

Managing irrigation and fertiliser in dairy farming

**Third Report
February 2002**

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Executive Summary

This report documents the third stage of a study into irrigation and fertiliser management on dairy farms in the Macalister Irrigation District. In the first stage of this study we interviewed dairy farmers in the District to identify the factors that influence the adoption of laser graded flood irrigation, spray irrigation systems, reuse systems and Whole Farm Planning. We discovered the type of irrigation system chosen by farmers depends on the soils and topography of their property, financial constraints, and farm layout. Time and labour constraints were also identified as key factors in the choice of an irrigation system.

These results were confirmed through a mail survey of farmers in the Macalister in the second stage of the study. Approximately 30 per cent of dairy farmers in the District completed the survey.

In the third stage of the study we collaborated with research and extension staff of the Department to formulate strategies to promote the adoption of spray irrigation, reuse systems and Whole Farm Planning.

The most important results to emerge from the study are that:

- Laser grading is the most effective means of reducing water and labour use per hectare on most farms.
- The adoption of laser grading, reuse systems and spray irrigation mainly depends on the biophysical and structural characteristics of farms.
- Many farmers in the District that are planning to install spray irrigation believe that Whole Farm Planning is an unnecessary expense and that Whole Farm Planning consultants lack expertise with spray systems.
- Lack of access to water on demand may be a factor preventing the adoption of spray irrigation for some farmers.
- Many farmers in the district with relatively permeable soils are more likely to need to store irrigation water for spray irrigation and are less likely to need to conserve run-off in recycling systems.
- Experienced farmers believed they had a high degree of competency in managing irrigation on their farms and expressed little interest in attending courses on irrigation. Some farmers we interviewed did exhibit interest in courses on fertiliser management. Virtually all farmers were aware that fertiliser should not be 'watered in'.

To encourage dairy farmers in the Macalister to invest in spray irrigation, reuse systems and Whole Farm Planning we recommend:

- The Department consider changing farmers' perceptions of Whole Farm Planning. This will require identifying, and then promoting to farmers, the benefits of using Whole Farm Planning as an aid to making decisions about investing in spray irrigation.
- The Department consider ways of facilitating collaboration between accredited Whole Farm Planners and spray designers to ensure that suppliers of Whole Farm Planning services are able to provide appropriate expertise.

- Alternatively, the Department consider negotiating with designers and installers of spray irrigation systems to formulate criteria that would allow spray irrigation plans to meet the Departments conditions for support under the incentive programs.
- The Department consider ways of promoting courses on irrigation and fertiliser management to farmers who are experiencing problems with pasture productivity or excessive water use and to farmers who are planning to expand farm production by increasing pasture productivity and stocking rates. Encouraging farmers who are investing in Whole Farm Planning to participate in these courses could support these promotional efforts.
- The Department encourage organisations responsible for the supply of irrigation water to consider improving irrigation infrastructure in the district and to consider reviewing groundwater policies as lack of access to water on demand may be a factor in the adoption of spray irrigation for some farmers.
- The Department consider extending the incentive offered for the installation of reuse systems to include systems that are also designed to store water to facilitate the installation of spray irrigation.

However, it is important to note that the results of the study suggest that:

- Widespread adoption of spray irrigation on a large scale by dairy farmers in the District is unlikely.
- Offering financial incentives to adopt spray irrigation or reuse systems only encourages farmers to bring forward plans to adopt these technologies. The incentives do not motivate farmers to adopt technologies they would otherwise never have considered adopting.
- Given the incentives are relatively small and spray irrigation technologies are expensive in absolute terms the uptake of the incentive program among farmers in the District will depend largely on milk prices.

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All errors and omissions remain the responsibility of the authors.

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Introduction

The efficiency of water and fertiliser use on irrigated farms has become an issue for dairy, beef and other farmers and the community in the Macalister Irrigation District in Gippsland, Victoria for a number of reasons. For example, the demand for irrigation water in the district has been increasing as the area under irrigation in the district has been expanding over time. This has resulted in a long-term decline in water allocations, which has been exacerbated by a series of unusually dry seasons. In addition, water and nutrient losses from both dryland and irrigated farms in the Lake Wellington catchment are believed to be contributing to algal blooms in the Gippsland Lakes and to the salinisation of agricultural land in the district.

A suite of best management practices is being identified to improve the efficiency of water and fertiliser use on dairy farms in the Macalister Irrigation District (see for example, Slee and Ewert 1998 and DNRE 2000). These practices are to be promoted through initiatives such as the Lake Wellington Salinity Management Plan and the Macalister Irrigation District Nutrient Reduction Plan. The nutrient reduction plan contains a number of financial incentives to promote the adoption of Whole Farm Plans, water recycling via reuse systems and the installation of spray irrigation systems. The salinity management plan has an irrigation extension component aimed at improving irrigation management on dairy farms.

Our objective in this study was to understand the adoption of Whole Farm Plans, water reuse systems and spray irrigation systems on dairy farms, and to identify and understand the factors that influence fertiliser management. This knowledge will be used to develop extension strategies to promote more widespread adoption of these systems and practices.

The study involved three stages. In the first stage we identified the technologies, practices and resources at the farm level that influenced the benefits and costs of adopting

different types of irrigation systems and fertiliser management practices. This stage involved interviews with farmers, extension staff and other relevant experts or specialists.

In the second stage we collected data on farmers' irrigation technologies and fertiliser practices through a mail survey of all dairy farmers in the Macalister Irrigation District. We used this data to classify dairy farmers into adoption segments.

In the third stage extension strategies and priorities were determined. This involved detailed analysis and interpretation of the study results by the project team in collaboration with research and extension personnel. For a more detailed description and justification of the methods used in the study see Kaine and Niall (1999), Kaine and Bewsell (2000), and Kaine and Niall (2001).

In this report we describe the findings from the third stage of this study.

Development of extension strategies

Extension strategies and priorities were formulated in a workshop setting by combining the information and perspectives gained from the market research with the knowledge and experience of Department staff involved in dairy extension. The research team and staff of the Department developed draft strategies for consideration in an extension program using a program logic approach (Mayeske 1994).

In conducting interviews with farmers in the first stage of the study, we rapidly came to the conclusion that farmers were likely to have devoted considerable time and effort to irrigation management. This is because irrigation management is a key farming activity in terms of labour resources and production and financial performance. Consequently, we believe dairy farmers in the Macalister Irrigation District will be motivated to change irrigation practices if they are dissatisfied with their irrigation management and they can identify an alternative practice that clearly offers a solution to the problem that is the source of their dissatisfaction. Therefore, when formulating extension strategies for irrigation management, we took the view that the fundamental objective of these strategies would be to assist those farmers who are motivated to change irrigation practices because they are dissatisfied with their irrigation management. Consequently, the starting point in the strategy formulation process was to identify the range of problems that could potentially cause farmers to be dissatisfied with their irrigation management.

The problems that were identified in this process were largely confined to problems that had the potential to adversely effect milk production and farm profitability or the time and effort needed to irrigate the farm. While the off-farm effects of irrigation and nutrient run-off were a concern to the farming community, the results of the qualitative interviews and the quantitative survey indicated that these concerns alone were not sufficient to motivate farmers to change irrigation practices.

Following Mayeske's (1994) procedure, the problems that could potentially cause farmers to be dissatisfied with their irrigation management were categorised into problem trees. These trees are summarised in appendix A. Solutions were then developed for the problems in each tree. The resulting solution tree is summarised in appendix B.

We classified the problems identified by the workshop participants into five broad categories. These were:

- Inadequate water security. Problems with water security result from inadequate inflows into the main storages and changes in water allocation policy. In principle, farmers can increase security by purchasing additional water right, investing in a groundwater bore or installing a reuse system to capture rainfall and irrigation run-off.
- Inadequate irrigation delivery system. This category included problems with both district and farm irrigation distribution systems. As our mail survey of farmers revealed, a substantial proportion of farmers in the Macalister experience disruptive delays in water deliveries and problems with variations in flow rates in their district supply channel. On the farm, problems can also arise with layout and capacity of farm channels and with inadequate capacity in spray systems and pumps, with inadequate farm storage or groundwater flow. Farmers can alleviate these problems by upgrading their farm and irrigation infrastructure (storages, channels, pumps and spray systems), seeking additional supplies of groundwater and properly maintaining structures and equipment.
- Irrigation management issues. These issues included problems arising from irrigation layout and design such as needing to spend too much time irrigating because of poor farm layout and too many bays. They also include problems arising from managing a mix of spray and flood irrigation systems and excessive power costs associated with spray irrigation. Farmers might alleviate these problems by installing automatic irrigation, hiring labour, laser grading, installing reuse systems and upgrading spray irrigation systems.

- Poor pasture performance. Problems with pasture growth and composition can arise from three sources. The first is waterlogging due to poor drainage or poor grading. The second is uneven spray distribution. Thirdly, pasture performance can suffer if there is a conflict between the timing of irrigation rotations and fertiliser regimes. Pasture performance may be improved by laser grading or installing spray irrigation and improving irrigation and fertiliser management.
- Excessive water use. Excessive water use can occur with flood irrigation on relatively permeable soils, flow rates in irrigation bays that are too slow, spray drift and unintended spray irrigation of laneways etc. Installing spray irrigation, laser grading, upgrading channel infrastructure and improving irrigation management skills may reduce water use.

The workshop participants then considered ways in which an extension program could assist farmers to solve the problems that had been identified. The resulting solution tree (see appendix B) indicated that extension could assist farmers to solve many problems with irrigation by providing advice and assistance in the design and management of reuse, storage, groundwater, spray and flood irrigation systems. At present, extension does provide assistance of this nature through Whole Farm Planning.

In principle, Whole Farm Planning encompasses the systematic evaluation and comparison of all forms of irrigation and their management that are relevant in a particular circumstance. Whole Farm Planning is based on a detailed survey of the physical resources of the farm and encompasses all aspects of irrigation design, construction and management. Whole Farm Planning may also be used as a tool for planning farm expansion. Given the potential of Whole Farm Planning to contribute to irrigation management across a range of problems in all segments we believed the promotion of Whole Farm Planning should be accorded a high priority for extension.

Extension could also provide additional support to farmers in terms of advice about irrigation scheduling, crop requirements and fertiliser management. At present, extension does provide some support of this nature through irrigation courses, fertiliser courses and benchmarking.

Market segments and extension strategies

Interviews with farmers earlier in the study indicated that many farmers in the Macalister Irrigation District were not convinced of the value of activities such as Whole Farm Planning, irrigation courses, fertiliser courses and benchmarking. A second round of interviews with two farmers from each of the irrigation segments confirmed the limited interest of farmers in these activities. These interviews confirmed that the farmers' interest in irrigation technologies such as laser grading and spray irrigation is driven by the unique characteristics of their particular farm context.

Many dairy farmers in the Macalister Irrigation District believed that the main purpose of Whole Farm Planning was to plan earthworks for flood irrigation. Consequently, farmers in the District have usually only considered investing in Whole Farm Plans when they have been planning to laser grade for flood irrigation. In many instances this planning has not applied to the whole farm but only to that portion that is to be laser graded.

Many of the farmers in the District expressed the view that Whole Farm Planning was an unnecessary expense for farmers planning to install spray irrigation and that Whole Farm Planning consultants lacked expertise with spray systems. Consider the following:

Dan operates a 40-hectare farm near Boisdale. The farm consists of a mix of flat and sloping country with sandy soils that are highly permeable. Originally the farm was flood irrigated but because of seepage in the delvas and down the bays it took two weeks to irrigate the farm. Dan improved water flow to the bays by replacing the delvas with pipes and risers. He also installed lateral move spray irrigation on about 60 per cent of the farm. Now, with less water, he can irrigate a greater area of the farm and in only three or four days. Dan has a 'reuse' system but really it is a storage dam for running the sprays. He is also really concerned about the amount of seepage from the District supply channel.

Dan considered centre pivots but decided against them as he would have needed to put in two pivots and would have had to cut down a lot of trees. He also considered fixed sprays but decided they would not be practical for a milking cow enterprise after talking with another farmer who uses fixed sprays on a bobby calf enterprise.

Dan commissioned an approved consultant to prepare a Whole Farm Plan to qualify for the incentive offered on spray irrigation. He believes the plan was a waste of time and resources as the planner was only familiar with spray systems for horticulture. Dan had a local engineering firm design his spray system once the Department had approved the Whole Farm Plan that was prepared by the consultant. Dan says the Department was not willing to approve a plan prepared by a local firm even though they were the ones that had the expertise in spray irrigation.

Given farmers' views on Whole Farm Planning, and the key role that Whole Farm Planning could play in an extension program, we suggest that farmers' idea of Whole Farm Planning needs to be changed. In marketing terms Whole Farm Planning needs to be 'repositioned' in the mind of farmers. This involves identifying the key benefits that Whole Farm Planning offers to farmers in each segment and developing promotional strategies accordingly. This effectively means offering Whole Farm Planning as a flexible package that can be customised to meet the particular needs of farmers in each segment. By treating Whole Farm Planning as a customised product the opportunity is created to promote Whole Farm Planning to each segment on the basis of the key benefits it offers to each segment.

Whole Farm Planning and the lasered layout segment

Consider, for example, farmers in the lasered layout segment. These farmers rely on flood irrigation and have laser graded most of their properties. Farmers in this segment who are planning to expand their farm operations may need to consider spray irrigation as a possibility. This suggests that Whole Farm Planning might be promoted to farmers in this segment as a systematic procedure for choosing between alternative spray irrigation systems and for integrating flood and spray irrigation. Groundwater management and on-farm storages may also be issues for these farmers. Consider the following example.

Roger runs a large farm on a river in the Maffra area. The farm mostly consists of heavy topsoils over clay sub-soils. The farm is flood irrigated

except for some broken land near the river. Roger was one of the first farmers in the district to use laser grading. He started developing the farm years ago and has now graded the entire property except for the broken section along the river. Roger says the original farm layout was awful and he spent too long irrigating so he started the lasering program to reduce the time he had to spend watering. Through lasering he was also able to bring land that had been uncommandable into production.

Roger is thinking about eventually installing lateral move sprays on the broken country near the river. He has a reuse dam and would pump from the river and use the dam to store water for the sprays once they are installed. He is concerned that the laterals would take too much time and effort to be worthwhile.

Roger believes the Whole Farm Planning process was a great way to plan out his development program. When he started lasering he had not heard of Whole Farm Plans. Fortunately he came across the idea before he had developed too much of the property and made too many mistakes.

The following farmer also faces some difficult choices.

Peter owns a 65-hectare dairy property on heavy soils near Heyfield. Although the country is undulating he has laser graded almost half the property to improve the layout and to reduce the amount of time spent irrigating. He has considered spray irrigation on the rest of the property but thought that centre pivots or fixed sprays would be far too expensive compared to lasering the land. Especially as he wishes to retain the trees on the property to shelter the stock. Peter would also have to convert his reuse dam into a water storage to provide water on demand if he went for a spray system.

Peter engaged a consultant to develop a Whole Farm Plan but is not sure he really got value for money.

Whole Farm Planning and the graded layout segment

The promotional focus for farmers in the graded layout segment might be on comparing flood and spray irrigation systems to save time and water and to boost pasture productivity. Reuse systems and farm storages may also be a consideration for these farmers. For example:

James and Jean run a 120 hectare dairy property outside Sale. One third of the property consists of heavier chocolate soils that are flood irrigated. The permeability of these soils is low and the layout is good. Consequently, Jean and James have not lasered this part of the farm. Another third of the farm consists of loamy soils that are flood irrigated and some of this has been laser graded. The main reason for lasering this part of the property was to improve the layout to reduce the amount of time they had to spend irrigating. Jean and James are planning to completely laser this area of the farm.

The last third of the farm consists of a relatively permeable, red loamy sand that they are planning to convert from flood irrigation to lateral move spray irrigation. This land is not suitable for lasering. It lies above the district channel so they already pump water to it. While the spray irrigation will involve a little more time they expect it will save them water.

Jean and James have calculated that the conversion to lateral moves will cost about \$30,000. They believe that converting to fixed sprays would cost about three times more! They had a consultant develop a Whole Farm Plan to develop a better layout for the area that is to be lasered and to qualify for the incentives on offer for spray irrigation. With the incentives on offer for spray irrigation they will probably save about \$4,000. To qualify for the incentive James and Jean have to commission a Whole Farm Plan for the entire property. This will cost about \$3,000 after allowing for the Whole Farm Plan rebate. This is about the same as what it would have cost to get a Whole Farm Plan done just for the area that they are planning to laser grade.

The following farmer has similar planning needs.

Tony runs a small dairy farm near Stratford. The farm consists of a mix of well draining silt soils and heavy cracking clay soils on some sloping country. Tony has been having problems with a high water table that is saline and has put in spear points to lower the table. He is also concerned about water and fertiliser run-off from the sloping country. The farm is flood irrigated but has not been lasered.

Tony plans to laser to the farm, mainly to improve his control over water movement around the farm and to save time. He expects he will save some water by lasering. Tony can't put in a reuse dam because of problems with saline seepage from the water table. Instead he hopes to install lateral move spray irrigation on the sloping country at the back of the property and to pump the run-off from his lasered country to his sprays. This should solve the problem of losing water and fertiliser through run-off from the sloping country.

Tony had a Whole Farm Plan prepared some time ago. He is waiting for the opportunity to lease some land nearby so that he can implement his plans without severely disrupting production.

Whole Farm Planning and the mixed irrigation segment

The promotional focus for farmers in the mixed irrigation segment might be integrating spray and flood irrigation to minimise labour and water use. Groundwater management and farm storages may also be issues for these farmers.

Bill and his son have two adjoining properties on the river near Tinamba. On one farm they have installed a centre pivot on 44 hectares of undulating land. Bill is close to retiring and they installed the pivot to reduce the amount of time and labour needed to irrigate the farms. Bill and his son did consider laterals but the labour saving far outweighed the extra cost for the centre pivot (\$2,800 per hectare for the pivot compared to about \$1,700 per hectare for the laterals).

The other farm consists of 50 hectares of lateral move irrigation and 20 hectares is a mix of graded and ungraded country that is flood irrigated. They follow an 8-hour shift at night with the laterals to save on power costs. Bill says they use twice as much water per hectare on the wild country compared to the sprays. He has also noticed that pasture composition and growth is much better under the spray irrigation. They rely on a river licence to supply water as needed to the sprays and use channel water for flood irrigation. Part of the area that is flood irrigated does drain to a reuse dam. The rest drains to a Southern Rural Water drain.

Bill and his son would like to put the remaining flood irrigation under sprays. This would cost them around \$30,000. They also have to construct a water storage so that they can water at night and on demand. They are not sure whether it would be worthwhile to go for the incentives on offer as they estimate it would cost them about \$20,000 to get a Whole Farm Plan drawn up that would cover both properties. The incentives become even less attractive if they have to engage a second consultant to help them design a proper spray system. They are not sure whether the storage dam would qualify for the reuse incentive.

Bill is particularly frustrated that he is unable to use the Southern Rural water drain as a reuse system. He can put in a dam near the drain but then he would have the extra cost of having to pump from the drain to the dam. He has heard that the research farm has put in a headwall across their drain and wonders if he can do the same.

Whole Farm Planning and the spray irrigation segment

Finally, the promotional focus for farmers in the spray irrigation segment might involve comparing alternative spray systems, groundwater management and investment in farm storages. However, the potential interest among farmers in this segment could be limited.

Vic owns a 45-hectare dairy property near Newry. The country is too undulating and the soils are too light for flood irrigation so the property has been irrigated for many years with lateral move sprays. Vic has access to water on demand because he pumps from the river. Vic has not bothered with a reuse dam – there isn't any run-off and the country is too broken to make a dam worthwhile. Vic is happy with his operation as it stands.

The key point is that Whole Farm Planning offers different benefits to farmers depending on their circumstances and should be promoted accordingly.

Courses on irrigation and fertiliser management appear to have the potential, in principle, to contribute to irrigation and nutrient management in all segments. These courses could facilitate better management of irrigation and nutrients through the provision of more reliable and accurate information and by assisting farmers to improve their management skills. However, most farmers believed they had a high degree of competency in managing irrigation on their farms. Most farmers also believed, on the basis of past experience, that they could become proficient in managing a new irrigation system within a season (two seasons at most). Consequently farmers were unlikely to believe that they had much to gain from courses on irrigation.

The farmers we interviewed did, however, exhibit a greater interest in obtaining more information on fertiliser management. This suggests that there are opportunities to provide information on fertiliser management through extension activities. It may be possible to provide information on irrigation management as part of these activities. In addition, we believe that irrigation and fertiliser courses could be promoted directly to farmers who are experiencing problems with pasture productivity or excessive water use. These courses could also be promoted to farmers who are planning to expand farm

production by increasing pasture productivity and stocking rates. Encouraging farmers who are investing in Whole Farm Planning to participate in these courses could support these promotional efforts.

The farmers we interviewed were not confident that benchmarking activities were worthwhile because of the difficulty of drawing valid comparisons between farms.

Key Findings

The most important findings and conclusions to emerge from the three stages of this study are:

- Widespread adoption of spray irrigation on a large scale by many dairy farmers in the Macalister Irrigation District is unlikely. For the majority of farmers, laser grading has been, and will continue to be, the most effective means of reducing water and labour use per hectare.
- Farmers' motivation to adopt irrigation technologies such as laser grading, reuse systems and spray irrigation depends largely on the particular biophysical and structural characteristics of their farms. This means that the offering of incentives to adopt technologies such as spray irrigation will not increase the adoption of such technologies in the long term. Such incentives encourage farmers to bring forward plans to adopt technologies rather than provoke them into making changes they would have never considered otherwise.
- The extent to which incentive programs accelerate adoption depends largely on the size of the incentive relative to the cost of the technology and the eligibility conditions of the program. In this instance the incentives are small relative to the investment costs (15 per cent or less for spray irrigation) and the technologies are expensive in absolute terms (possibly \$2000 per hectare or more for spray irrigation systems). This suggests the incentives are unlikely to greatly accelerate adoption. The rate of uptake of the technologies and the incentives will depend largely on the profitability of milk product. Hence, we expect that the popularity of the incentive program among farmers in the District will depend largely on milk prices.
- Dairy farmers in the Macalister Irrigation District believed that the main purpose of Whole Farm Planning is to plan earthworks for flood irrigation. Farmers have relied

on commercial suppliers of spray irrigation equipment to design and install spray irrigation systems. At the time of this study none of the suppliers of spray irrigation equipment in the District were recognised by the Department as Whole Farm Planning consultants. Consequently, many of the farmers in the District that are planning to install spray irrigation believe that Whole Farm Planning is an unnecessary expense and that Whole Farm Planning consultants lack expertise with spray systems. These beliefs are unfortunate given the potentially pivotal role that Whole Farm Planning could play in facilitating practice change in the District.

- Lack of access to water on demand (groundwater, pressurised pipe or on-farm storage) may be a factor preventing the adoption of spray irrigation for some farmers. In some instances adoption of spray irrigation may be prevented by poor reliability of water delivery and variability in channel flow. Poor reliability in terms of water delivery and variability in channel flow may also be a factor limiting the effectiveness of flood irrigation on some farms.
- Given the long-term decline in water allocations in the district, and the continuing investment in laser grading, we believe recycling systems will eventually be installed on most farms throughout the District. However, many farmers with more permeable soils are more likely to need to store irrigation water for spray irrigation and less likely to need to conserve run-off in recycling systems.
- Farmers believed they had a high degree of competency in managing irrigation on their farms. They also believed they could become proficient in managing a new irrigation system within a season - two at most. Consequently few farmers expressed any interest in attending courses on irrigation. Some farmers we interviewed did exhibit interest in courses on fertiliser management. Virtually all farmers were aware that fertiliser should not be 'watered in'. We believe most farmers, and their fertiliser advisers, would be interested in receiving detailed information about advances in fertiliser management.

Recommendations

On the basis of the key findings of the study we recommend:

- The Department consider changing farmers' perceptions of Whole Farm Planning. Changing farmers' perceptions will require identifying, and then promoting to farmers, the benefits of using Whole Farm Planning as an aid to making decisions about investing in spray irrigation.
- The Department consider ways of facilitating collaboration between accredited Whole Farm Planners and spray designers to ensure that suppliers of Whole Farm Planning services are able to provide appropriate expertise. Alternatively, the Department consider negotiating with designers and installers of spray irrigation systems to formulate criteria that would allow spray irrigation plans to meet the Departments conditions for support under the incentive programs.

We believe that efforts to incorporate spray irrigation systems into Whole Farm Planning in the dairy industry could have benefits for Whole Farm Planning in other industries. Such efforts could provide a model for Whole Farm Planning in other agricultural industries where spray irrigation is widely used, such as horticulture.

- The Department consider ways of promoting courses on irrigation and fertiliser management to farmers who are experiencing problems with pasture productivity or excessive water use and to farmers who are planning to expand farm production by increasing pasture productivity and stocking rates. Encouraging farmers who are investing in Whole Farm Planning to participate in these courses could support these promotional efforts.
- The Department encourage organisations responsible for the supply of irrigation water to consider improving irrigation infrastructure in the district and to consider

reviewing groundwater policies as lack of access to water on demand may be a factor in the adoption of spray irrigation for some farmers.

- The Department consider extending the incentive offered for the installation of reuse systems to include systems that are designed to store water on farms, as this would facilitate the installation of spray irrigation.

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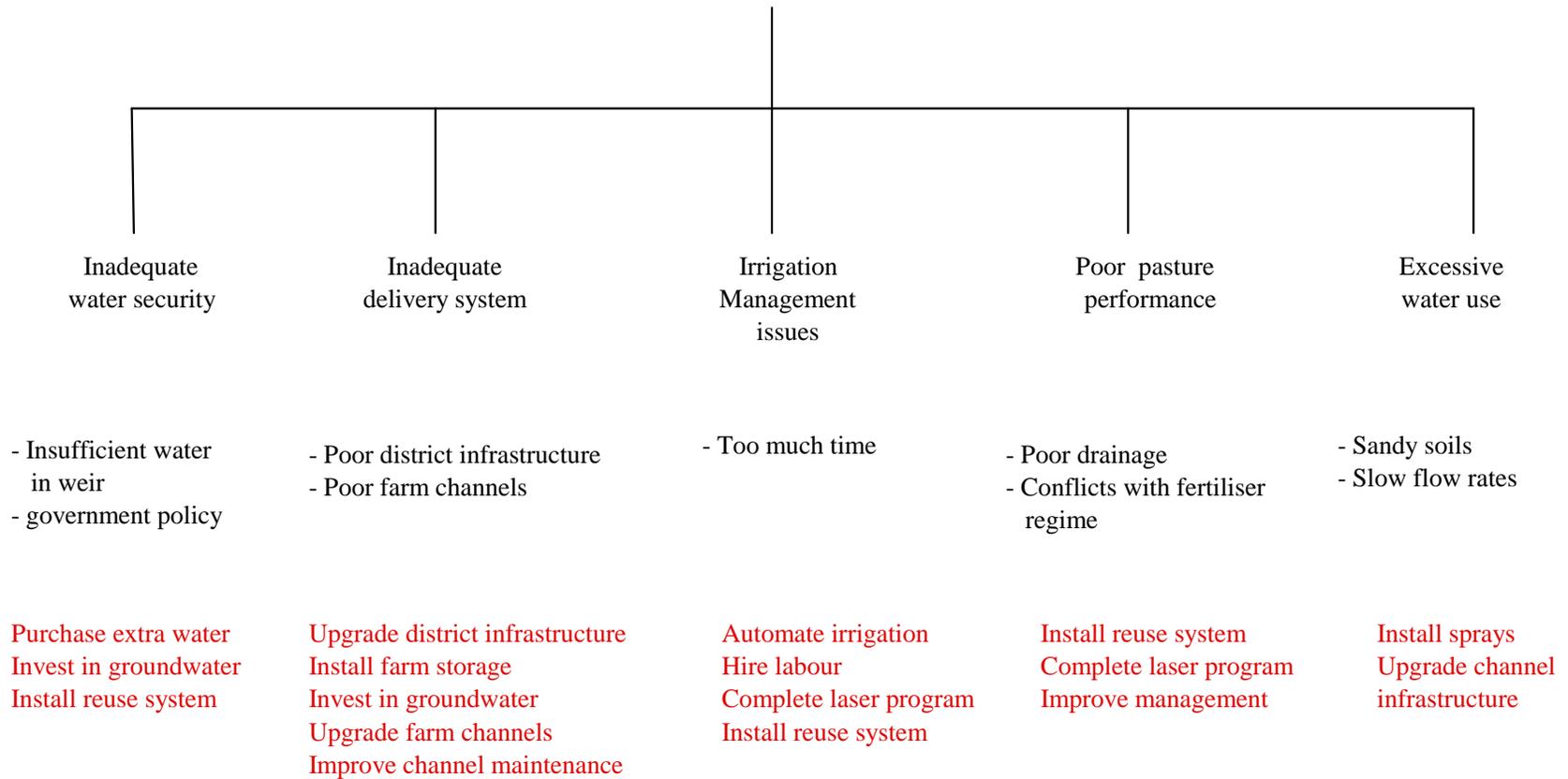
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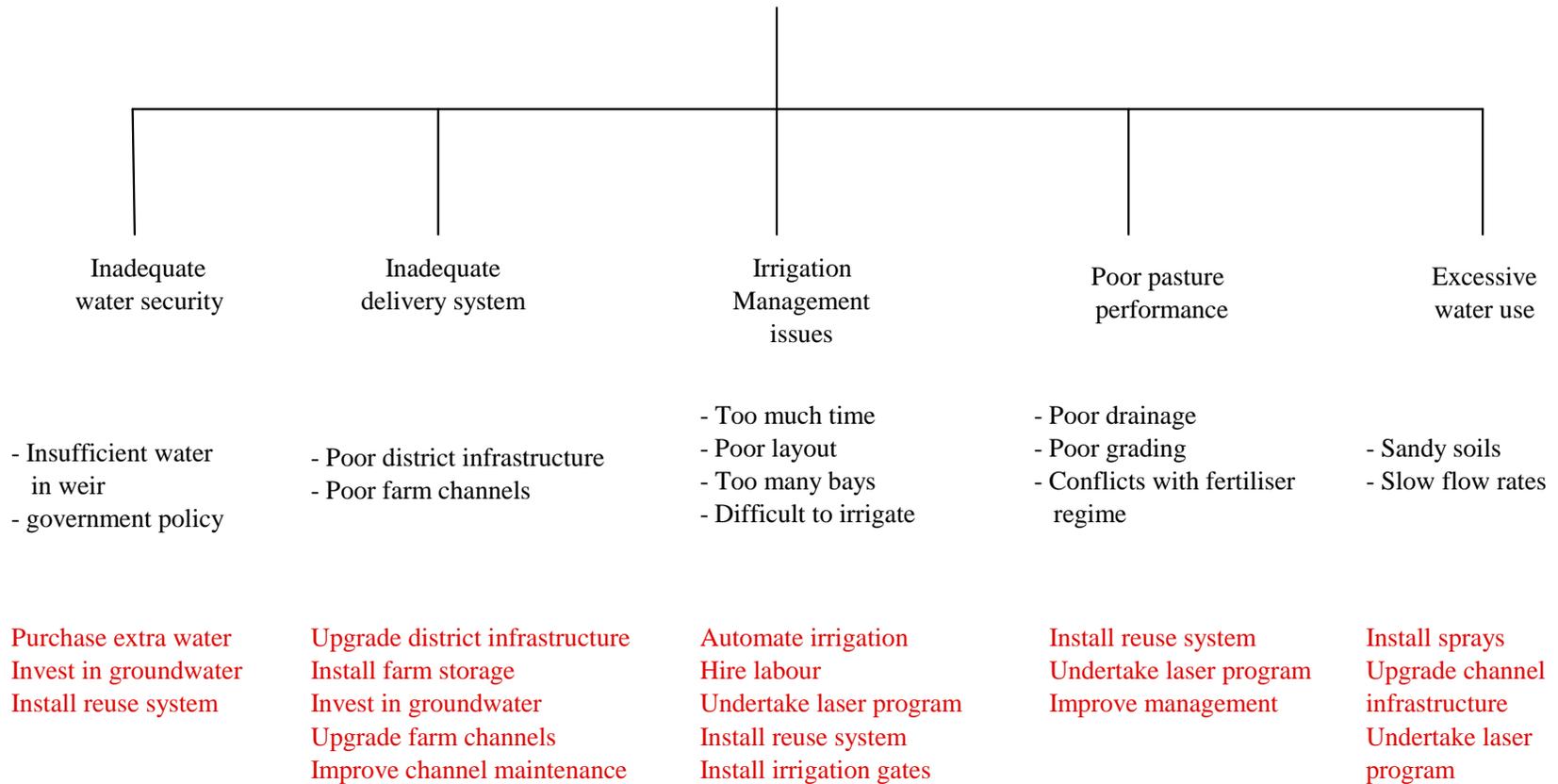
Appendix A

Problem Trees

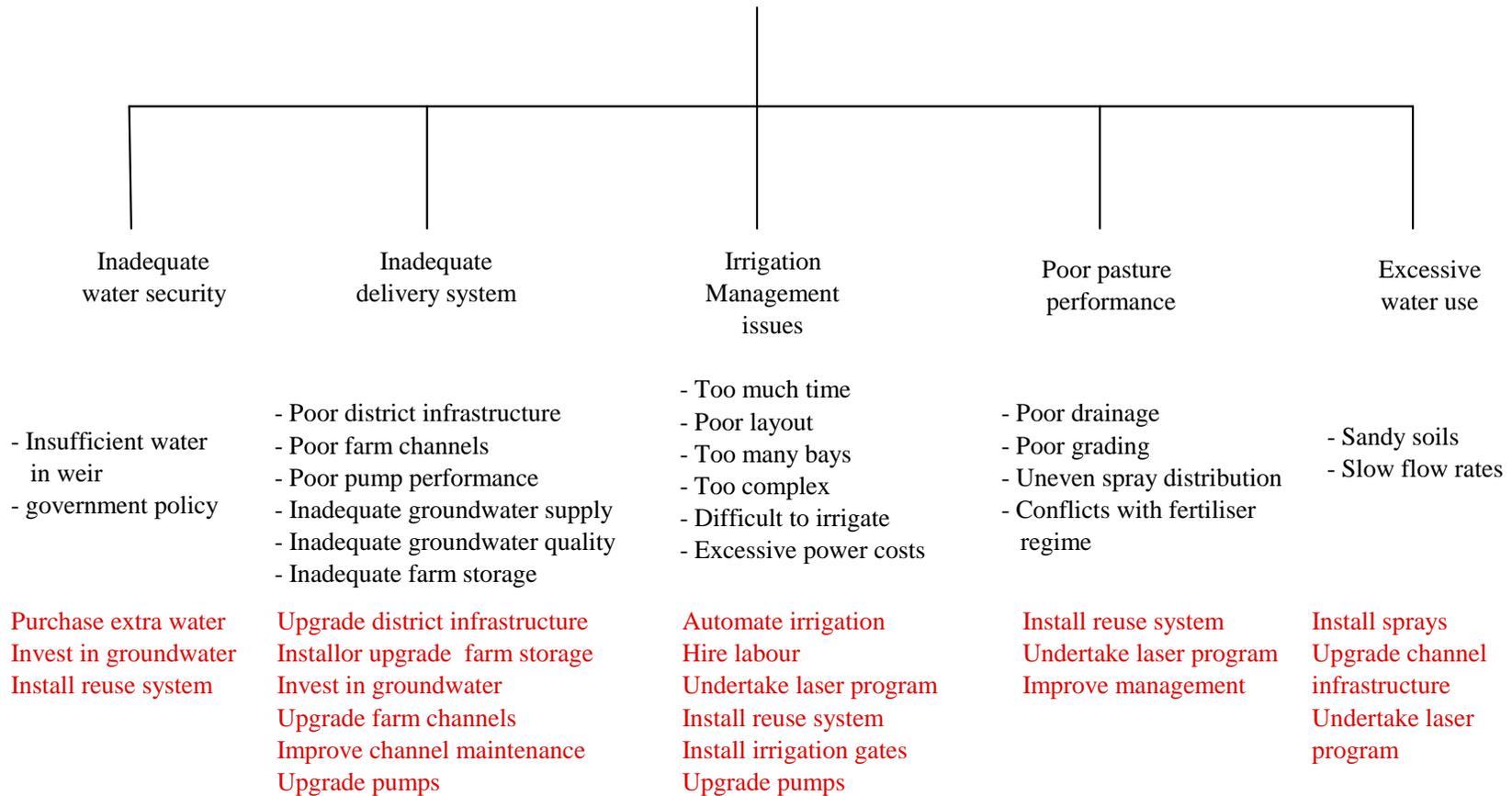
Sources of dissatisfaction with irrigation
lasered layout segment



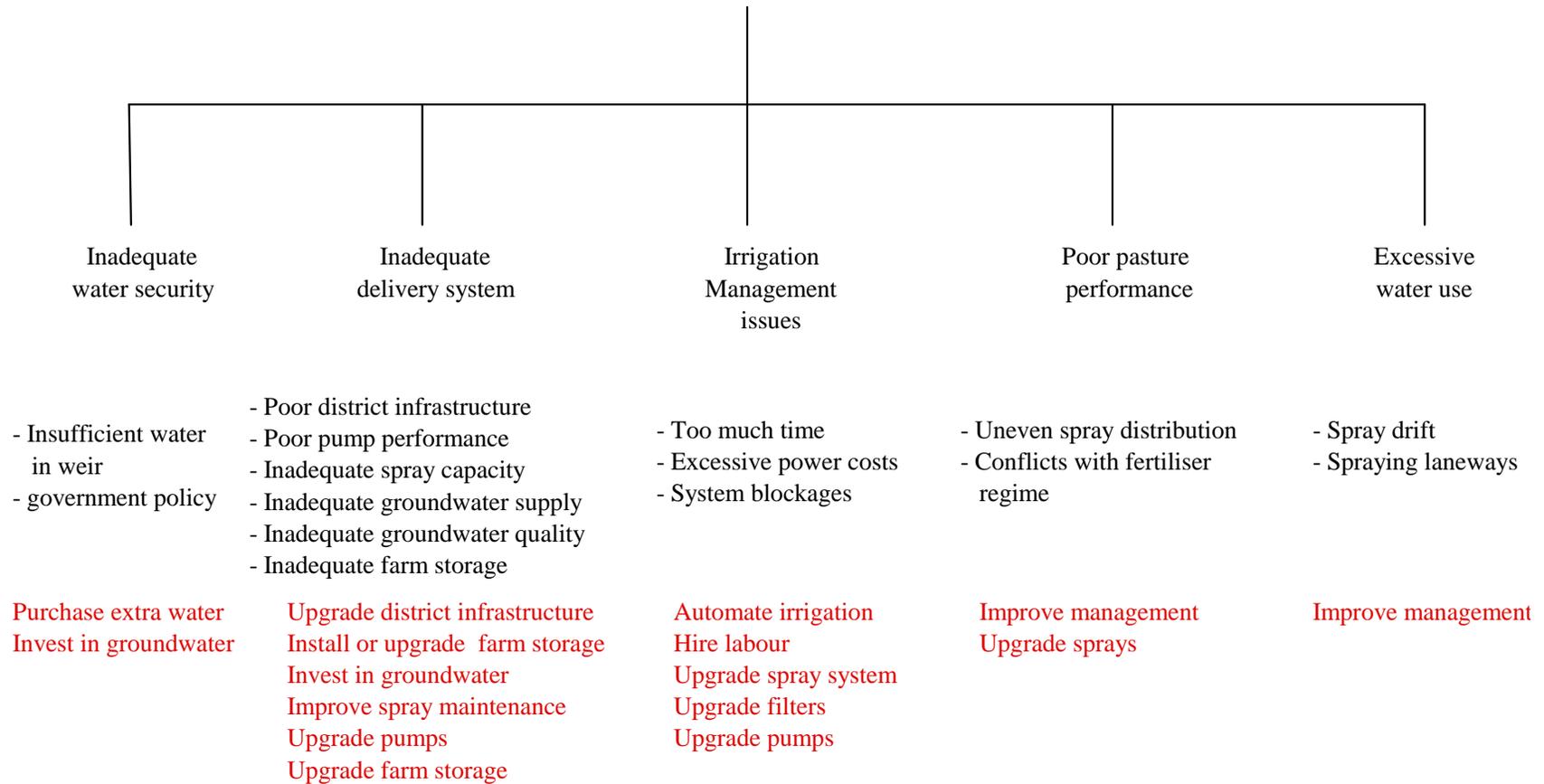
Sources of dissatisfaction with irrigation
Graded layout segment



Sources of dissatisfaction with irrigation
Mixed layout segment



Sources of dissatisfaction with irrigation
Spray segment



Appendix B

Solution Tree

Improving satisfaction with irrigation

