of drenched and undrenched lambs

	Control		Browse block (Full access)		Browse block (Restricted access)	
	Drenched	Undrenched	Drenched	Undrenched	Drenched	Undrenched
Initial liveweight (kg)	28.5	28.3	28.6	28.4	28.5	28.6
Final liveweight (kg)	43.7	39.3	46.4	43.4	40.6	39.0
Liveweight changes (g/day):						
First half (weeks 1-6)	217	184	218	191	183	194
Second half (weeks 7-12)	116	56	158	129	80	42
Weeks 1-12	158	111	182	154	13	107

None of the treatments affected parasites of the large intestine, which were all present in low numbers. Overall, grazing of browse blocks has successfully given some control of internal parasites, notably of the three species present in the greatest numbers. This has been translated into greater animal growth in the full access group.

Analysing the financial benefits of fodder trees

From John Stantiall, Agricultural Consultant, Wilson & Keeling Ltd, Palmerston North

Analysing the financial benefits of fodder trees is a challenging exercise due to the range of possible scenarios and different perceptions about which costs should be included. The range of scenarios includes poplar trees - planted specifically for fodder, or for erosion control - which are pollarded (branches cut back to a stump) for drought feed; shrub willows which are grazed by sheep or cattle; and shrub willows used for dairy effluent disposal. Items often discussed about their inclusion in the analysis are the initial establishment costs, loss of grazing during establishment and labour costs. The analysis to date suggests that fodder trees may break even on a straight cost-benefit basis in some situations if the labour cost is not taken into account.

Any particular analysis is only valid for the set of circumstances being studied and the assumptions made. For the purposes of this project, the farm systems where the trial blocks were grown were initially modelled, because recorded information was available. Based on this information and a set of assumptions, several similar scenarios were developed to investigate the impact of variables, such as the percentage of effective farm area planted in trees. Ultimately, the model could be developed to the stage where farmers could use their own information and test the economic benefits of planting trees for fodder or dairy effluent disposal on their own farm.

Members of the project team have discussed the initial financial modelling. The following results are tentative, and may be modified over time as new information becomes available or the method is refined.

Pollarded poplars
The poplar block is space-planted at 400 trees/ha. If the trees are harvested every three years, it is assumed that the pasture production is similar to a block without trees because a reasonable amount of light still gets through to the pasture. Based on 2004-05 prices, the cost of establishing a pollarded poplar block is about $3,140/ha or $1,680 if labour costs are not included.

The model is based on the availability of edible dry matter, and assumptions made (based on farmer experience) about the difference in lambing percentages for the ewe flock and stock sale weights. Farmer experience indicates that ewes fed tree fodder have an increased lambing percentage of 3-5% compared to the others in a drought situation. Hence for the whole flock, the impact on lambing percentage will depend on the proportion of ewes that have access to the tree fodder. This is illustrated by the following example:

Impact of tree fodder area on the overall lambing percentage
Assumptions made:

- A pollarded poplar system
- Farm size 600 ha
- Flock size 1750 ewes
- Tree fodder is 15% of the ewe's diet
- 120% lambing without tree fodder
- 126% lambing with tree fodder

Area in trees (ha)	Percentage of Farm	No of ewes fed tree fodder	Average flock lambing percentage
1.25	0.2	179	120
5	0.8	716	122
10	1.7	1433	123

This table shows that the impact of a small area of trees is diluted across the total flock. While the extra lambs provide extra income, this relativity only occurs in the drought years.

Financial implications
The stock performance advantage for fodder trees only occurs in the drought years (one year in five is used in the model). In the other four years, the farm with the trees has the same stock performance, but must continue to carry the extra costs. The greater the area of trees, then the higher are the costs that must be carried each year. Hence, in non-drought years, the business operating surplus decreases by the cost associated with having the trees. Based on current costs and prices, for a 600 ha Otago farm, up to 4 ha (0.7% of farm area) of pollarded poplars is profitable if the labour costs are not included. On a North Island hill country farm, however, where there is a higher sheep-stocking rate, up to 2 percent of the farm area in pollarded poplars may be profitable if labour costs are not included.

Browse Willows
The willow browse block is densely planted at 6000 trees/ha. Often, an area is chosen which is constantly waterlogged, and hence produces very little pasture, especially during winter. The willows have the effect of pumping the water out of the soil, allowing more pasture to grow and be grazed throughout the year. Hence this system can result in extra pasture production along with the tree biomass, compared with similar areas lacking trees.

On this basis, extra stock are wintered on the browse block. The willow block has a high establishment cost ($8,710/ha including labour, $6,460 without) due to the high plant population. There is also a loss of grazing during the establishment phase, but this is minimal due to the low initial pasture production.

For a 500 ha Wairarapa case study farm, up to 2 ha (0.4% of farm area) of browse willow is profitable if the labour costs are not counted. If the willow tree crop lasts only ten years, then the establishment costs double within a twenty-year period, and each crop provides fodder for only two droughts. On this basis alone, the crop would be unprofitable, however, the crop needs to be grazed each year, and as further information is gained, the net benefit of annual grazings will also be analysed.

The browse willow block for dairy effluent is still in its establishment phase and the financial analysis will be published once more information is available. For further information, contact John Stantiall at Wilson & Keeling Ltd, ph 06-357-6333 or e-mail: john@wilsonkeeling.co.nz

Otago – Update on dairy effluent trial

From Malcolm Deverson, Clutha Agricultural Development Board, Balclutha; Barrie Wills, Central Environmental Services, Alexandra; Land & Forest Consultants Ltd, Dunedin

Year two of this project begins on the Wharetoa farm of the sharemilking Sharpin brothers with the hope that the weather will be more typical this year for the trees, so that results can be deemed reliable for the region. After the rain and cool temperatures of last summer, winter has been mild and this spring has delivered excellent growing conditions. Growth has been consistent on the pasture and the Kinuyanagi willows being used for this trial.

Early August saw some tidying up work by a group of Diploma in Business Studies students from Telford Rural Polytechnic. In late August selected rows were sprayed and others left unsprayed. Spring growth has been about three weeks early this year and the willows have grown well, especially on the sprayed areas.

Replanting the blanks on the year-old established site and on a small planting extension took place in September with help from the IHC and Clutha Agricultural Development Board (CADB) supporters. We blanked up in the area already planted with 680 new willow cuttings.

The more sheltered higher ground had very good establishment results and required minimal blanking. The trial area was also extended to approximately 12 metres by planting 320 cuttings to the west along the slope.

However it will be more difficult to obtain good establishment on this new area as the ground was not prepared well enough before planting took place and there are indications that weed regeneration and grass growth is already causing some problems.

Established trees at Sharpins

CADB Projects Manager Malcolm Deverson also used the trial area for an on-site visit by a class of technology students from Clydevale Primary School in October. The students were learning about using technology in the dairy industry and it was a good opportunity to showcase thoughtful work by farmers to maintain our clean waterways and for effluent disposal, which young people are concerned about.

In the summer the effluent irrigation will start earlier and will be more regular this season so as to really test plant tolerance and any groundwater leaching impacts. All dairy effluent applications are recorded - in particular the date, time and conditions. Water samples have been taken again from the nearby stream and early results are promising.

Poplars pollarded for forage in Otago

From Barrie Wills, Central Environmental Services, Alexandra; John Prebble, Mount Blue, Palmerston; Murray Harris, Land & Forest Consultants Ltd, Dunedin

The 'Flevo' poplar forage trial at Mt Blue, John Prebble's dryland farm at Dunback, near Palmerston in coastal North Otago, was measured twice in 2005 – in March and November. The pollarding treatments imposed in November 2004 were repeated this year.

The treatments applied to the poplars were:

1. Pollard regrowth trimmed, leaving only stems at least 20 mm diameter (Treatment T1).
2. Pollard regrowth trimmed, leaving only stems less than 20 mm diameter (T2).
3. Control – no trimming of pollarded trees (T3).

Results are summarised in the following table:

As at Mar 05	# Branches remaining		Mean branch length (m)		Total branch fresh weight/tree (kg)	
Pollarding Date	Nov-04	Mar-05	Nov-04	Mar-05	Nov-04	Mar-05
T1 = >20mm	12	11	2.2	3.5	7.7	25.9
T2 = <20mm	68	29	1.6	2.2	7.8	20.8
T3 = Control	80	40	1.9	2.9	15.5	46.7

As at Nov 05	# Branches remaining		Mean branch length (m)		Total branch fresh weight/tree (kg)	
Pollarding Date	Nov-04	Mar-05	Nov-04	Mar-05	Nov-04	Mar-05
T1 = >20mm	12	11	5.07	4.77	63.2	57.9
T2 = <20mm	30	25	3.70	3.95	71.3	59.5
T3 = Control	30	32	4.82	4.45	106. 0	113.1

As at Nov 05	Mean branch basal diameter (mm)		Regrowth density (0-5)[a]		Regrowth length (m)	
Pollarding Date	Nov-04	Mar-05	Nov-04	Mar-05	Nov-04	Mar-05
T1 = >20mm	59	58	2.3	2.8	9.6	5.7
T2 = <20mm	34	34	2.0	3.8	6.8	9.0
T3 = Control	44	45	0.7	0.3	1.6	0.8

[a] score of canopy density increasing from 0 to 5

From these measurements it appears that trimming pollarded poplar trees to leave branches less than 20 mm in diameter will enable a farmer to harvest more and slightly heavier branches than leaving thicker branches when pruning. With Treatment 2 the branches were only slightly longer than the year before, but had the same diameter, so were lighter than when trimmed in the same treatment a year earlier. The control trees show just how much these poplars can grow – and gain branch weight – within a year, and unless they are trimmed regularly they can carry dangerous weighty branches. But the big question with these trees remains – does a farmer keep the trees growing for a significant drought, or should the trees be trimmed at regular intervals anyway, to keep them leafy and bushy?

Pollarded poplar tree

Essentially the November 2004 pollarded trees have increased their fresh weight from 7-9 times between assessments, whereas the March 2005 pollarded trees have approximately doubled their fresh weight during the same period. Harvesting for forage is more likely to be conducted later in the growing season once pasture feed shortages occur, so production from the autumn-trimmed trees is probably more likely. Note also that regrowth density is much better on the thinned trees (especially those autumn-trimmed). This may be beneficial in that we could feasibly gain at least one, and possibly two seasons during recycling these trees for forage, which should markedly improve the economic benefits. Regrowth from the control trees remains poor (due mainly to greater canopy density), so their regrowth would be considerably delayed after harvesting.

John Prebble is now considering a rotational block-cutting regime to prevent accumulation of heavy branches. It would ensure sufficient mature trees were always available, and spread the labour for tree maintenance.

Managing mature poplars

From Ian McIvor and Carlo van den Dijssel HortResearch, Palmerston North

Two Manawatu farmers, Jim Rainey at Mangaweka and David Worsfold at Kiwitea, have kindly offered some very large poplar trees for our poplar and willow killing trial. The trees are growing on quite steep slopes and range from two to well over three metres in circumference at breast height. Two herbicides, sold as the brands Escort and Roundup, are being tested at either varying strengths (Escort) or varying volumes (Roundup) to kill the trees. Holes of 7 mm diameter are drilled with a battery powered electric drill through the bark (angled downwards close to 45 degrees) and at least 30 mm into the trunk. We are injecting the herbicides with a hypodermic syringe, which places the liquid into the base of the hole, but a farmer could use an old drench gun.

Tree at Te Awa

The holes are spaced at 10 cm intervals around the tree at a height convenient to the operator (around waist height) and 2 ml of chemical is injected into each hole. Escort is being applied at three concentrations – 10g/L, 20g/L and 40g/L, these being 0.5x, 1x and 2x the manufacturer's recommended application rate. Roundup is being used undiluted so instead the hole spacing is being varied – either 20 cm, 10 cm or 5 cm apart, these rates also being 0.5x, 1x or 2x the manufacturer's recommended application rate.

The treatments were applied in October 2005, and will continue in December, February and April. This should identify when during the growing season is the more effective time for poisoning, and whether a dose other than the recommended dose is satisfactory, either for economy or effectiveness.

Preliminary results will be reported in the next edition of *PWNews*, and the final results be will published in the June 2007 issue. At this stage the main observation is that drilling the holes takes more work than the herbicide application. Both sites are grazed, offer great scenic views and are a pleasure to visit.

NB. In using the herbicide brands stated above we intend no endorsement or criticism of these products or of any others not mentioned. The brand names are only used to make reading easier.

FEEDBACK

We are keen to hear from farmers and other people living or working on the land about their experiences with managing poplars and willows for soil conservation, shelter and shade and using them for supplementary fodder.

If you have had some experience with poplar and willow tree management and can offer some positive suggestions that we could include in the practical guidelines, then please contact one of the team listed below and give us the details. We will check with you for accuracy and content suitability before any of your information is published.

We thank the following for funding this work:
MAF's Sustainable Farming Fund
Massey University, Riverside Farm Research Trust
and Hawke's Bay Regional Council

Want to know more?

If you are interested in this project and its results and would like someone else to receive future issues of *PWNews*, please contact any of the following:

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