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PWNews

Managing poplars and willows on farms

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From the Project Leader

Peter Gawith

Welcome to the June 2006 issue of *PWNews* that focuses on managing poplars and willows on farms. The team continues to achieve the milestones set for this project and we report on the latest progress made in this issue. A draft of the planting and management guidelines has been reviewed by team members and revised accordingly. We also feature an article on another land management officer who is a key participant in this project – Neil Faulknor of Hawke's Bay Regional Council, who comments on his experience with poplars and willows over the past 40 years. An article on the successful field day at the Ennor Family farm in Central Hawke's Bay has had to be held back until the December issue, to keep within the required size.

The Otago team continues to progress steadily with effluent management using willows near Balclutha and poplar pollarding systems on John Prebble's farm near Palmerston. 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

The project has now been running well for about two years and is about to enter its final year. Project team members in the North and South Islands have made a lot of recent progress in several areas, and some of the more significant include:

Grant Douglas

- ***Planting and Management Plan*** A comprehensive draft has been prepared with contributions and feedback from regional council land managers, farmers, consultants and researchers. It is planned to distribute the latest draft more widely to gain more feedback and ensure that the final document is as relevant and accurate as possible. The team is now starting to consider adding appropriate illustrations for these guidelines, and the best way of distributing the final product.
- ***Economic analyses*** Tweaking of the models is ongoing, as more feedback is obtained from within the project team and from other feedback. It is expected that these will be completed in late 2006/early 2007.
- ***Otago pollarding trial*** Another harvest of variously pollarded poplar trees was conducted in March and data collected on branch number, length, basal diameter, and weight. These data are being analysed and will assist with recommending appropriate management.
- ***Parasite trial*** A trial to determine the effect of willow browse on hogget mating and internal parasite activity commenced at Massey University's Riverside Farm in January 2006. Weaning is scheduled for January 2007.
- ***Field day in central Hawke's Bay*** A very successful day was held on 4 April, which focussed on the management and economics of willows and poplars on farms. The day was attended by about 50 people, and included an excellent demonstration of pollarding technique and harvesting/killing large trees.
- ***Publicity*** Aspects of the project have continued to be publicised well in various newspapers and popular magazines. An overview of the project was presented to the annual conference of the Tree Crops Association in April, and the project received some airing on radio. So the project has received its fair share of promotion.

- ***Nutrient movement trials*** Willows in the Otago effluent trial were harvested after two growing seasons in February and data collected on yield and other growth characteristics; foliage and soil samples have also been analysed for nitrogen concentration. Massey University has continued its trials at two sites to compare tree-pasture systems with pasture, for managing nutrients.

You'll read more about some of these activities in this issue of *PWNews*. As always, if you require more information about any aspect of the project, please contact appropriate people directly, or the people listed at the back of this newsletter. Also, don't forget to view the project's website, hosted by HortResearch, listed on the front page. Happy reading.

I'm delighted with the progress made by the project this year, and this has only occurred because of an enthusiastic and committed technical team, and participants who have been happy to contribute and share their knowledge openly. To you all, a very big "thank you", and I trust that our final year will be as equally rewarding.

Experiences with trees in Hawke's Bay

From Deric Charlton, Greenfields Communications, Palmerston North

Ask anyone to do with the land in Hawke's Bay who knows about soil conservation and I'd bet that their reply would include the name Neil Faulknor.

Neil Faulknor

Neil's own experience in soil conservation began in the mid 1960s, when he began at the Hawke's Bay Catchment Board's Napier office, where he soon became familiar with the tree clones from the National Plant Materials Centre at Aokautere, near Palmerston North. In 1970 he moved to Waipukurau, and still works from there.

"The Italian Hybrid poplars (mostly I455, I78, I30, and I214) were popular then," Neil recalls, "but other poplars grown then included the black poplar, *P. laevigata*, and Lombardy, the latter being harvested from many miles of shelterbelts around orchards on the Heretaunga Plains. The poplars were not that vigorous on higher slopes, so we would plant 1000 poles per year on a farm and expect to lose up to half of them. It wasn't all the tree's fault, as we would dig a hole by spade and replace the soil in the hole, but the clay soils shrank away from the poles as they dried, and the pole worked loose if re-ramming was not done."

In the late 1960s, once Italian hybrid poplars were available in quantity, poplars were planted on slopes and golden willows in gullies for erosion control on farms. Fortunately matsudana willow soon became available, as golden willows were very brittle, then in 1973 the two leaf rusts hit poplars and matsudana was the only suitable tree willow available in any numbers. Although several *matsudana* x *alba* clones were later released, matsudana is still a first choice for farmers in many Hawke's Bay situations, says Neil.

In 1970, Neil Faulknor transferred to the Hawke's Bay Catchment Board's Waipukurau office just as pole rammers became available. These had a major impact as they improved the pole survival rates and the planting rate, enabling costs to be held for some time. Pre-plant soaking also ensured a marked improvement in survival of poles, particularly poplars. Large soaking bays were built at the Hawke's Bay nursery to ensure poles were soaked before planting and farmers were advised to store poles in fresh, flowing water if they were not to be planted soon after delivery. Attention to siting and soaking and improved planting methods saw survival rates of poplar increase from 50 percent to over 95 percent in years with moist summers.

The arrival of poplar leaf rust disease in 1973 left Hawke's Bay without any suitable poplars, and matsudana willow was the only alternative soil conservation tree. The lack of poplar material dramatically changed the look of planting on farms, he remembers.

"Suddenly, willows were growing everywhere, and matsudana was reliable on most sites. It has been criticised for developing heavy side-branches, which split off, almost splitting the tree in half," comments Neil, "but that can be controlled, and the tree is still favoured by many for its more compact form, and it seems less susceptible to willow

rust that partially defoliates some of the *matsudana* x *alba* clones. Currently, the willow sawfly has not had a major impact on matsudana trees in the field. The sawfly seems to appear, cause some slight damage, and then disappear. We hope that continues."

New poplar clones were slow to become available, Neil recalls. Flevo was the initial clone, and some subsequent releases lacked vigour on any hard site, leading to fundamental changes in recommendations for siting poles. The Hawke's Bay Regional Council (HBRC) land managers used willows on slopes, poplars in deeper soils on the mid-slopes, and willows in their traditional role – around gullies and waterways, and despite newer and better poplar clones becoming available, these recommendations remain today.

Neil Faulknor also attributes improved pole survival rates to development of sleeve protectors. In the late 1960s and early 1970s, HBRC had used large Wattie's juice cans to protect poles against stock chewing, but each pole needed about nine cans, and each can had to have its bottom end cut out. Many cursing farmers had blistered fingers and worn-out hand-held can openers, he recalls. The cans were effective, especially against possums, but they were bulky to transport.

Chemical repellents came next – several vile concoctions mixed with a latex carrier, painted on trees in trials. The eventual development of Netlon sleeves finally permitted cattle to graze among trees with minimum bark damage, though cattle exclusion for a season or two was still recommended to allow the pole to form roots. Subsequent development of Dynex sleeves has given even more protection, though with some slight problems – bark seems to stay soft until exposed when the sleeve bursts off, and stock must be kept away from newly unprotected trees until the bark hardens.

"Despite all these developments," says Neil, "the more that things change, the more they stay the same. Pole planting is still accepted as the best erosion control method for the erosion in Hawke's Bay, allowing pastoral farming to continue sustainably. Pole planting numbers have remained remarkably constant in central and southern Hawke's Bay – around 20,000 willows and poplars a year.

"The low point came in the early 1990s when the government grant was phased out, but the Regional Council's *Regional Landcare Scheme,* introduced in 1994, again offered up to a 50 percent grant for erosion control. Since then the ratio of poles has returned to around three-quarters poplars and one quarter willows, as before. The recent extremely wet winter has seen widespread deep-seated erosion return, not seen in Hawke's Bay for over a decade. Accordingly, demand for poles has been high, and we expect it to remain high next year. Let's just hope that the moist summers we have been experiencing don't change to dry summers, with a consequent loss of poles."

Economic Models for pollarded poplars and browse willows

From John Stantiall, Wilson & Keeling Ltd, Feilding

This article considers the economics for pollarded poplars and browse willows. Using willows for dairy effluent disposal will be covered in a future newsletter.

The following analyses are based solely on the costs and returns of trees planted for stock fodder. Other benefits such as stock health, erosion control, stock shelter and shade and any aesthetic value added to the farm will need to be added on a case-by-case basis, and are likely to result in positive overall returns to the original investment in trees. A 20-year timeframe is considered in the model, with a drought every 5 years. A farm with fodder trees is compared with an identical farm without fodder trees over this period, with stock performance adjusted accordingly. The average gross margins for the 20-year period are presented in the summary. The model considers three options: fully costed; labour costs excluded; and the exclusion of establishment costs (on the basis that the cost is borne by another component of the farm, such as erosion control).

John Stantiall

Establishment and Annual Costs The establishment costs include time (preparation, planting, releasing); materials (poles, sleeves, chemical); and loss of income due to the area not being grazed in the first year or two (to avoid damage to the young plants by stock). The annual costs include the interest on the original investment, an allowance for repairs and maintenance on the tree block, and any harvesting costs when the trees are fed to stock. In a pollarded block the trees require cutting every three years (regardless of drought) to minimise trash, improve safety and maintain a sound pasture

sward. (The alternative to this is to include a cost for removing the large branches and trash that occurs when big trees are pollarded, and to allow for reduced pasture production.)

Calculating the Financial Benefits The following three scenarios used were:

1. Base situation - no drought, no fodder trees - the expected stock performance level in a year with no drought.
2. Drought situation, no fodder trees - the expected stock performance level without tree fodder in a drought year.
3. Drought situation, with fodder trees - in this scenario, the annual cost of trees is present every year, and in a non-drought year, the stock performance is similar to the base.

BUT in a drought year, stock performance in the fodder tree model does not drop as low as the model with no trees - depending on the amount of stock that have access to tree fodder.

A gross margin (GM) analysis was prepared for each scenario. A 20-year cash flow (based on the GMs, with a drought every five years) was completed for the three scenarios listed above.

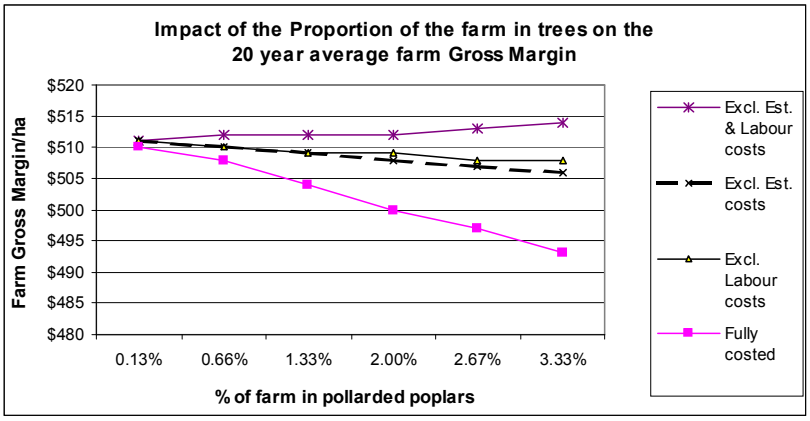
POLLARDED POPLAR BLOCK

In this model, the trees are specifically planted in a single block at 400 stems/ha to provide feed during a drought. They are used to maintain condition of cattle or breeding ewes. The model is based on an improved lambing response from ewes fed tree fodder compared with those receiving less feed. The response data are initially based on farmer experience. The model assumes that the lambing response for a flock is proportional to the percentage of the flock fed on tree fodder. In a situation where the trees are space planted on hillsides for erosion control, then consider the returns from the option, which excludes the establishment costs. Based on the case study farm in Central Otago, the cost of establishing a block of poplar trees for pollarding for livestock fodder is about $3,141/ha ($1,680/ha if the cost of labour is not included). The annual cost, including interest on the initial investment, and the average annual cost of harvesting the trees is $533/ha ($134/ha if labour is not included).

Summary of the Average Gross Margins for a 20-year period A generalised model, based on a 750 ha sheep & cattle breeding property with 1 ha of poplar trees for feeding during a drought:

	Including labour $/effective ha/year	Excluding labour $/effective ha/year
Without fodder trees	$510.27	$510.27
With fodder trees	$510.15	$510.73
Benefit/(Cost) with trees	$(0.12)	$0.46
With fodder trees when establishment costs are excluded	$510.66	$510.97
Benefit/(Cost) with trees when establishment costs are excluded	$0.39	$0.70

Impact of the proportion of the farm in trees When the fodder trees are on a small proportion of the farm and are fully costed, there is a small cost over a 20 year period, but the trees provide a feed option during a drought. This in itself helps to mitigate a reduction in stock performance and income that may otherwise occur. If labour is not costed, the fodder tree option has a slight advantage based on the costs and returns used in this example.



As the proportion of the farm in fodder trees increases, the overall farm gross margin declines rapidly when fully costed. If either the labour costs, or establishment costs are excluded, the decline is less marked. If the establishment and labour costs are not included, but the benefits are, then there is a slight improvement in the gross margin with increasing proportion of the farm in fodder trees.

WILLOW BROWSE BLOCK

In this model, the trees are specifically planted in a single block at 6,000 stems/ha to provide feed during a drought. They are used to maintain condition of cattle or breeding ewes. The model is based on an improved lambing response from ewes fed tree fodder compared to those receiving less feed. The response data are initially based on farmer experience. The model assumes that the lambing response for a flock is proportional to the percentage of the flock fed on tree fodder. In a situation where the trees are used for erosion control, then consider the returns from the option, which excludes the establishment costs. In this model, the trees are specifically planted to provide feed during a drought. While other benefits are acknowledged, such as animal health benefits or erosion control, their benefits are not included. The block is for sheep grazing. The model is based on an improved lambing response from ewes fed willow browse plus extra pasture production from the browse block compared to those receiving less feed. The model assumes the lambing response for the flock is proportional to the percentage of the flock fed on willow browse.

Costs for Browse Block Based on the case study farm in Wairarapa, the cost of establishing a block of willow trees for browsing by livestock is about $8,570/ha ($6,320/ha if the cost of labour is not included). The annual cost, including interest on the initial investment, is $906/ha ($506/ha if labour is not included).

Average Farm Gross Margin over a 20-year period A generalised model, based on a 500 ha sheep and cattle breeding property with 1 ha of willow browse for feeding during a drought:

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	Including Labour $/effective ha/year	Excluding labour $/effective ha/year
Without fodder trees	$530.28	$530.28
With fodder trees	$527.64	$528.85
Benefit/(Cost) with trees	($2.64)	($1.43)
With fodder trees when establishment costs are excluded	$530.66	$531.07
Benefit/(Cost) with trees when establishment costs are excluded	$0.37	$0.79

The willow browse block has a high establishment cost due to the high plant population. When fully costed, the gross margin for a farm with a browse block is less than without it, despite the benefit of feed during a drought once every five years.

Impact of the proportion of the farm in trees As the proportion of area in browse willows increases on the farm, the overall farm gross margin declines rapidly when fully costed. If either the labour costs, or establishment costs are excluded, the decline is less marked. If the establishment and labour costs are not included, but the benefits are, then there is a slight improvement in the gross margin with increasing proportion of the farm in fodder trees.

SUMMARY

The scenarios provided in this article have been based on particular case studies and have been developed as a draft for generating discussion, with the aim of improving the model over time. The scenarios used have tested the impact of variables such as the labour and establishment costs on the overall economics.

In general, fodder trees add a cost to a pastoral farming system. They also provide benefits, which in some circumstances outweigh the costs. Some aspects of trees such as the value of aesthetics, stock shelter and shade, erosion control and nutrient trapping are difficult to value, but can still be real benefits. One of the aims is to develop the model, based on actual cases, so that it can be used as a predictive tool for farmers wanting to investigate the economics of planting trees for livestock fodder in particular.

Otago – Update on dairy effluent trial

From Malcolm Deverson, Clutha Agricultural Development Board, Balclutha

A mild winter and a warm spring led on to good summer growth in the Kinuyanagi willows at the Sharpin brothers' property in the Otago willows effluent trial. The lower area, originally from strong rooted cuttings had grown to approximately 1.8m by early December, with the best of them up to 2.5m where effluent had been channelled on this sloping site. The middle section, with more difficult starting conditions already recorded, was more variable, between 1m and 1.6m high at this time. Trees in the top plot, although from unrooted cuttings but with the advantage of the shelter nearby, were also growing well and averaged 1.9m tall.

The willows block

The strong-rooted cuttings blanked up in September had variable success but had largely taken well, doing best in the sprayed rows as expected. The extended area to the west along the slope had been planted with 320 extra wands in September, but these were swamped in knee-high pasture grasses and could be a total loss. They had suffered because the area had not been grazed, nor sprayed before planting. Effluent spraying via the K-line irrigation system resumed in mid January under the protocols arranged by the farmers and the Otago Regional Council.

Cattle in the block

Much activity involved detailed consideration of the late summer sampling and analysis and then the harvesting methods and procedures. An on-site meeting was held in December with CADB, ORC and farmer input, and it was decided subsequently to assess the fodder and pasture in early February. Accordingly the growth was measured in February and the resulting data are being analysed. A lot of data have been collected and care is needed in describing what has been achieved by the willows – both in terms of their effluent uptake and in the growth achieved for cattle fodder.

The option adopted was the one most likely to be taken by a farmer in this situation – to let cattle graze the block *in situ*. The block was divided into four sections – Telford Polytechnic students and a consultant cut the lines – and in late February the first cattle were introduced. The cattle reactions were observed and grazings continued through March. It looks likely that a harvest will be conducted much earlier next season and the possibility of a small cut-and-carry operation will be considered. It is also important to identify any change in production figures for the cows that spend time in the browse block.

Twenty-three samples of pasture, willow foliage, edible stems and non-edible stems were taken in late February, and these were sent to Crop and Food Research, Lincoln for nitrogen analysis. These comprised non-irrigated and irrigated pasture, and leaf, edible and non-edible stems for newly harvested and repeat harvested, effluent-irrigated Kinuyanagi willow. In addition, nitrogen extracts were taken from 20 soil samples, and these were also analysed by Crop and Food Research at Lincoln.

Hogget Mating on willow browse blocks

From Tom Barry, Kelvin Musonda, Eileen McWilliam and Bill Pomroy Massey University

The table below summarises results for the hogget mating experiment conducted on Massey University's Riverside Farm near Masterton. Normally hoggets are mated for two cycles, but it was restricted to one cycle in this experiment, because hoggets are normally mated later than ewes and all the browse blocks were used at the end of the first cycle, and in any case the willow leaf fall time was approaching. As with last year involving weaned lambs for meat production, grazing the browse blocks has slightly increased liveweight gain and reduced the dag score. Fodder tree supplementation during mating increased reproduction more than liveweight gain. Hogget markings for the pasture trigger-drenched group in the first cycle are similar to what were found at Riverside Farm last year for hoggets mated

on pasture in the first cycle. Looking at the faecal egg counts there does not seem to have been any effects of browse blocks reducing parasite problems in this year's trial, in contrast to the 2005 results.

Summer/autumn 2006 results from Riverside Farm, Massey University

	Units	Pasture Regularly drenched [1]	Pasture Trigger drenched [2]	Browse block Trigger drenched [2]
Number of hoggets		114	115	114
Initial liveweight (19 January)	kg	27.4	27.2	27.3
Final liveweight (15 May)	kg	37.4	37.1	38.5
Liveweight gain (116 days)	g/day	85	85	97
Hoggets marked by entire rams (1 cycle only)	%	36	51	72
Dag Score				
Initial	Units	1.04	1.03	1.07
Final	Units	1.72	1.70	1.53
Increase	Units	0.68	0.67	0.46

1 Drenched at the start of the Experiment and then at monthly intervals.

2 Drenched at the start of the Experiment and then when FEC reached or exceeded the trigger of 1000 eggs/gram of faeces. This turned out to be at 4 week intervals for both groups.

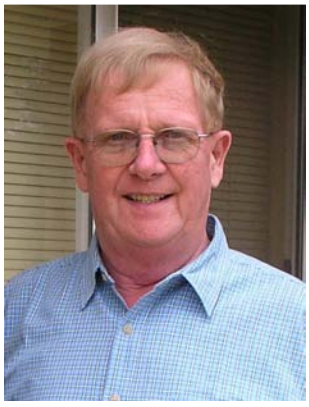
The preliminary trial results show a possible huge benefit in terms of lambs conceived in the first cycle – meaning not only several weeks earlier lambs, but many more of them. In business terms this could reduce the need for hormonal treatments to increase lambing percentage, enhancing the "clean green" image farmers are keen to protect, to give lamb a competitive edge in future marketing.

Preliminary information from ram marking indicates that mating hoggets on browse blocks may have increased reproductive performance. Further more conclusive data will be available at scanning in early July, at lambing in September/October and at weaning in January 2007.

Poplar and Willow Management Guidelines drafted

From Deric Charlton, Greenfields Communications, Palmerston North

The guidelines for farmers and landowners with regard to growing and managing poplars and willows on farms have taken much longer than anticipated to write, but they are now in almost final form. An initial draft was sent to 15 key people involved in this SFF project for comment and suggestions, and the edited, updated draft will soon be ready for circulation to a wider range of participants.



Deric Charlton

These guidelines have taken time to prepare because the information is scattered widely and much of it is not readily available. Initially the sources were previously published books and research papers, but a search of regional council publications resulted in further valuable items, and several land management officers were generous in providing very useful documents from their files.

When farmer experiences that had been acquired through interviews and various meetings were added, the information became even more relevant. Searches of Internet websites added to the information to some extent, although little if any

overseas material has relevance for this country, in comparison with locally acquired experiences.

At present the guidelines include the following aspects:

- Overview of poplars and willows in New Zealand:
  - Species attributes; Clones for New Zealand situations.

- Establishing poplars and willows:
  - Planting regimes for different landforms; Pre-planting preparations; Essentials of pole planting; Establishment methods; Pole protection; Grazing management during establishment; Establishing browse blocks and coppice blocks.

- Tree management:
  - Pruning equipment; Sleeve removal; Pruning pollarded trees, browse blocks and coppice blocks (for effluent disposal); Managing poplar trees; Managing willow trees; Dealing with unwanted mature trees.

- Risk management:
  - Safety procedures; Safety equipment; Training for tree management; Possums; Tree diseases and pests (rust, sawfly).

- Cost-benefit analysis of poplars and willows as supplementary fodder.
- Glossary of Terminology and Further Reading.

We welcome any positive suggestions about content not listed above that could make these guidelines even more relevant to poplar and willow tree users. The next stage is to add relevant illustrations and decide on the most suitable formats for these guidelines to be acquired and used by those on the land.

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.

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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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