THE SOCIAL CONTEXT OF LAND MANAGEMENT PRACTICE AND DECISION MAKING IN THE MOORABOOL BASIN:
A case study of potato farming and water management

September 2006

Associate Professor Ruth Beilin, Lucinda Pike, Bethan Carr and Dr Carolyn Kabore

CORANGAMITE CMA
HEALTHY CATCHMENTS - HEALTHY WATERWAYS

Australian Government

Victoria
The Place To Be

THE UNIVERSITY OF MELBOURNE

The Social Context of Land Management Practices and Decision Making in the Moorabool Basin: A Case Study on Potato Farming and Water Management

Dr. R. Beilin, L. Pike, Dr. C.Kabore & B.Carr & Dr. C.Kabore
School of Resource Management
Faculty of Land and Food Resources,
The University of Melbourne
VIC, 3010
The University of Melbourne acknowledges that this project was funded by the Corangamite CMA as part of the National Action Plan for Salinity Program.

Front Cover Photos: 'Spray Irrigation of Potato Crops, Bungaree', Kevan Richards
'The Moorabool River at Morrison's', River Health Strategy Summary Report, Corangamite Catchment Management Authority
'Potato Seed Crop', Department of Primary Industries, Research and Development
'Potato Farming Groupshot Grader' , Hawksebury City Council

This report contains the opinions and interpretations based on the information provided by the client and other sources. This report is subject to the following disclaimer:

The University of Melbourne provides this report in good faith. The University of Melbourne, and its employees and contractors, takes no responsibility in any way whatsoever to any person or organisation (other than that for which this report has been prepared) for the information set out in this report, including any errors or omissions therein. The views expressed are those of the author and do not necessarily represent the official position or policy of The University of Melbourne.

Acknowledgements

This study has been funded by the Corangamite Catchment Management Authority as part of the National Action Plan for Salinity, in order to gain an understanding of the social context of land management and decision making in the region. In particular we are grateful to Peter Codd and Felicia Choo of the CCMA for their unstinting commitment to the research process and their engagement with the ideas generated by the analysis.

The researchers would like to thank the Department of Primary Industries, Central Highlands Water and Southern Rural Water who have all contributed to the findings in this research, as well as Laurie Norman of FARM Consulting for his input into the project.

The researchers would also like to thank the many people contacted during this study for willingly providing information and advice and taking the time for interviews and focus group attendance.

The University of Melbourne support included the assistance of Ms. Susan Vinden and Ms. Carol Stewart, for which we are also grateful.

Table of Contents

EXECUTIVE SUMMARY

Introduction

This report presents the findings of a social science study with potato farmers and CMA and other agency personnel in the Corangamite Catchment in 2005/2006. The study explored the social context of land and water management practice and decision making in the Moorabool Basin. A key aspect of the research was describing the social environmental and economic considerations involved in decision making around local practice, and developing a triple bottom line framework that reflects these considerations. This research uses landscape and ideas from complex theory as the underlying context to explore these issues. The use of complex theory informs the way in which the triple bottom line matrix evolved in this research and has implications for the way in which the data is presented and intended for use.

This project was conducted in collaboration with the Corangamite Catchment Management Authority. The following issues are some of the key findings of this research, prioritised as they appeared in interviews:

Catchment Management

Overall there was very little engagement of the local community by the CMA. Most farmers were unaware of their role, and had had extremely limited contact with the CMA. The CCMA was frequently interpreted as a regulatory body, and was easily confused with other water authorities operating within the catchment, eg. Southern Rural Water and Central Highlands water. For farmers who had participated in the CCMA's Moorabool River Project, their understanding of the CCMA's role was greater, and their attitude towards the CCMA was generally positive. Most farmers commented on the CCMA's willow removal program, (part of the Moorabool River project), and saw this as a positive for the region. The CCMA has an opportunity to be more inclusive at a local level, to mutually derive recommendations for integrating landscape management and supporting higher levels of local awareness about the value of the CCMA 'umbrella'.

Environmental Flows and the Moorabool River

The key concern was where water for environmental flows was going to come from, and how local practices would be affected. Environmental flows were a contested issue, as reflected in the wider population of the State. Some farmers wanted to see increased flow to the Moorabool, whereas others felt that environmental flows had to come second to production requirements. There was some scepticism from land managers about environmental flows in this river system because of its significant on stream urban storages and large numbers of farm dams that create permanent modified flow conditions. Farmers argued that sustainable future water management entailed not over using the available water supply and staying within the limits of your access to water. This required or assumed that current access to water would be maintained. This issue is a key one for the credibility of the CCMA as an umbrella for water management in the region. There is a critical need to raise the level of integrated debate about the future of water in the Corangamite region.

Sustainable Futures

'*We decided to plant for 500 seasons'* –people are here for the long term.

A key finding is the pragmatic way in which intergenerational potato farmers accept the possibility of changing commodities in the foreseeable future. There is a commitment to the landscape and to the family in the landscape that is only partially connected to potato farming.

Communities

The dominant group for these farmers is the McCain Growers Group meetings. This is also a vital part of their business. The potato farmers have reportedly become increasingly united as a group in the face of increasing pressure regarding their contract negotiations

Traditional notions of local communities have been declining as the local towns grow and the number of farmers dwindles. There is limited participation in farming based community groups. Farmers also noted a lack of time to be involved with community groups, which led to a number ceasing to exist eg. Tennis Clubs. They recognise that with the decline in community activism goes the likelihood of their voices being heard on matters affecting regional decision making.

Water Security in a Water Supply Catchment

The security of water availability was a source of concern to many farmers. Water security was perceived as being threatened by a number of different sources. Perceived competition with urban water supply demands was the most significant concern regarding water security. Farmers understood that they were the focus of the CCMA's attention in part because of their location relative to the rest of the catchment. The pending Moorabool River Stream Flow Management Plan and Bungaree Groundwater Supply Protection area were additional sources of uncertainty with regard to future water security and there were expectations of changed management conditions as a result of these strategies coming into effect. As with the the environmental flow issue, the opportunity to be actively involved in contributing to the strategic and management decisions within the area would diminish the doubt and distrust surrounding the issue.

Land Management Practices: Diversified Farming Systems

Potatoes are a rotational crop, and farmers grow a diversity of other crops during these rotation periods. These included lamb fattening, cattle, horse rearing as well as pasture and forage crops. Increasing diversification was linked with increased long term viability in the landscape.

Farmer Water Management Practices

The most common means of irrigation were the travelling gun irrigator. Many farmers had tried alternatives, but the travelling gun was understood as being the most suitable. Technology and innovation were argued as the way forward by agency staff and there was some puzzlement that recommendations for technical change appeared to be resisted by farmers. The study found that high costs for implementation coupled with uncertainty associated with McCain's long term plans contributed to farmer reluctance to adopt the technology. There were other concerns as well, including the inappropriateness of the technology to rotational cropping. This highlights how the labelling of these farmers as single commodity, potato farmers, neglects the other facets of their engagement with the landscape.

Water was sourced from either groundwater or dams, or a combination of both.
A number of farmers did not use all their groundwater allocations, and viewed them as back up to their water supply. This is in direct contrast to agency understandings of groundwater licenses being completely utilised. Several farmers noted drops in their groundwater levels in recent years, and a reduced reliability in the flow. The amount of water accessible determined the area of potatoes planted. Some farmers had sufficient water to continue their current practices, whereas others were under pressure due to the reduced annual rainfall since 1996. There has been a marked increase in pumping costs due to the increase in fuel prices. Over the last year, fuel prices have increased dramatically, leading to a massive rise in the input costs for a crop. This rise has not been incorporated into contract prices.

Commodities in the Landscape

Over 90% of potato growers in this region grow their crops under contract to McCain, who operate a potato processing plant in Ballarat. Most growers are contracted to grow potatoes for processing, while a smaller number are contracted to grow seed potatoes. McCain's demands a high water, high input potato variety. It negotiates contract prices with a 'representative group' of growers and there is a continuous sense of uncertainty and dependency in the dealings with this company.

Extension and Information Sources

For many growers, McCain's expensive agronomy service is the principal source of extension. Department of Primary Industries extension has downsized its services and many farmers lamented the difficulties in accessing DPI services. Consultants provided advice to a small number of growers. McCain does not include environmental messages in its extension program, as their focus is purely production efficiency. There is no input into this program from any government agency. However, DPI staff has indicated that they intend to provide information to McCain with regard to pest management.

Lack of Agency Integration

There is a perceived lack of integration between agencies, which occurs at a number of levels. For farmers, there is a lack of certainty about the roles of different organisations. The CCMA was frequently confused with the CHW, as well as some crossovers with SRW. There is no sense of a holistic extension delivery, or whole farm management advice. What appears on-ground is that separate parts are managed by separate agencies with little if any cooperation or collaboration.

Local Knowledge

Local knowledge is highly valued in this area and is relied upon as a source of information. As an example, knowledge of groundwater resources was often through local mine maps drawn up during the 1850s. These were reportedly 'as accurate' as current groundwater sensing equipment. The recognition of local knowledge as a part of everyday practice gives an opportunity for equity between the CMA and its communities. This will assist in building trust and more viable partnerships in relation to water and land management.

Landscape History and Landscape Change

There is an ongoing decline in the number of potato farmers. This was closely linked with the reduced profitability of growing potatoes, and the associated increasing acreage required in order to be profitable. Almost every farmer interviewed was at least a 3rd generation farmer in the area. For many, their families had arrived during the gold rush of the 1850's.

Urbanisation and Land Use Change

Farmers were concerned about urbanisation in relation to water security for farmers and because of the impact of lifestyle farms on land management. The increasing occurrence of lifestyle farms has resulted in both an increase in land value and a significant shift in local demographics. There is now a growing percentage of the local population who commute, and anecdotally, are reportedly absent from the local community. Their understanding of water issues in the landscape is not known. All of these factors have implications for the social, environmental and economic well being of these landscapes.

Labour Intensity of Crop Management

Current crop production practice is incredibly labour intensive, and due to declining profit margins, farmers employ little additional staff. Farmers do not have time for activities that are not directly associated with crop production. Also, the labour intensity has a severe effect on families, as well as creating individual stress.

Succession

Farmers are facing a succession crisis as their children are not prepared to continue farming potatoes. This succession crisis is consistent with the wider population of farming families in other commodity groups.

Farming potatoes is not desirable for the younger generation as it frequently may entail inheriting significant debt, and working extremely long hours. Further, the current contract arrangements are insecure, and profitability of potato farming is declining. There are also attractive employment opportunities in nearby towns with reasonable levels of income. The reduced succession in farming is also linked to the increased sale of properties, and the subsequent conversion of productive agricultural land. This encourages the families to think about alternative production regimes.

Riparian Management

Farmers whose properties were adjacent to the Moorabool River and it's tributaries managed it in a diverse number of ways, from fencing out and revegetating to enclosing it in a pipe. Agency recommendations for riparian management were often at odds with farmers practice. Pest plant and animals are also of significant concern to farmers considering fencing out and recommendations to address these issues need to be contextualised to mixed farming regimes. In general all land managers provided grass buffer strips to the river. Throughout the interview area, all the land managers commented on the poor condition of the Moorabool River.

This environmental concern for the quality and quantity of the water in the river appears as a potential catalyst (or trigger) for change in the matrix. The river is visible and has a long

association with these land managers. The social and economic issues that prevent a different approach to the river are associated with mixed farming regimes. Recommendations for these land managers that integrate this local context with their environmental interest in the river will be more easily transformed into practice change.

Native Vegetation Management

Native vegetation plantings were considered valuable on many properties with significant stock operations. Here, native vegetation provided benefits such as being a shelter belts or a wind breaks. Small landholdings and intensive production practice were identified as key reasons for limited native vegetation plantings: every acre planted was an acre out of crop production. Environmental benefits associated with native vegetation were not the focus of those involved in land management in this region. Agencies have attempted to describe the production oriented benefits of native vegetation as the catalyst for changing local practice. In reality, the small holdings and constant rotation of production crops makes it impracticable to look within holdings for native vegetation. However, the idea of landscape connectivity here is important. Agency focus on 'one landscape' may provide more impetus for and support in managing local reserves, roadsides and incentives that focus on connecting social activities like football and school bus routes as remnant corridors has worked in other parts of Victoria. For example, most farmers were aware of the Gorge revegetation project and commented favourably on it.

Acronyms

CCMA	Corangamite Catchment Management Authority
CFTT	Centre for Forest Tree Technology
CHFS	Central Highlands Farming Systems
CHW	Central Highlands Water
CMA	Catchment Management Authority
CRCS	Corangamite Regional Catchment Strategy
DPI	Department of Primary Industries
DSE	Department of Sustainability and the Environment
GSPA	Groundwater Supply Protection Area
NRM	Natural Resource Management
SFMP	Stream Flow Management Plan
SKM	Sinclair Knight Mertz
SRW	Southern Rural Water

List of Figures

1. Introduction

Research Context

This report presents the findings of a qualitative research project with potato farmers in the Corangamite Catchment in 2006. The focus of this project is the social context of land management practice and decision making in the Moorabool Basin.

The project was funded by the Corangamite Catchment Management Authority (CCMA—Corangamite Catchment Management Authority), and was based on interviews conducted with potato farmers who live in the fertile volcanic red soil areas in the headwaters of the Moorabool catchment. It includes interviews with various agency staff operating in the area. Interviews were analysed using a thematic approach which allows both these and new themes to emerge from the discussion and be further explored. A focus group with agency staff occurred after the initial analysis and subsequent to presenting the key links to senior members of the CCMA. The focus group provided feedback on the themes that had emerged in the course of the research study. The overarching intention of the research is to assist the CCMA in exploring the local practices and understandings of landholders about the role of the CCMA; to understand land managers' natural resource management in general; and to investigate their water management as part of a wider landscape context.

This research uses landscape and ideas from complex theory as the underlying context to explore these issues. Landscape provides a framework for understanding not just the physical aspects of environment, but also how it is understood as a whole: the history, the patterns of land use, and the values and beliefs of those constructing the landscape. In this way we use the metaphor of landscape to connect the ecosystem with the daily activities associated with land management. The Latin root for complexity means 'embraced' or 'entwined'. Complexity theory assists us to conceptualise that two or more parts as components in a system, are difficult to separate for the very reason that they are co-elements or aspects of the system. In fact, to separate the 'entwined' elements is only possible theoretically. Gershenson and Heylighen (2005) describe them in reality as distinct and connected. The important point here is that reducing the complex to its component parts does not allow us to understand its significance because the pursuit of one aspect of the complex has flow-on effects to its interconnections. Gershenson & Heylighen give examples of complex systems as a society, an economy, an ecosystem, the Internet, etc (ibid). Over many years, natural resource management has been underpinned by scientific method and technological innovation that have necessarily compartmentalized problems in order to be able to isolate and pursue solutions. Field experiments to test proposed changes are examples of how we have attempted to re-insert innovations back into the system. However, we can also recognize that the flow-on effects of these 're-insertions' were not always known, or able to be imagined. In acknowledging this for the biophysical system, we can also recognize that this 'entwining' will resonate with the social and economic systems.

In this research study we have approached the issue of land and water management with three systems in mind: the social, the economic and the environmental. We have sought a method of displaying their 'entwinement' in this report both visually and practically through the text. There is a considerable body of literature currently on the 'triple bottom line', and we have developed our matrix representations as a result of this and previous research that focused on

the indicators and signs that would assist communities and practitioners to explicitly monitor and evaluate social systems in the TBL(Beilin, Paine & Pryor, 2003). In this study with the potato farmers we note that the characteristics associated with a simultaneous correlation of the social, economic and environmental are made static in the effort to display them for discussion on the page. That is a limitation of text based discourse that we cannot overcome. However, with complex theory firmly in mind, we encourage the readers to recognize that at any point in the display, we are discussing a dynamic system that within itself is changing as a result of internal pressures; and externally is changed by the interconnection with its co-systems. It is only in this way that we can emphasise the importance of not reading down the matrix columns as a summation, and encourage instead the association of ideas within the matrix to embrace the complex system underlying the TBL grid.

In this study the social, economic and environmental systems are understood to contribute to a complex whole. The indicators or signifiers used to describe the themes that emerged from the data analysis are qualitative and context based. Examples from the thematic matrices are more fully described through links to the original text. These are easily located in the text as boxed narratives.

Finally, the matrix outcomes lead us to a series of recommendations for changing practice within the landscape and among the participants. These are framed in the context of adaptive management. Adaptive management emanates from within the socio-ecological systems literature (Walker et al,2004) and therefore, as an approach to change, it is synergistic with the objectives of the research.

Research Objectives

1. to examine participation of potato farmers and land managers in agency NRM programs associated with water management;

2. to investigate the priorities and concerns significant to landholders and compare these with assets and threats identified within the CCMA at a strategic level;

3. to develop a triple bottom line matrix for landscape management from the social, economic and environmental values identified by stakeholders (agency and land managers)

4. to make recommendations that contribute to future land management activities and the integration of community and CCMA strategic directions; and

5. to explore the social context of land and water management in order to understand the context in which farmers make decisions regarding land and water management..

2. Report Structure

The next chapter provides background information about the potato farming area in the northern section of the Corangamite Catchment (Map 14, F1, UBD Victoria Country Roads Atlas). It includes a summary of a literature review undertaken at the beginning of our engagement with the CCMA, at a time when we were not focused on the potato farmers in particular but were scoping the underlying social, environmental and economic indices across the CCMA. It forms the backdrop to the landscape in which the potato farmers produce their crops, and it is the operational focus of the CCMA. The methodology chapter describes the origins of the research and discusses the methods used.

The research interviews were organised around key themes that were explored throughout the research; and expanded to include those that emerged during the research process. The overall list of themes prioritised as they appeared in the interviews is:

- catchment management
- environmental flows and defining sustainable systems in relation to the Moorabool River
- sustainable futures
- communities
- water security in a water supply catchment
- land management practices: diversified farming systems
- farmer water management practices
- commodities in the landscape
- extension and information sources
- lack of agency integration
- local knowledge
- urbanisation and land use change
- labour intensity of crop management
- succession
- landscape history and landscape change
- riparian management
- native vegetation management

Chapter 5 presents the findings for all of the themes. For the priority themes as identified in the research discussions and interviews, a matrix of triple bottom line indicators has been developed. These matrices illustrate an integrated approach to understanding landholder decision making and land management practice. Appendix 4 is an integrated matrix, which incorporates the triple bottom line, and links these to current policies. The findings presented in Chapter 5 are the basis for the conclusions and recommendations that form chapters 6 and 7.

3. Background

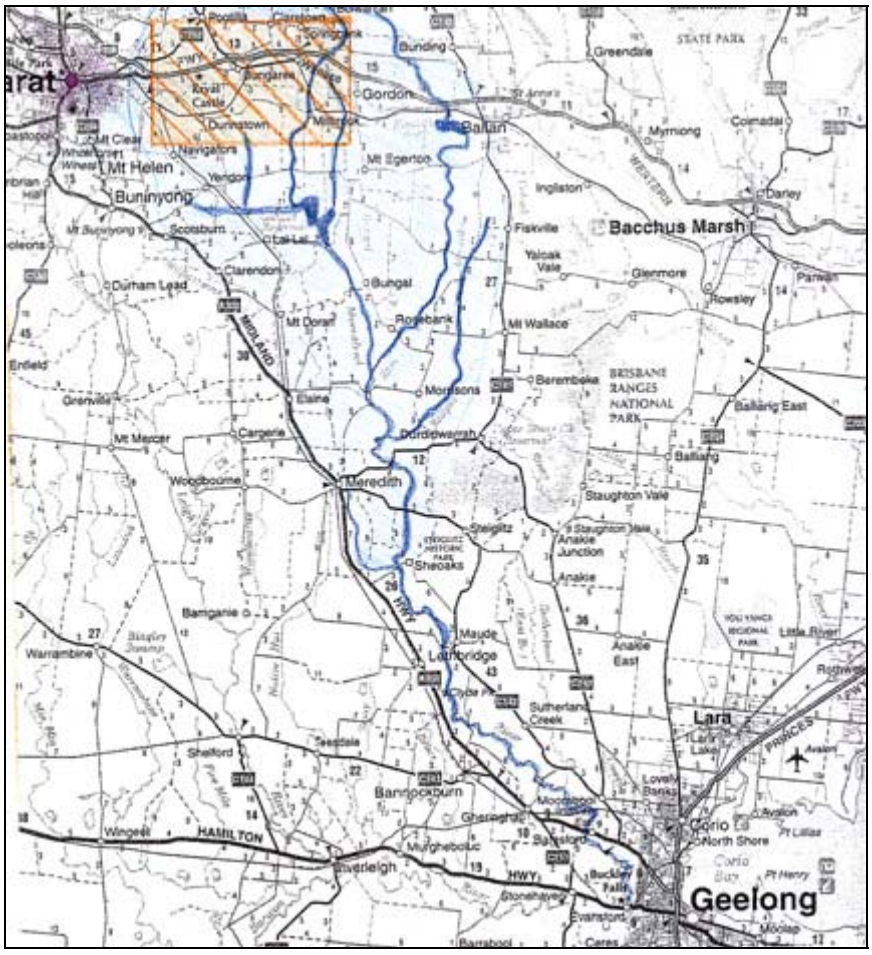
Location of Dunnstown Potato farming Region

Potato farming occurs across the Central Highlands of Victoria, and crosses over three different Catchment Management Authorities. These are the North Central CMA, the Glenelg Hopkins CMA and the Corangamite CMA. The focus of this study is the potato farming area that exists within the Corangamite Catchment's boundaries. This area is situated immediately east of Ballarat, and includes a number of small townships such as Gordon, Bungaree, Dunnstown, Clarkes Hill, Springbank and Wallace.

During 2001, potatoes were grown on 2922.7 hectares across the Central Highlands, (Nexus Consulting, 2004), of which almost 50 % occurred with the boundaries of the Corangamite Catchment. As illustrated in the map below, this potato farming study area is located in the upper branches of the Moorabool River Catchment, and above the Lal Lal Reservoir. This situates it directly in the Moorabool River declared water supply catchment. The orange rectangle indicates the parameters of the study area.

Figure 1: Map of Study Area

(Source: UBD Victoria Country Roads Atlas, Map 14)



Initial Research Considerations

Potato farming has been part of this region since farmers arrived during the gold rush and it is currently the dominant land use. Over time, this farming group has experienced many of the changes common to rural and regional Australia. The number of potato farmers is declining, the terms of trade are being set by global forces, the value of the land is increasing relative to the distance to local and provincial towns and water has been increasingly scarce due to the long dry period the central highlands has experienced.

Potatoes are a relatively high value crop which makes a significant contribution to agricultural production in the region. In 2001, 121,635 tonnes of potatoes were produced across the central highlands, and the value of this was $47, 426, 474 (Nexus Consulting, 2004). The value of potato crops during 2001 exceeded the value of any other form of agricultural production. (Nexus Consulting, 2004).

Many potato farms occur within the Lal Lal Reservoir Catchment, part of the Moorabool River's designated water supply catchment. The Lal Lal Reservoir provides a significant proportion of the urban water supply for both Ballarat and Geelong. The Moorabool Basin is one of the most stressed river systems in Victoria. The primary demand upon the river is the provision of urban water supply for two of Victoria's largest regional cities, Geelong and Ballarat. Further, there are a large number of farm dams located within the catchment. Almost all branches of the Moorabool River are listed as being in poor condition (CRCS, 2003) and frequently the lower reaches have no flow in summer.

Regional population is projected to increase in both Ballarat and Geelong which will continue to place pressure on the already stressed river catchment, and also affect regional land use. This situation is exacerbated by the recent dry period that has is ongoing for the last 10 years. An Environmental Reserve has been allocated for the river, which will increase the competition between other users in the catchment when it is provided. Currently, a Stream Flow Management Plan (SFMP—Stream Flow Management Plan) and a Groundwater Supply Protection Area (GSPA—Groundwater Supply Protection Area) program are underway to improve the condition of the Moorabool River.

In the 2005 CFTT (CFTT—Centre for Forest Tree Technology) study titled 'Minimising Erosion Resulting from Irrigation of Potato Crops in the Ballarat District' it was noted that levels of sediment and nutrients in runoff from stationary irrigators is extremely high. Slope and degree of soil cover were also found to have a noticeable effect. The highest rates of erosion occur under bare and steep conditions (CFTT, 2005). In a study in a potato growing region in NSW, growing potatoes on these red soils was noted to likely cause severe soil erosion, due to the intensive soil bed preparation, and soil disturbance during harvest. (Cole & Clarke, 1993).

Fletcher (1998) describes the increasing rates of nitrogen and phosphorus in the groundwater and waterways of the Lal Lal Reservoir catchment, and directly connects this with the application of fertilisers in the potato growing area. He also notes the high level of sedimentation in the Reservoir and attributes this to land use (including potato cropping) upstream of the Reservoir. Fletcher (1998) describes Lal Lal Reservoir as operating as a sediment trap, and this results in a gradual reduction in the catchment's volume. Also, nutrient input is sediment bound which results in eutrophication of the Reservoir (Fletcher, 1998). The rate of sedimentation that is occurring in the Lal Lal Reservoir has led to the CCMA targeting it

as a high priority focus for change in the Corangamite Nutrient Management Plan. (CCMA, 2000). Controls that Fletcher identifies include contour ploughing, crop rotation and tree integration as possible controls. (Fletcher, 1998: 252)

Potatoes are produced in rotation, generally, one year out of every four years. This means that at any one time, potato crops exist on a maximum of 25% of a property. Other crops and production occur during these non-potato years in rotation: potatoes are part of rotated production systems. These rotation systems vary from farmer to farmer, but frequently include livestock enterprises, such as lamb fattening operations or beef cattle. In this sense, potato growers are effectively mixed farming system farmers (Phillips Agribusiness, 2001). The adoption of winter wheat has been successful, but the adoption of other mixed cropping rotation systems has been variable in its success. Chris Bluett (pers comm., 2005) noted that one of the main reasons for this is that growers are reluctant to irrigate these alternative crops even once or twice at establishment as they perceive this may jeopardise their ability to adequately water the upcoming potato crop.

In Prince Edward Island, a major potato growing region in Canada, legislation has recently been introduced titled the 'Crop Rotation Act '(efarm.ca) which delivers mandatory rotation standards for potato crops. It was introduced to have both economic and environmental benefits: one of the key contributing factors to the Act being passed was a series of significant numbers of fish deaths associated with nitrification and sedimentation of waterways. Several Canadian sources note that the crop rotations enable soil quality, quantity and productivity to be maintained through reduced soil erosion and increased organic matter in the soil, as well as reducing diseases. The benefits of improved soil quality and productivity result in increases in crop yields and quality (McKinnon, 2003; Eastern Canada Soil and Water Conservation Centre, 2005). In terms of environmental sustainability, longer crop rotations reduce soil erosion and associated sedimentation. They also reduce the build up of nitrates that leach into the groundwater or enter waterways as runoff (MacKinnon, 2003).

During the last 30 years, Victorian potato farmers have increasingly signed contracts for their crops with the McCain processing company that has a factory in Ballarat. Now, over 95 % of potato farmers in the area have contracts with McCain, the world's largest producer of frozen french fries (McCain website, 2006). The Russet Burbank is the potato used by McCains in the production of French Fries in Australia and around the world, and it accounts for 50% of potatoes produced in Australia (Lee, 2004).

McCain contracts one variety of potato, the Russet Burbank. The Russet Burbank variety requires considerably higher and more consistent applications of water as well as high application rates of fertiliser and pesticide in comparison to other potatoes.(Lee, 2004, Wilson, 1999) The cropping of this variety greatly increases the amount of inputs (water, fertiliser, pesticide, labour, machinery) required. The use of this variety in particular compounds the issues of erosion and eutrophication in the area. The specific requirements of the Russet Burbank and the absence of any alternative market for potatoes means that McCain effectively has control over production in this landscape. At present, their intention as indicated by local farmers is to reduce the number of contract growers, but maintain the yield in this area as a means to increase cost efficiencies for McCain.

The number of contracted growers is continually dropping: six years ago there was approximately 200 contracted growers (Bluett, 2005 pers comm.), whereas there are approximately 75 potato farming families across the Central Highlands area (Norman, pers

comm., 2005). Preliminary interviews with agency support services indicate that this number will continue to drop at least another 50% (Norman, 2005; Bluett, 2005). While the number of growers has dropped substantially in recent times, the area of production is remaining the same. Contracted growers are often leasing land from people who are no longer farming potatoes.

Contracts for the McCain Growers Group are determined by a representative group of three to four growers. This group negotiates with McCain the price per tonne and the contract specifics (Norman, pers comm., 2005), which is applied to all other growers. It would be possible for potato growers to individually negotiate their contracts, however they nominate to have their contracts negotiated as a group. Nonetheless, several growers indicated that some of their colleagues appeared to make private arrangements on individual aspects of the contract.

Contract prices have consistently decreased over time (Norman, pers comm. 2005; ABC Online, 2005). In 2005 in the most recent round of contract negotiations, Ballarat and Dunnstown potato growers were in the news repeatedly regarding their negotiations with McCains. The declining profitability of potato growing is forcing many farmers to consider the long term viability of their contract arrangements and overall land management practice.

Murphy (2000) described the challenges that a loss of contract entails for these potato growers. Growers have significant capital investment of specific machinery that is not highly transferable. In addition, farmers are unlikely to get organic certification. Murphy (2000) notes that there is a perceptible difficulty in transferring industries, and the viability of growers willingly leaving is small. Another point of conflict noted is the acute tension between corporate expectations and government water policy, which Murphy (2000) argues results in a loss of family farms and a conversion to corporate owned enterprises.

One complaint that has been consistently registered by growers in funding submissions is the labour commitment required during the potato season. The nature of the irrigating regime currently requires most growers to be on the farm 24 hours a day, moving irrigators around (Norman, 2005, Bluett, 2005 pers comm.). This is a source of major frustration to growers as they are unable to participate in regular social activities, such as watching their children play sport on the weekend, or spend time with their partner. Chris Bluett (2005, pers comm.) notes that this aspect of labour commitment is the biggest driver for change amongst potato farmers, who are interested in seeking more efficient less labour intensive means of irrigating. The labour intensity of the potato season is also resulting in the upcoming generation of potato growers being reluctant to pursue potato growing. A 'lack of succession' is one of the main social issues facing the growers (Bluett, pers comm., 2005), as young family members recognise their capacity to earn a good income in towns such as Ballarat and not work such long hours or need to have such total commitment to work. The proximity to the growing provincial towns also means that this rich crop land may be wanted for subdivision and that the land values for selling off parts of the property may provide superannuation in a way that continued potato production will not.

Relevance of the Research

The Dunnstown area predominantly utilises water in one type of practice: potato farming. This area does not have a significant influence on salinity in the catchment, but it's location in the north of the catchment at the headwaters of the Moorabool River means that it has a major influence on inflows into the Lal Lal Reservoir and subsequently on the Moorabool's flow.

This area was identified as a priority for investigation in conjunction with the CCMA because it had considerable impact in the catchment, in terms of both water use and impacts on water quality. It was also selected due to the shifts in land use that are occurring and the anticipated need for restructuring of farming systems.

The CCMA has not actively engaged this farming group to date, and this work was anticipated as a complement to other research projects that were occurring in the region. There has been a considerable amount of biophysical research conducted on the Moorabool River to date, including water quality analysis, land use studies and population demographics, but there has been little research into the social context of land management.

During the preliminary discussions about this research potato growers were frequently stereotyped by agency personnel, so that the initial impression was that these farmers did not use water efficiently and were reluctant to make any changes to their farming practice. Overall, they were considered to be problematic for the CCMA in it's efforts to improve water use efficiency, and provide environmental flows in the Moorabool Catchment. It was noted that there has also been research into alternative irrigation techniques which reduce water use and resulting erosion, however, it was thought that there has been little adoption of these irrigation practices by potato farmers. The stereotype of the potato farming focused on gun irrigators blasting water across a road, rather than careful application of this precious resource on to the crop.

This initial image of the potato farmer as driven by the dictates of production imperatives and disconnected from concerns about water use and land management was the beginning of the research process. Recognising that the potato growers were actually involved in mixed farming was the first step in reconnecting and positioning their potato growing as a wider landscape activity. In this way their isolation as potato growers with only economic outcomes as drivers, changed through the research process to the identification of social and environmental consequences of potato cropping. In re-orienting our enquiry to the landscape rather than the crop, there was an opportunity for the farmers to also identify the complex systems in which they worked.

4. Methodology

Qualitative research Methodology

The first phase of the research was a series of telephone and face to face interviews to scope the project. This was undertaken in early 2005. At that time the research was not focused on the potato farmers, but on the social, environmental and economic issues relating to land and water management in the Moorabool. This initial research led to a scoping document for the CCMA (Beilin, Carr, Kabore, 2005). At the conclusion of the initial phase of the project, the potato farmers had been identified as part of two distinct areas that were facing significant change in the region. The other area identified was the gravel caps region of Morrison She-oaks, located at the confluence of the East and West branches of the Moorabool.
(This document is included as appendix 1.)

The aims of this phase were:

- gain knowledge of area and priority issues for policy makers
- examine the policy context of the CCMA and its partnerships with other agencies, groups and individuals
- determine current perceptions within the CCMA and other agencies of landholders, their attitudes, practices and participation in Natural Resource Management
- obtain general information on landholder issues from on-ground staff working with multiple land holders
- identify stakeholders
- analyse gaps in information that may be evident

The first phase of the research included over 15 informal telephone and in person interviews with Corangamite Catchment Management Authority (CCMA- Corangamite Catchment Management Authority) Staff, Department of Primary Industries Staff, Conservation groups and private industries operating in the area.

In addition to conducting these initial scoping interviews, an extensive review of the literature was undertaken. This consisted of journal articles, theses, technical and social research reports and policy documents and a review of available maps and databases. These were oriented around governance, regional demographics, and projects / groups that were operating in the area.

In the second phase of the project, the decision to focus on the landscape management practice of the potato farmers, led to the red soils of the Dunnstown area. It was agreed that we would continue to develop 'the rich picture and thick description' (Geertz, 1973) associated with qualitative, in-depth interviews. The strength of qualitative research lies in it's focus on the social world. Bryman notes that qualitative research emphasises an 'understanding of the social world through an examination of the interpretation of that world by its participants' (Bryman, 2001: 265). Given the project's focus on the social aspects of land management, and the need to locate and integrate it into the economic and environmental reality of the farming landscape in the area, it was important to use a method that allowed for discussion, emerging

ideas and opportunities to pursue these ideas with those involved. The process was literally an unravelling of ideas in the interview phase and then integration of ideas into the analysis.

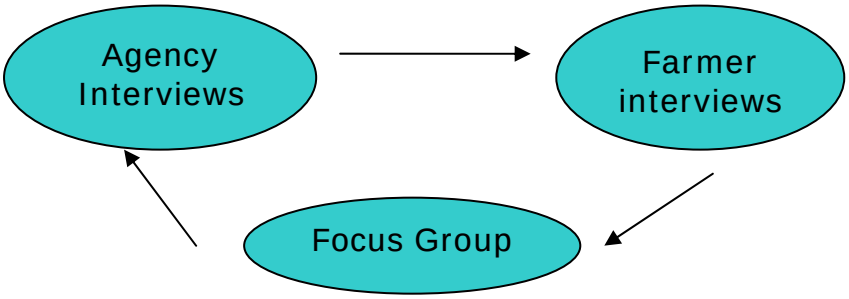
Figure 1:The inductive research process

General Research Questions → Select site subjects → Collect Data →

Intepret data ↔ Consider concepts and theories → Write up findings

This iteration also relates to the revisiting of themes across interviews and data collection. Beardsworth and Keil (1992 in Bryman, 2001: 315) describe this as 'an iterative process of refinement whereby lines of thought taken up by earlier interviewees could be taken up and presented to later interviewees'. This increases the validity of the research as different ideas are triangulated from a number of different perspectives, and also using different methods. In qualitative research, data collection and data analysis occur simultaneously.

Figure 2: An iterative approach to data collection



Another aspect of iteration that occurred in the research process was a continuous literature reviewing process. As new ideas and themes emerged in interviews, the literature on the topic was continuously reviewed to contextualise understanding.

Case Study Design

In order to more fully understand the daily experience of the potato farmers and their community and their community networks, a case study design was selected to frame the research. Case studies 'entail a detailed and intensive analysis of a single case' (Bryman, 2001: 41). Here, it allowed for an in-depth investigation of the social, environmental and economic values of all stakeholders from their perspective, and overall, an intensive exploration of the experiences of landholders practicing in the catchment. The focus on one case is in this research, the study area, and enables for real time and in context consideration of current issues. Geertz (1973) refers to the 'thick descriptions' that are generated, and Yin (1994:41) reflects that the creation of such rich and descriptive information 'alone will be revelatory'. The provision of 'thick descriptions' (Geertz, 1973) and rich detail allows readers of the research to make their own conclusions about the generalisability and the validity of the research.

Ethical considerations

A significant concern in any intensive study of a small area is protecting the privacy of landholder participants. The small sample size means that there is a risk of landholders being identified in the research and any publications that arise from it. In order to overcome this concern, participants are referred to by pseudonyms in all publications. Participants were also informed of the risks associated with confidentiality at the outset of the research. It was also identified in both the invitation for their participation and the consent form. Involvement was voluntary and participants were entitled to cease their involvement at any time, and withdraw and unprocessed data previously supplied.

All interviews were tape recorded, transcribed, and then returned to the participant for verification. Participants were asked to read through the transcript and make any changes or corrections that they thought appropriate.

Literature Review and the Identification of Research Themes

The literature review was extended to focusing on the potato industry in the second phase of the project and prior to any interviews with the potato farmers and agency staff relating to the potato farmers. The purpose of the extended literature review was primarily to identify areas to explore in interviews as well as provide a solid basis for understanding the social context of potato farmers land and water management practices. Two preliminary interviews, acting as a pilot, were undertaken with key individuals directly involved with potato farming in the area and were used to guide the direction of the literature review, and to highlight areas that needed particular consideration. Following the completion of the literature review a set of interview themes and questions were identified. These themes aligned with the aims of the research project.

These themes were:

- the Moorabool river
- landscape history and landscape change
- local communities
- water management practices
- land management practices
- contract growing - commodities
- extension and specific potato industry participation
- sustainable futures
- native vegetation management
- catchment management

Semi Structured Interviews

The above listed themes were used as a basis for interviews, with questions in each theme. Interview questions with potato farmers differed slightly from questions with Agency staff, and interview questions also varied between different agency staff, dependent upon their role in the region. For example, for a potato extension officer, there were more questions on land management practice. Appendix 3 includes the interview guide for agency staff and potato farmers. The use of a theme list or interview guide allowed us to discuss in a structured format issues of particular interest, such as water management practices, however, they also provided scope for participants to respond and incorporate other information that they felt was relevant. In a discussion on semi structured interviews, Bryman describes how the 'interviewee has a great deal of leeway in how to reply… Questions that are not included in the guide may be asked as the interviewer picks up on things said by the interviewee' (Bryman, p314).

The theme list and questions also have a historical emphasis to them. Participants were asked to consider the landscape history, and changes that had occurred in the landscape, as well as landscape futures. This connection was important given the intergenerational context of potato farming in the landscape means there is a history of association with the site; and therefore it is reasonable to enquire about historical, emerging and planned links that these farms have with the river and water management. The landscape future discussion anchored and connected today's events and experiences with conventional expectations of potato farming in this landscape.

Themes that emerged from the interviews included:

- water security
- environmental flows
- water supply catchment
- succession
- urbanisation and land use change
- labour intensity of crop management
- diversified farming systems
- corporate control

Participant selection

In this phase of the research, Lucinda Pike conducted 13 interviews with agency staff and 12 interviews were conducted with farmers. An interview was also conducted with the local Landcare president. Two interviews were done with McCain personnel, the field officer and the field manager, however these transcripts were withdrawn from the project on request by McCain.

Agency staff were initially identified in the scoping project, and then snowball sampling was used. Snowball sampling is where 'the researcher makes initial contact with a small group of people who are relevant to the research topic and then uses them to establish contacts with others' (Bryman, p98). This approach meant that all agency interviews were conducted with

staff with a direct role in the Dunnstown area, whether they were working with farmers or with water management.

Landholders were randomly selected from a membership list provided by Central Highlands Farming Systems (CHFS). This organisation was subscribed to by McCain growers group (which accounts for over 90% of potato farmers in the area) and a majority of other potato growers. [1] The membership list included farmers whether they were McCain farmers or not, as well as whether they grew seed potatoes. To gain a fairly representative sample, the membership list was stratified into these 4 groupings (McCain's growers, non-McCain's growers, seed potato growers, and farmers who had recently stopped growing potatoes. The number of farmers contacted from each group reflected the membership list details.

Group	Number Interviewed
McCain grower—Processing	6
McCain grower – Seed	2
Non McCain Grower	2
Recently stopped growing potatoes	2

It is worth noting that one of the McCain seed growers also grows other varieties, and McCain seed growing is only a small portion of his seed growing enterprise. Also, one of the non McCain growers had grown processing potatoes for McCain until several years ago, when they lost their contract. The two farmers who had recently stopped growing potatoes had previously contracted processing potatoes with McCain.

Thematic Analysis

The basis of all analysis in this research is thematic analysis. Remembering that in complex theory, all parts of the system under investigation (or in the case of the triple bottom line analogy-- social, environmental and economic research—and multiple systems) are entwined, and that therefore, a theme is unlikely to apply to just one area or system. Initially, literature was reviewed, and themes were identified as a basis for constructing interviews. At this stage we allocated the theme to the matrix. As interviews occurred, the discussion of the themes led to the 'filling in' of the matrix with the ideas from the interviews. This then made us aware of the implications within the system and triggered new questions for the respondents. It also made us conscious of how each theme linked across the matrix. Each thematic analysis led to new, emergent themes and connections being identified. As these themes emerged, they were revisited in later interviews. In this way the thematic analysis used as an iterative tool in the research, informed the matrix. The matrix emerges as a representation of the complex system associated with the potato farmers' landscapes.

[1] The limitation of this membership list is that it is possible that this sampling frame did not include every single potato farmer operating in the area. It can be said however, that over 95% of potato farming enterprises were included on the list representing the vast majority of potato farmers.

Focus Group

The final stage in this research was a focus group with agency staff operating within the research area. It included staff from a variety of organisations, from the City of Ballarat Town Planning, to the Sustainable Landscapes Division in the Department of Primary Industries. As part of the project reports to the CCMA, we had presented the CCMA project coordinators with the early findings from the analysis. In this discussion, a decision was taken to provide the agency staff with our findings and ask for feedback.

The purpose of focus groups is to 'collect data from group discussions around a focussed topic' (Hansen, 2006). It was considered a particularly useful method in the context of this research as it enabled diverse agency staff to discuss common issues together. The goals of the focus group listed below were derived from the thematic analysis that emerged from the research process.

The goals of the focus group were:

1. to discuss the lack of integration we observed between the different agencies in the region;
    a. Question: *What tangible outcomes are you achieving with other organisations?*
    b. Question: *How do you think you are integrating with other agencies*

2. to discuss how this commodity group perceives agency staff;

3. to bring together the agencies' expertise to discuss ways of getting core quality messages and improved interaction with farmers operating in the region

5. Findings by Research Topic

Catchment Management

Key findings

- Overall there was very little engagement of the local community by the CCMA. Most farmers were unaware of their role, and had had extremely limited contact with the CCMA.
- landholder awareness of the CCMA was closely linked to their involvement in CCMA initiated projects. For farmers who had participated in the CCMA's Moorabool River Project, their understanding of the CCMA's role was greater, and their attitude towards the CCMA was generally positive.
- Most farmers commented on the CCMA's willow removal program, (part of the Moorabool River project), and saw this as a positive for the region.
- The CCMA was frequently interpreted as a regulatory body, and was easily confused with other water authorities operating within the catchment, eg. Southern Rural Water and Central Highlands water
- There was an interest in a 'grass roots' connection to the CCMA, through local meetings or local contacts being established. This 'grass roots' connection was seen as useful to the farmers

.

As previously noted four farmers had participated in the Moorabool River Project. These farmers all had positive attitudes towards the CCMA, and had a fairly clear understanding of the CCMA's role in the landscape. These farmers linked the CCMA to river health and water quality. Several noted the positive results of willow removal in the region, and were pleased that this had occurred. These farmers had been involved directly with the CCMA through on ground projects, and were happy with the role of the CCMA and their relationship with them.

'We have seen them doing stream management and weeds ... they did the willows down the back: sprayed them and poisoned them all, so yes—I can see that the CCMA has been of great value.'

At the same time, these farmers were not aware of the names of any committee representatives or board members, nor the committees of the CCMA; and nor were any of the other farmers interviewed.

There was a total lack of connection to CCMA by these potato farmers in terms of community representation on CCMA committees. This effectively alienated farmers from regional catchment decision making processes, which led to criticism from some farmers. One farmer observed,

'I am fairly critical of the Catchment management people because they don't consult with us– to me they are in a world of their own…'.

Farmers not involved in the Moorabool River project did not cite any other form of interaction. There was one meeting that was held in the area several years ago, but this was the only one farmers were aware of occurring. Several farmers suggested that the angry responses from farmers had led to the CCMA being reluctant to hold any further meetings in the area. CCMA staff on the other hand felt that relationships with the Dunnstown potato region were generally very positive and that there was a lot of community engagement that had occurred. Their evidence for this was that they held public meetings and field days (e.g. Freshwater Circus) and farmers attended. In discussing this further, it would appear that the CCMA staff reflected on events held close to Colac and these were attended by farmers, *in general;* while the potato farmers lamented that there were few activities in the 'north', and organised for their particular commodity needs.

On-ground this did not appear to be the case. One farmer described his interaction as being:

'I've seen notices and things in the paper, and I think I have got a letter or two from them in the past… I have had no real direct contact with them as such…'

Farmers who had not been involved with the CCMA in any on-ground projects often wanted more information about what the CCMA was planning, while others were content with no direct contact. One farmer who was not critical of the role of the CCMA in the landscape noted:

'I'd like to have more information about what their issues are I suppose… and what they think and what they'd like to direct – what directions they are heading towards I suppose.'

This demonstrates a desire to understand the role of the CCMA more clearly, and to be more aware of their role in the landscape. It also makes the point that the farmers do not perceive the CCMA as necessarily beneficial to them, so they have no impetus for seeking out the CCMA staff, rather they are waiting, and expect that if the CCMA wants to engage the farmers, the CCMA will send staff. In effect, this research study was exactly that sort of contact, with Lucinda Pike carrying the farmer message of disenfranchisement and 'neglect' back to the CCMA and all other regional agencies through this report.

Many commented on their geographical position in the catchment as being part of this alienation; they were unable to attend public meetings held around Colac, and there was very few meetings held in their local area. It is unclear why there were few meetings, or if there were meetings that simply were poorly attended due to the timing of the meeting. Both of these need to be clarified and addressed.

'they are basically down in Colac, we are not very involved in what goes on down there, but basically they don't understand how the system works up here.'

Other farmers were intensely critical of the CCMA, and were concerned about the implications of their role in the landscape. These farmers were concerned about the power that CCMA's had in the landscape, but the lack of community ties, and several were also concerned that appointments within CMA's were politically motivated.

CHW staff felt that there was most likely poor representation from all farmer groups, and this was evident. Other industry staff observed that the CCMA had lost it's grass roots connection, and that for it to have a role in the community, it needed to be seen and heard in the field, talking to growers. Only one farmer discussed the connection between the CCMA and Landcare: There was also suggestion that the CCMA did not place sufficient emphasis or value upon the human resource component in the landscape. Another industry criticism of CMA's was that they were generally reactive in their management practice, and what was needed was a proactive approach.

Comments:

The lack of transparency regarding CCMA's role in the landscape coupled with a sense of alienation has created a situation where there is little feeling of a catchment community. Capacity building within the community was also not really occurring. Farmers were not part of a mutual journey towards a sustainable landscape, as evident in comments such as 'their issues'. Ideally, there is a need for an understanding of 'our issues', where the CCMA and farmers are working together on shared issues towards a shared future.

The CCMA faces a significant challenge in communicating it's often dualistic role in the landscape. It is linked to river health, and also protection of urban water supply. The current lack of transparency surrounding the CCMA's directions in the landscape create mistrust, and at worst, hostility.

Recommendations:

- Reinvigorate strategies for local engagement, and local connection. Be seen and heard on ground to re-establish local, grass roots connection.
- The CCMA would also benefit from transparently communicating it's role in the landscape, as well as it's priorities.
- Facilitate greater levels of community discussion, where farmers really are part of the catchment community. This entails farmers being involved not just in the final stages, but throughout planning, designing, implementing, monitoring and evaluation.

Environmental Flows and Defining Sustainable Systems in relation to the Moorabool River

Key findings

- The key concern was where water for environmental flows was going to come from, and how local practices would be affected. Sustainability in relation to the flow or water management was not mutually defined so participants were generally at cross purposes when they attempted to relate to the 'other party's' definition.
- Environmental flows were a contested issue, as reflected in the wider population. Some farmers wanted to see increased flow to the Moorabool, whereas others felt that environmental flows had to come second to production requirements.
- There was some scepticism about environmental flows in a river system with significant on stream urban storages and large numbers of farm dams creating permanent modified flow conditions.
- The common thread throughout most responses from farmers was that sustainable future water management entailed not over using the available water supply: staying within the limits of your access to water. This required or assumed that current access to water would be maintained.
- For agency staff, sustainable water management was about a compromise between all the users of water, and a *fair* distribution between these needs.

The Moorabool River was identified in the 'Our Water, Our Future' white paper on water use as being in need of an environmental water reserve, due to it's highly stressed nature. This year, 6000ML was set as the volume required to fulfil this environmental reserve. A CCMA staff member noted that to actually meet the minimum environmental flow requirements the Moorabool would require an extra 20 GL to be provided: which is half of Ballarat's current entitlements. A farmer summed up the challenge of allocating environmental flows when he said:

' It's coming up with something that will be a happy medium I suppose, and what that figure should be will be debatable, there are going to be a lot of differing opinions.'

Environmental flows were an extremely contested issue, and many farmers were dubious about the actual benefits to the environment that increased flows would provide. They linked increased flows in the Moorabool to an increase in the water security of urban populations. Several farmers who had participated in the Moorabool River project also commented that they would like to see the Moorabool in better condition, and that there was a need to take better care of it. Reduced flows in the Moorabool and a reference to water authorities such as the CCMA and CHW elicited:

'I reckon they should take more care of it…just on the management side of it you know…'

from one of the farmers interviewed. This represented a commonly held view that farmers are doing their best to manage the environmental issues facing them and to hold these in balance with increasing production pressures; but that agencies charged with the management of the river and with water allocation do not seem to be 'holding up their end'. This dissonance is important as it speaks to the lack of trust among stakeholders along the Moorabool.

Others argued that the provision of environmental flows was problematic, as it failed to recognise the need for water in agriculture. It was common for the discussion to reflect an 'either/or' position so that it was felt that environmental flows might rob farmers of their entitlement. This sentiment is clearly exacerbated by the current water shortages. One farmer noted that environmental flows need to be compatible with the needs of the population and there is a need to share water,

'You can't expect to have a population of 20 million increasing to 30 million and have rivers running they did 100 years ago.'

This comment reflects two critical elements in predicting potentially useful strategies to address local concerns. One is the disconnect farmers experience between policy and daily reality. Increasing populations in the region are part of planning and policy decisions that are not in the realm of local farming decision making. The implication is that growing populations require food and the reality is that regional food production is going to be a significant issue for sustaining regional population growth in the future. The second part of this comment reflects a not uncommon farmer critique of environmental flows. It refers to the perceived lack of data on which the flows are to be based and the pragmatic view that the river is not the same place as it was at the time of white settlement. Both of these ideas require discussion in order for the goals of all the stakeholders (we include farmers here) on the River and the future generations of people, flora and fauna to be accounted for in planning for water use in this landscape.

A CCMA staff member described the difficulties in water allocation in an already over-allocated catchment. She/he said that:

'Without impacting on particular groups, there is really no way of moving towards sustainability within that particular system'.

The evocation of 'sustainability' is commonly heard when environmental flows are discussed. As can be seen in the following excerpts, there is no consensus about what sustainable water management is for the region. Sustainable water management was understood by the same staff member as:

'Water being available for the specific users over the long term, but also no major degradation of environmental conditions in the river'.

If we do continue to get major degradation of the river, that's also going to impact on water quality for Ballarat, and that's an unacceptable risk to that huge population as well'.

For agency staff, sustainable water management was associated with managing water into the future in a way that would meet the needs of most users, acknowledging that this meant an emphasis on non-agricultural zones. Farmers are particularly conscious that water diverted to

cities appears to be going into industrial zones—so not for consumption; and their argument is that there is no rational reason for why one form of production is being privileged over the other. Another CCMA staff member considered it to be:

'Managing the water resource in a way that all parties (Farmers, CCMA, CHW) get a fair slice of the water, without jeopardising the ecological values of the river'.

Again, in discussion with farmers, the ecological values of the river are not necessarily self-evident. Fishing and willow control are two ecological issues that farmers in the region[2] clearly acknowledged as important for river management. However there was little understanding about how the CCMA has structured its strategic work program around ecological assets and threats, and how this structure heightens agency awareness, emphasis and focus. The CCMA has not effectively communicated these values or impetus to the wider community, creating external dissonance around what seems like fundamental values to internal staff.

Farmers understanding of sustainable water management differed significantly. They looked at sustainable water management in terms of their properties, and discussed staying within the limits of water availability. This was also acknowledged to be subject to change:

'…we don't grow more crops than we know we can irrigate…'

'…well firstly, we don't use our total allocation every year…'

One farmer was concerned that the needs of producers were being ignored:

'I am fearful that the environmental push isn't recognising the needs in dry times of those who grow the food'.

Several farmers also were critical of what would actually constitute environmental flows. The historically variable flow of the Moorabool was also described. Some farmers noted that prior to the construction of the Lal Lal reservoir, the Moorabool ceased to flow in summer time. They noted

' *Even the Moorabool before there was a dam built on the streams, it would have been running and not running... during summer it wouldn't have run, where as during winter there was rain so it will flow…'*

And,

'…An acceptable environmental flow needs to be relevant to current rainfall.'

This was closely linked to the provision of water from storages:

'I have no time for environmental flows out of storages, it has to be natural.'

Southern Rural Water staff noted the hazards associated with cutting farmers water allocations in order to provide an environmental flow. They reflected that the CCMA needed to be able to account for whether the environmental flow you are achieving is sufficient to benefit the

[2] Pike(2005) Landholder's water management practices in a water stressed catchment, Honours Thesis, University of Melbourne.

environment. This presents the conundrum of how 'sufficient' and 'benefit' will be defined and who will define them. He also noted that urban storages and the large number of farm dams were the greatest impact on the flows in the river.

Comments:

The close relationship between environmental flows and urban water supply were articulated clearly by CCMA staff. Farmers were often suspicious of the benefits of environmental flows. At present, there is a lack of transparency about the goals for river management which needs to be addressed. It remains unclear whether environmental flows will lead to major benefits for the environment. What they will provide is increased security for urban water allocations and reduced costs of water treatment for urban supply.

Despite the idea of sustainability being employed to justify management actions, there is no agreed definition of sustainability, or sustainable water use.

Recommendations:

- The CCMA could lead community dialogue on the subject of sustainability, so that an agreed and shared understanding of what sustainability means within this catchment is established. This discussion around sustainability needs to focus in the first instance, on how sustainability manifests in water management practices.

Environmental Flows - *issues all interrelate with key theme, not necessary to read across page*		
Social	***Environmental***	***Economic***
Long term sustainability of water supply	Restoring highly stressed river system	Loss of capacity to sell water. eg SRW if groundwater licenses are restricted.
Increased pressure on urban centres to conserve water use	Improved water quality in river	Costs of metering/ additional measuring required by urban and rural water authorities
Improved water quality for urban consumption	increased biota and fish communities	cost of environmental water: metering, farm production loss, alternative water sources for urban supply
Pressure on farm families: loss of water	positive effect on downstream river and wetlands associated with Barwon River	Reduced water availability to farmers linked to reduced crop production
Provision of any environmental flows would by necessity impact on at least one particular group: due to current overallocated nature	EWR 6000ML, minimum scientific reserve 20 000 ML. current environmental flow provisions inadequate for providing environmental benefits	Increasing competition for avaliable water -- increase in cost possible
Contention over SKM River Assessment	Severe impact of farm dams and urban storages: highly modified flow regime: how to provide environmental flows?	Cost to Society and to farmers of seeking alternative water supply options

Sustainable Futures

Key Findings

- '*We decided to plant for 500 seasons'* –people are here for the long term.
- One of our key findings is the pragmatic way in which intergenerational potato farmers accept the possibility of changing commodities in the foreseeable future.
- Sustainable futures in farming hinge upon the presence of a profitable potato contract, or profitable alternative production systems.

Sustainable futures were generally interpreted as the ability of landholders to stay farming in the landscape. Landholders criteria for staying, was in terms of sustainability of water use and the sustainability of current production practice. In the current production system, there is little scope for imagining alternative ways of being viable producers in the same landscapes.

The quote below is from a farmer who is explaining his selection of oaks for an avenue on his farm. Previously there had been cypresses, and at the age of approximately 100 years, the cypress had deteriorated and needed replanting. There is an ancient Persian proverb that says that you plant grain for the next harvest, and trees for future generations. This resonates with this farmer's long term planning in the landscape, and his desire for his family to be in the landscape well into the future when he says:

'*…we decided we would plant for 500 seasons!'*

As the Roman philosopher Cicero (45 BC, in *Disputationes Tusculanae)* noted:

"The diligent farmer plants trees, of which he himself will never see the fruit."

Sustainability into the future was a priority for many farmers. There was awareness amongst many farmers that contract potato farming may or not be part of that future. For these farmers, changing commodities was anticipated. For some, this was considered a difficult option, and one they were reluctant to acknowledge in an immediate sense. Nonetheless, they were prepared to make the adjustments. For others, it was simply a matter of deciding to change farming systems, and then implementing that change.

The currently unsatisfactory contract arrangements for their potato crops were causing many farmers to contemplate their future in the landscape, and what they would be like if contracts were not to exist. The continual uncertainty surrounding both water and contracts meant that many farmers had already faced the idea of not growing potatoes.

Agency staff also discussed sustainable futures in terms of the sustainability of contract growing for McCain. They did not consider sustainable futures in terms of how farmers may stay in the landscape, broadly, but only in terms of continuing the same practice. McCain

staying in the region and continuing to purchase Ballarat potatoes was identified as providing long term sustainability. It would seem that agency personnel have confused 'stability of markets' with sustainability of production systems. Trans-national companies are notoriously unlikely to have allegiance to particular crop production localities if it does not suit them financially to do so. McCain's makes no secret of their increasing production focus in New Zealand and India.

Agency staff also noted that sustainability could be further enabled by different potato varieties that demand less water, fertiliser and chemicals. However, as McCain only accepts Russet Burbank potatoes at the moment, it appears to these researchers that the only way to change varieties is not to produce for the chip market. Cutting dependency on one buyer would do more to encourage species variety and alternative cropping than any other issue.

In discussions with agency staff there was often the implication that potato farmers were stubborn and reluctant to change practice. Agency staff did not perceive a future in the landscape for these farmers outside of potato farming. By contrast, the farmers interviewed appeared to be planning as best they could given the difficult circumstances, for their future and were aware of the likelihood of a major change in their commodity production system.

Sustainable water management was closely tied to increases in water efficiency by agency staff. Efficiency in irrigation practice was considered to allow water to be utilised in the most efficient manner: for environmental flows, industry or urban supply. The water authorities considered water efficiency by potato growers as a priority.

Looking after the environment

Agency staff often indicated that farmers did not think about the environment in their management practice, and that they would utilise as much water as they could with little consideration of the impacts. Farmers did not necessarily agree with this notion. One stated:

'…we are only custodians of the land so it's in our best interest to do what's best for the land and the environment.'

While a consultant commented:

'They know that if they use and abuse the system, the system won't be there to support them in the future.'

These pragmatic responses do not indicate neglect of the systems in which they work. Rather, there is a sense of continuity and an acceptance of stewardship.

Comments:

Most farmers were not the agency staff stereotype of a potato farmer. It appears to us that they are agrarian pragmatists, who are adapting to the market in the conventional Australian way; and to their situation as farmers in a global commodity system. Markets and global commodity system changes are part of uncertain and risk oriented decision making processes. They are both chaotic and intolerant of the particular and local conditions. Farmers, participating in these systems did not consider themselves as practicing either archaic technology or outdated innovation. They understood their daily management process and

practice as dynamic. Within the confines of the production system, our research team agrees that this is a logical response to maintain the specified outcomes…eg. potatoes.

It appears to these researchers that agency staff adopted a more static approach to sustainability and they did not see the need to address the necessity for corresponding agrarian pragmatism within the change process that would bring the farmers into the water services discussion. It appears to us that farmers are planning for a long term future in this landscape, and what remains unclear is what patterns of landscape the future will entail. It was not clear to us what future landscape the agency staff were imagining and whether the focus on assets and threats had so directed their attention to ecological outcomes that they did not foresee the need for production along this river at all.

Critically we consider that in order for all the stakeholders to discuss their potential needs and aspirations for this landscape and region, there needs to be some work, which could be led by the CCMA, on how sustainability for the area is being defined. We suggest the central questions might be: who is involved in defining sustainability currently and how can that process be made inclusive, and what time frame is appropriate in deciding sustainable outcomes across social, ecological and economic systems?

Recommendations:

- Plan for the future via an adaptive management approach: reconceptualise extension around the delivery of Triple Bottom Line outcomes and adaptive management strategies.

- The CCMA and other agency staff have to take the initiative in breaking through the stereotyping barriers prevalent in the region before productive outcomes that generate practice change can eventuate. An example of the first step could be organising the transition from processing potatoes to seed potatoes or other crops.

Communities

Key findings

- The main group organisation or meeting in this community, for farmers, is the McCain Growers Group meetings. This is also a vital part of their business. The potato farmers have reportedly become increasingly united as a group in the face of increasing pressure regarding their contract negotiations
- The social fabric of local communities has been declining in size over recent years. There is limited participation in farm based community groups. This is associated with the decline in rural populations from the amalgamation of properties and the loss of farm families. Rural communities are also becoming increasingly diverse and commodity based groups like (VegCheque) or others like Landcare and Waterwatch may not appeal to new arrivals.
- Farmers also noted a lack of time to be involved with community groups, and this coupled with a decline in numbers, leading to a number ceasing to exist eg. tennis clubs.
- As potato farmer numbers decline, they have a reduced voice in the region (associated with this commodity) which leads to a sense of marginalisation; and a historic community of practice also diminishes.

Along with the landscape changes occurring in recent years, traditional notions of local communities have also been changing. This is due to a number of different forces. Farmers reported that small farms had been becoming more unviable over time. In the past, an 80 acre property was reported to sustain an entire family, which is no longer possible. As farmers have left the area over time, and farms have amalgamated, schools have been forced to close down due to lack of student numbers, and other community services and groups have declined . eg health delivery, sporting groups.

The number of farming families in this area has reduced according to anecodotal evidence. One farmer described how he and his two brothers who operated in partnership now owned 15 farms: which equated to a loss of 12 farm families in the area. He said:

'When you think about our 15 farms, it means there are 12 less families at schools, sports clubs, and paying for hospitals. The problem with amalgamation is the social structure goes down.'

Farmers also noted that they did not have time to be involved in what are seen as generalist, farm focused community groups, such as Landcare, and this was most often attributed by farmers as being due to a lack of time. (See discussion on Landcare participation under Native Vegetation Management page 102).

It could be deduced that farmers were not interested and lacked the time to be involved in community committees, however, of the growers interviewed, a number were involved in a

diverse number of regional organisations: eg the Groundwater Supply Protection Plan Committee in conjunction with Southern Rural Water, The Potato Council of Australia, Horticulture Australia. The reality is that the intensity of potato farming demands a focused involvement groups important to growers. These organisations were all directly tied to production practice. Landholders are involved in committees that are oriented around production, improving production and securing water, rather than NRM in general. This finding is mitigated by the age of children in the home as links to community networks are also associated with lifecycle. However, the men in the interviews all indicated that they had difficulty focusing on any non-crop activities during the 9months of potato season.

The McCain growers group has the characteristics associated with a community of practice in that there are institutional and cultural practices that are understood to be part of all the members daily experience; and that social cohesion and responsibility to the group is undoubtedly built through this association with the group. The negotiation of contracts with McCain was a vital part of their business, and all McCain farmers were involved with the group. Farmers here did not identify themselves within a catchment community, they identified themselves as part of the McCain growers commodity group. Beilin (2001a) has argued that commodity landscapes encourage this type of association and that it can be understood as working in the favour of the commodity managers (eg. McCain in this current scenario) and because these types of groups focus on just one aspect of life in the landscape, they tend to further isolate members from their other potential networks. It can make information seekers overly dependent on one source of information, for example. In extension literature, the type of practice that McCain's engages in with this group is a very top-down one in which the farmers are not equal participants in negotiations or information sharing.

However, what we heard and observed in this research with the potato group is that as the commodity production system comes under threat, it appears to shift to engage membership through other network allegiances—and these allegiances are in effect, the way farmers know each other within their local communities. Many farmers noted that as a commodity group, they were becoming increasingly united in the face of increasing pressure with regard to contract negotiations.

'We are all out there to survive.'

'In the last five years, you will find growers in general will talk more, a lot more openly to their neighbours than they would have in the past. In the past, they tended to keep to themselves and do there own thing and wouldn't tell anyone but that's changed now, our main competition is not the grower – he is on your team.'

Several agency staff indicated that growers would happily undercut other growers to ensure that they were able to maintain their own livelihood, but this did not appear to be the case on ground anymore. It was also claimed that McCain wanted to have disconnected growing communities—as in Tasmania, New Zealand and Dunnstown, as it would give them the capacity to negotiate individual contracts with growers.

Rural communities are reportedly becoming increasingly diversified, with increasing numbers of part time farmers and lifestyle farmers. One farmer commented that:

'Now there is a new blend of people, and they have different expectations of what the rural life can offer.'

Part-time farmers and lifestyle farmers, who have sufficient sources of off-farm income did not necessarily become part of the local community. They lived in the area, but worked and recreated in another location. Barr, building on the North American descriptor of 'dormitory suburbs', notes that these are increasingly occurring across Victoria. These are 'a new landscape full of people whose livelihood and often social life was elsewhere' (2005:22).

Comments:

Catchments are not natural communities. The landscape was not originally mapped to mirror the hydrological realities of this continent. Instead communities were established along market routes and from white settlement, production was oriented to export needs. In 1994, catchments were literally imposed on the Victorian landscape (Beilin, 2001b). There were no elections for membership and local people saw that there was not necessarily representative membership in the governmental appointments. Things have certainly progressed in terms of governance, but for many communities, not just those of the Corangamite CMA, there is little understanding of how this next level of regulation and authority is really going to work in their favour or even include them in the discussion. In stressed water catchments like the CCMA, the imperative to counter the unfortunate start is even more pressing than elsewhere. The need to engage 'community' in order to have any credibility is essential. The need to engage community in order to effectively achieve most of the desired outcomes in the strategic plan is a challenge.

What constitutes 'community' to agency staff differs from the farmers' understanding. Policies designed to engage a particular community will have limited success if the community they are targeting does not represent the individuals in the landscape. Current planning restrictions exist within the catchment, and the changes in land use that are occurring are associated with a decline in traditional farming communities. As the structure of local communities change from those dependent on production in this landscape to those who live in the landscape but do not earn their living there, farmers feel increasingly abandoned by the service agencies that previously represented them and 'understood' their needs.

The CCMA operates in the name of a catchment community but farmers do not feel as if they are part of this community. Farmers are aware of their physical position in the catchment, and the potato farmers are aware of their 'reputation' with the CCMA. There is currently a project to profile community networks in the CCMA and the information from this study will be invaluable in considering how to better integrate the diverse needs and interests of the multiple communities that exist in this area.

These landscapes are not just rainwater collectors. They, like the CCMA, are socially constructed and require people to maintain and manage them.

Recommendations:

- Community is central to the success of the CCMA. The economic and environmental systems require a social system that is driven by indicators such as social coherence, social capacity and social equity. The CCMA can adapt many of its current strategies and policies to include people in the landscape rather than just the assets and threats to the biophysical region.

- The CCMA can foster notions of catchment community through dialogue tables and discussion, where there is *one landscape* and *one water* source.

- The CCMA can engage all community members in dialogue about the landscape and it's futures.

Communities: *issues all interrelate with key theme -- not necessary to read across the page*		
Social	***Environmental***	***Economic***
Little involvment in local community apart from economic links	Bungaree Groundwater Protection Area	Economic negotiations with McCain: McCain growers group
Declining community groups. Eg football, tennis	Disconnection between DPI, DSE and CCMA - lack of integration between these organisations impacts on on ground land management practice	Community of Practice: Contract potato growing for Mccain.
Declining numbers of potato farmers: consolidation of potato farming properties	Low levels of involvement in Landcare initiatives	Consolidation : economies of scale
Labour intensity of farming practice	Economies of scale linked to improved environmental practice	Discussions with other growers regarding practice / advice
Reduced farming voice in region: reduction in farm numbers	Stable climate: no extreme droughts, frost events compared to other farming regions of Australia	Economic interest in retaining groundwater entitlements.
Low morale, negative attitude amongst growers towards current practice	Fertile, well draining soils of district	Extremely high value agricultural land
Disconnection between lifestylers and farmers		
Representation on GWPA comittees and board.		
Social cohesion in historical (inter- generational) families		
Historic community of practice disappearing		

Water Security in a Water Supply Catchment

Key findings

- The security of water availability was a source of concern to many farmers. Water security was perceived as being threatened by a number of different sources. Perceived competition with urban water supply demands was the most significant concern regarding water security.
- Farmers were highly aware of their geographical position within a water supply catchment. It was associated with increased pressure upon their farming practice in terms of water use and nutrients.
- Other issues raised were the impact of water trading, the impact of climate change, long periods of reduced annual rainfall as well as the provision of environmental flows.
- The pending Moorabool River Stream Flow Management Plan and Bungaree Groundwater Supply Protection area were additional sources of uncertainty with regard to future water security and there were expectations of changed management conditions as a result of these strategies coming into effect.

Position in Catchment

Farmers and agency staff both noted the significance of this potato farming region's location within the Moorabool Catchment. Staff from all water agencies noted that farm dams situated above the Lal Lal reservoir fill up before water reaches the river, and this affects water available for river flow, and, for downstream irrigators. A SRW staff member observed:

'*Because there are lots and lots of on stream dams: so when it rains the first guy gets everything, until it fills, and then the second guy gets one [filled], and to actually get flows down the river is nearly impossible.'*

One farmer described how the position in the catchment was beneficial, and that government restrictions were less likely to impact upon them. Interestingly, he correlated environmental flows with the provision of water to downstream users. He said

'We are alright, we are head of the stream, but the ones down stream that rely on the likes of us to let the environmental flows go or whatever [may not be].'

In an alternative interpretation, a Landcare president noted that these farmers would be in the same situation as those irrigators located downstream with no allocation, if it wasn't for their position in the catchment. He stated:

'if [these] irrigators didn't catch the water first then they wouldn't have any.'

A CCMA staff member reiterated the increased insecurity for farmers below the reservoir. They noted:

'As CHW take up full [bulk entitlement] allocations in the Moorabool, this will affect what flows are provided below the Moorabool.'

This positioning in the catchment was also associated with increased pressure on water management practice in the rural landscape. Farmers and agency staff commented on the planning restrictions that this entailed. For further discussion on planning restrictions, please refer to Urbanisation and Land Use Change.(page 84)

CCMA and CHW staff reflected that concerns about fertiliser and pesticide use were heightened due to the position of potato growers in the catchment. Similarly, the implications for downstream water affected by sedimentation and nutrient run-off from the potato farms and the resulting impact if there is chemical overuse were discussed.

On their part, potato farmers saw the adoption of grass buffers along the river as a mitigation for potential leakage of run-off and erosion into the river. They did not discuss the earlier work of Fletcher (1998) in regard to this issue.

Water Security

Water security was understood in a variety of ways by farmers and agency staff. Agency staff described how water licenses did not guarantee any security of supply for farmers, as they were in an unregulated system. Licenses ensured 'a security of right', and were based on the assumption that water was there.

Climate change, water trading, urbanisation and increasing government restrictions on water use were the key threats farmers identified to water use. Farmers concerns relating to urbanisation are discussed in detail in the section Urbanisation and land use change (page 84). Regulation and urbanisation were closely associated, as evident in the comment

With pressures on for town water and that sort of thing, governments can regulate to take water away from us'.

Comments:

The divide between rural communities and provincial towns is unhelpful in planning for water security across the catchment. There is only one landscape, and only one water source, and there is a need for a connectivity to be established between all parties.

Farmers' position in the catchment around water is dangerous, as it disconnects them from their impact upon regional hydrological systems. It is difficult, if not impossible for farmers to visually gauge or evaluate the affect of farmer's water use and storage on the regional water availability in such an extremely modified catchment. Any changes to river flow can be attributed to management of urban storages as well as climate change.

Recommendations:

- The idea of landscape connectivity is of significance here, so that all users are aware of their reliance on what is in reality, one landscape and one water source.

- Water security could be used as a topic by the CCMA for creating dialogue and a civic space. Capacity building within the regional community, including provincial towns and rural farming communities, would enable more holistic solutions for the broader community around water security.

2. Potatoes and Water Security *- linear relationship and overall interconnection of issues*		
Social	***Environmental***	***Economic***
Increased labour required for production in potato farming	reduced annual rainfall / climate change. Increased pressure on groundwater supplies	increased reliance on bores and dams-- increased costs of production
Pressure on families and individual stress: because not immediately in personal control	Changes in river management: environmental flow provision	Reduced availability of water for farmers and urban users
Loss of water in region: associated loss of livelihood	Loss of water from regional hydrological system	Water trading: cost to low value water users, profit in other farming regions and for parties negotiating sale of water.
Water commitment for potatoes inhibits diversification of farming practice for some farmers	Basing crop selection on ecosystem capability	High water use of for potato crops limited application of water on rotation crops; developing regional food systems
Uncertainty and concern around groundwater licenses and potential changes / restrictions due to Pending Groundwater management plan.	Effect on river of full GW license take up unknown -- sleeping licenses	
Sleeping licenses a form of security - who has them? How can they be regulated?	mapping of water services across catchment	Buy out sleeping licenses / compensation / change to legislation
Fear of losing water access - through regulation of groundwater licenses / uptake of licenses not utlised	hoarding water	Increased costs of applying water - auditing of water management practice

Water Trading

Overall, there was concern amongst both farmers and most agency staff about the possibilities of water trading in the catchment. One key concern was the affect on on- ground land management of water trading. It was observed by one farmer that if banks and corporations were to buy all the water up, they would have huge control across the landscape. The control of water buyers and the impacts of water trading already being felt by farmers in the Goulburn Murray Water region, was recently reported in the Age newspaper (Egan, C., 17/09/06).

Water was also expected to be traded to urban use. Another concern was that water authorities were trying to buy surplus water from irrigators. The result was anticipated to be a market benefit situation for the CCMA:

'…But then those authorities can sell it at so much more expensive [a price], like they can sell it off to whatever use they would like really.'

In the 'Our Water, Our Future' paper, there is suggestion that water trading leads to more efficient water use, as it is used on only high productivity crops. A downside of this would be that all licenses are fully utilised (and at present there is considerable anecdotal evidence that licenses are not being fully utilised) then there was potentially going to be more pressure on the river. Further, there is the assumption that the value of the high productivity crop returns to the growers or is obviously manifest in the national GDP. The reality as demonstrated in the case study area is that the benefit goes to the corporate and trans-national company contracting the potato farmers. In this way the cost of water continues to be externalised from their corporate responsibility.

Water trading was discussed in terms of the economic impacts: it was perceived that there would be less water available for production. Water trading simultaneously impacts on social and environmental systems: water traded out of the region leads to significant changes in the environment, and would lead to a decline in country towns because of reduced water access for town and regional citizens; but there is also the flow on costs of losing farmers or land managers within the community as land without water rights becomes largely unviable.

Climate Change

There was widespread consensus that the region had been in a long dry spell, which had lasted almost 10 years (corroborated by data), and this had impacted upon all farmers in one way or another. For some, they had had dams go dry that had previously never dried out before. For others, springs that had always flowed had stopped flowing at the end of the season, and bores had been deepened.

'It is not flowing like it used to, nowhere near it. It actually stopped and it was the first time ever… there is no history of it ever stopping. It is definitely affecting a lot of the springs around the place.'

One farmer observed that the need to deepen bores wasn't necessarily a result of climate change, but could also be the response of the aquifer to continued overuse.

An absence of anticipated rainfall had a number of effects. As dams weren't filling, it increased the reliance on groundwater. It also increased the time that farmers spent irrigating, which led to a significant increase in fuel input costs. The length and cost of this dry spell coupled with declining profit margins had forced one farmer interviewed to stop potato farming completely.

Another observation made was the effect of this dry spell on big trees in the landscape. Some comments that demonstrated this were:
'You can go around the paddocks and you will see trees fallen over.'

'We are getting enough rain to get us by, but obviously it is not enough rain for trees.'

Reduced rainfall was a curse for some farmers, while others noted increased productivity with a dryer climate.

'In some ways it is quite ironic, that with these reduced and lowered rainfall years – it has been a positive for this district, because sometimes when you get your high rainfall years the paddocks get too wet, and you can have crop losses and your stock suffer. So really, with the reduced rainfall there has been higher productivity.'

A DPI staff member observed that runoff was less of a concern during these drier years, but it would require increased management when higher rainfall years returned.

Climate change is an example of an extremely complex environmental issue that has implications across the triple bottom line systems. It's potential for catalysing changed management practices can be harnessed by the CCMA to more directly confront important ideas about uncertainty and risk in the management of land and water. It is an opportunity to evoke adaptive management as a starting point for the discussions around how the local population and the CCMA can interact to achieve a 'one landscape' understanding.

Uncertainty around incomplete Management Plans

Farmers were aware of the Bungaree groundwater management plan, and the Moorabool River Stream flow management plan. Several had participated in the advisory committee. There was widespread frustration that the plan had not been decided upon, and there was uncertainty about what it would entail.

Southern Rural Water's staff member interviewed reflected that the groundwater management plan was inadequately equipped to deal with the much larger problems that were contributing to the stressed condition of the Moorabool. The larger impacts of urban storages and farm dams significantly outweighed any benefits that could be gained from an aggressive program of restricting groundwater licenses. He noted that:

'*…the issues we were trying to solve were too big for the process that we had to solve them.'*

A farmer involved in the committee reported that the perceived inaccuracy of the recent Sinclair Knight Mertz Groundwater Assessment documents that the Groundwater Management plans were to be based on had led to the lack of finalisation, as the advisory committee had continually disputed the figures presented in the report. Other farmers were also concerned about the results of the report, and reiterated that it was inaccurate analysis.

The lack of completion of these plans has resulted in a number of rumours being generated around future water access, and the uncertainty is not likely to lead to favourable community responses. Many farmers referred to the large reductions to groundwater allocations and the resulting loss of livelihood that had occurred in other parts of Australia, and feared that this might also occur here.

Changes to water access

Responses to changes in water access and security elicited many different responses from farmers. Some felt that it would be a matter of changing farming practice, while another felt that it would be something that would result in massive conflict.

Comments:

Farmers use of groundwater disconnects them from the impact of climate change. Farmers were aware of changing rainfall patterns, but were insulated from the impact of these: groundwater is noted to take longer to respond to over use, than surface water, and reductions in it's flow are delayed.

There is also a sense on ground that farmers are on the receiving end of decisions and assessments about regional water use and availability, despite the presence of consultative committees. Anecdotal evidence suggests that some of the CCMA committees tasked with these consultations are constituted but rarely meet.

There is great uncertainty around the pending stream flow management plans and groundwater management plans. Farmers are aware that an environmental reserve has been allocated for the Moorabool River, but are anxious where this water will come from. The Groundwater Management plan process has become particularly lengthy, and while it remains unresolved, it increases the sense of division between farmers and authorities.

Recommendations:

- The CCMA can lead dialogue between all stakeholders in the catchment around regional water use, and changing water availability in the landscape.
- The CCMA to actively monitor its consultative groups and ensure that they are part of the civic dialogue and participants in the planning and monitoring of river related and ground water related programs.

Water Supply Catchment - *linear relationship and overall interconnection of issues*		
Social	***Environmental***	***Economic***
Increasing urban populations	impact of large urban storages on river system	economic value of bulk entitlements
Pressure on farming practice within catchment	Environmental Water Reserve- how to deliver to a modified system	
Demonstration farm : poor implementation, great idea	Declining water quality	costs of water treatment for urban supply with declining water quality
Leased land: insecurity for farmers	Impact of irrigation practices and on farm runoff / soil management	Costs of alternative water sources
Reduced water availability for urban supply	Impact of farm dams on river system	
	overallocated stressed river system	

Land Management Practices: Diversified Farming Systems

Key findings

- Potatoes are a rotational crop, and farmers grow a diversity of other crops during these rotation periods. These included lamb fattening, cattle, horse rearing as well as pasture and forage crops. Increasing diversification was linked with increased long term viability in the landscape.
- Most farmers grew their potatoes in long rotations, or less than one year out of five in any given paddock. This reportedly improved the crop yield and reduced the likelihood of pests and diseases.
- Many farmers are concerned about the declining profitability of potato arrangements. For example, one, demonstrating agrarian pragmatism, had been increasing his cattle herd size, while slowly reducing the tonnage of potatoes produced each year.
- Despite widespread concern about the declining profitability of potato farming, farmers were often reluctant to stop growing potatoes due to the comparatively poor profitability of alternative farming systems. Further, the level of investment in specific machinery was considerable.
- Another interesting parallel observed was that the less dependent on a contracted potato crop, the more likely it was that farmers would engage in natural resource management projects, eg. Landcare, or the Moorabool River Project. In this study, 2 farmers were involved in Landcare, and 4 were involved in the Moorabool River project out of 12 families.

Potatoes were one of the main source of income for most of the farmers interviewed. For many, it accounted for up to 90% of their current income. Potatoes are a high value crop, but also require rotations. This means that at any one time, farmers will only a portion of his property dedicated to growing potatoes. Potatoes can only be grown in a particular paddock for one season, (and on some occasions two seasons) until the paddock is rested from potatoes for a minimum of 3 years. During this non-potato period, other crops are grown. Only one farmer had ever used a three year rotation, and this was only in paddocks that were particularly productive.

All farmers had other crops and livestock operations during this time. Livestock enterprises included:

- lamb fattening
- sheep breeding
- cattle
- horse stud

And crops included:

- oats
- winter wheat
- Cereal crops eg. rye grass
- Oil seeds eg. Canola
- Turnips
- *Brassica* crops
- Pasture eg.lucerne

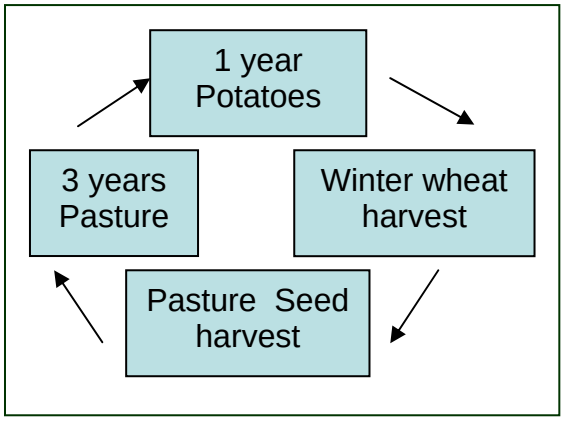
No two farmers managed their rotational systems in the same way. Rotations ranged from 3 years to 10 years. It was widely noted that longer rotations were beneficial for several reasons. Firstly, they reduced the incidence of soil borne diseases, and were associated with higher yields. One farmer described the rotations as simply part of the potato cycle:

'All those rotations are part of the potato cycle, because what you are trying to do is build up all the organic matter to get the ground in the best possible till, to grow the best crop of potatoes'.

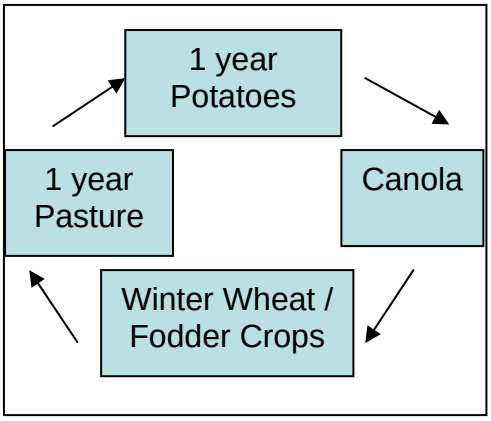
For seed growers who often grew a number of different varieties, longer rotations reduced the likelihood of having varieties that were previously planted volunteer in a new crop. The diagram below demonstrates some of the rotational systems farmers employed. The seed growers interviewed generally had longer rotations, that were up to 10 years.

Rotation production systems: Variations observed in interviews

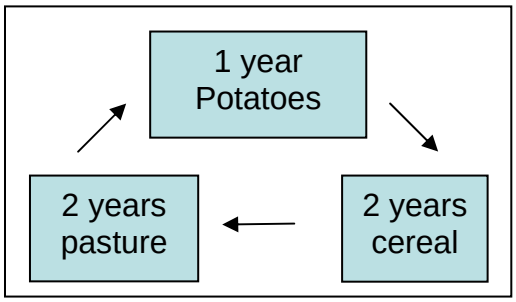
5 year rotation



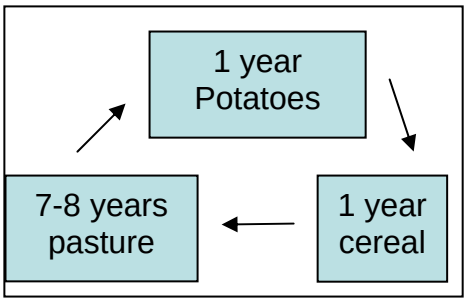
3- 4 year rotation



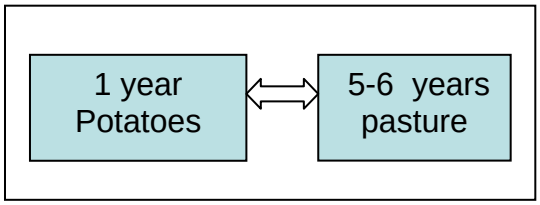
5 year rotation



10 year rotation



6-7 year rotation



Fertiliser and Pesticide Use

Greater levels of chemical and fertiliser use were associated with the Russet Burbank variety. Two of the seed growers described how they hated using chemicals. One grew no Russet Burbank, while the other grew only a small volume for long standing clients. He said:

'That's why I grow less Russet Burbanks because I don't… I hate using chemicals. I try and use the least amount of chemicals.'

Farmers who grew the Russet Burbank, were often unhappy with using these chemicals, but felt production of the Russet Burbank market ensured their viability. One described this uncomfortable compromise:

'And it is just another chemical that I don't like using, but to be viable... The Russet Burbank which is not a very environmentally, friendly potato, But you see the thing is, McDonalds require that product. The market is there – you have to grow to the market.'

A number of agency staff and farmers commented that aerial pesticide / fungicide spraying was receiving increasing criticism from lifestyle and hobby farmers who were concerned about aerial drift. One farmer noted that this had led to field application of fungicides rather than aerial spraying.

Diversifying farming enterprises

Farmers were concerned about the decreasing profitability of potato growing, and were reluctant to keep on farming in way that required such labour intensity. A number of farmers were actively diversifying their production system to reduce their reliance on potatoes. Three farmers were increasing the size of their cattle herds, so that potatoes now accounted for less than 50% of their income. One described the reasoning behind his decision to adjust his farming enterprise:

'In the past we have had more vegetable production, but we are finding with the costs of vegetable production, we are finding we have to go into more alternatives….'

Another was gradually building his sheep numbers, while another had already increased cattle numbers significantly, so that they now provided the bulk of his income. A third had a cool room for storing other growers' potatoes, and operated a potato cutting business. The potato cutting business had clients from all over Victoria and New South Wales. He commented that:

'Diversified farming practices is the way to do it, to ensure your survival…'

Other examples of diversifying land management systems that were being developed were a horse stud, and farm based tourism.

Farmer opinion was relatively divided when it came to whether these alternative farming practices would provide sufficient income if they were no longer growing potatoes. Some farmers said that stopping growing potatoes would be extremely difficult, as there was no other farming enterprise that they considered to be as profitable as potatoes, particularly due to the small acreages farmers were farming. In reference to lamb fattening, two farmers noted:

'Around this area, you don't have enough land to do it in a big enough kind of way',

And,

'*…we are doing some of that, but we just can't run enough of them, to make an income [on their own].'*

Most farmers agreed that lamb fattening was a good supplementary income, but was nowhere near a sufficient replacement, and these too had been declining in profit margin. Every farmer interviewed had considered the possibility of not growing potatoes into the future. Several farmers noted that they would have to get an off farm job, unless a market for another crop became profitable. Farmers often noted that they would also need to gain new knowledge and skills about other farming practices if they were to change cropping systems. There was also a risk associated with new cropping endeavours. One farmer reflected:

'In this area, there are a lot of hit and miss with new crops… there is a big risk involved in trying new crops… They are run on an international market, so if you put in a new crop, the imported price will govern the price you get.'

Interestingly this farmer thinks of McCain's as a local market, even after the recent experiences in the district with McCain's making it clear that it was engaging an international production market.

Some farmers felt that it was simply a matter of deciding to change, and making the change. Interestingly, these farmers all ran cattle on their properties. One said:

'It probably wouldn't be difficult – if I got out of spuds I would probably just have to get more cattle in I suppose.'

One farmer noted that it was much easier to stop farming potatoes if you did not have debt. He said:

'I have simple needs, I don't need a lot of money. I could run a few cattle, redo the pasture. If I was in debt, I couldn't do that.'

This research also identified a correlation between diversified farming enterprises and increased participation in natural resource management activities. Two farmers were involved in Landcare, one had recently stopped growing potatoes due to an industrial accident, while for the other, potatoes formed less than 50 % of his farming enterprise. Only one of the four farmers involved in the Moorabool River project had contracted potatoes as the bulk of their income. The other three grew potato for seed or had diversified their farming enterprise so that potatoes were no longer the majority of their income. This finding correlates with the comments farmers made about labour intensity in potato production precluding participation in just about any other community activity.

Clearly McCain was the main market for potatoes in this area. The fresh market for potatoes had shifted to other areas, which coincided with McCain's arrival in the area. Farmers were unable to compete on the fresh market for two reasons. The first was that they lacked the economy of scale that potato farmers in other parts of Australia enjoyed. Further, varieties preferred for fresh sales were those without the 'dirty' skins associated with the red soils of this region.

Comments:

Currently, there is advice from agencies that addresses specific monocultures. Unfortunately, this advice can be at odds with other crops a farmer may be growing. This is also because the farmers are not seen as growing polycultures but as only growing potatoes as a valued crop. For example the recommendations to fence out waterways and revegetate them is suited to field crops, but, where farmers rely on rivers and streams as a source of stock water during their rotations such a recommendation would not be appropriate. As well, extension services appear to promote McCain's in the sense that there is relatively little advice or support for diversified cropping and DPI sends its extension advice to McCain's for dissemination on some occasions. This is clearly only going to be potato production advice.

In this research, there are farmers who are proactive in seeking diversified farming crops, and who have readied themselves for future market fluctuations. Other farmers are more sceptical about alternative production systems, or diversifying their current systems, due to a perceived reduction in profitability. There is a mistrust of agency recommendations regarding alternative crops, and this could be associated with the issue of transparency. Luhmann, (1979) links trust with transparency, and argues that without transparency , trust cannot be achieved.

If an adaptive management approach (Jiggins and Röling, 2000) was taken to this situation there is the opportunity to link the ecological resources available to these land managers to their decision making; and to follow the implications for social and economic outcomes associated with diversification. For example, if the cost of water and the quality of soil are factored into the system, it might well be that other horticultural crops become more viable as production alternatives. Coupled with the social conditions associated with diversifying income away from one crop dependency and there may be incentive to change land use in the region. In a complex system, the challenge is to re-integrate the pieces that are separated out in the way that services, inputs and outcomes are factored. The looming crisis with McCain's and the possibility of one with the CCMA are examples of disturbances to the system that will have both

anticipated and unexpected outcomes. The adaptive management approach is an opportunity for the CCMA to take a leadership role in considering how to reintegrate the pieces of this particular puzzle.

There are major benefits that could be gained by having an interaction between all stakeholders, centring extension around possible change. Examples catalysts for change could be reduced water allocations, alternative high value cropping systems, change in production system and so on. By centring extension around these change processes allows agencies to be prepared and to anticipate changes in the landscape. This focus on change as a process that may embrace different crops, rather than single commodities, is part of an adaptive management approach.

Recommendations:

- Recommendations for mixed farming systems need to be responsive to the diversity of land management practices, in order for farmers to adopt them. It suggests a need for crop management advice to be integrated into landscape management advice rather than separated. This is an adaptive management approach that reintegrates the currently fragmented support to land managers.
- Further studies are required on alternative viable profitable production systems.
- Partnerships depend on transparency of purpose and anticipated outcomes in order to build trust. We recommend that this sort of relationship be a goal of the agencies and farmers, because trust is fundamental to credibility on both sides.

Diversified farming systems:- *linear relationship and overall interconnection of issues*		
Social	***Environmental***	***Economic***
Need to update skills to change practice		Financial risk in changing farming systems
Diversified farming systems provide greater flexibility regarding labour input	Tree planting and fencing out occur: provide benefits for other components in farming	Reduced financial dependency on contract: loss of 'guaranteed' income from Mccain
Reduced personal stress associated with contractual lack of control	Alternative crops may be more water efficient	Diversified income sources: impact of low contract price reduced
Demand / need for support services to enable transition into new enterprise	Reduced fertiliser and pesticide/fungicide use and associated runoff	Mixed economic viability of alternative crops
Age and education level of farmers inhibits diversification		
		Growing crops still depend upon world market prices
Decision to change varieties	Reduced irrigation intensity-- less runoff	Financial insecurity of open market potatoes
Increased autonomy of management	Increased likelihood of involvement in local and regional NRM projects eg. Landcare, Moorabool River Project	

Runoff Management

CCMA and CHW water staff often noted runoff as a main concern that was associated with farmers' water management practice, and the use of travelling gun irrigators. They were concerned about nitrogen, chemicals and sediment reaching water sources.

'There is always a risk of polluted irrigated water being run, running off these areas into water source. There's the use of nitrogen and chemicals that go along with it, and chemicals being for both disease and insect pests that are applied aerially.'

'The soil is tilled and there is potential for lots of sediment or topsoil to get into the waterway.'

One CCMA staff noted that the main issues with fertiliser and pesticide use were linked with the urban water supply catchment. They said:

'They are running off into an urban water supply catchment so that has to be an even higher priority than the environmental implications…'

Agency staff identified grass buffer strips along river banks as the common form of run off management by farmers.

'There are buffer strips around areas to prevent runoff that does occur to be captured to make sure that doesn't enter our streams and creeks.' Farmers linked run off mis-management with excessive use of water, and with steeper sloped land, and DPI staff described run off management as being about 'better control of water'.

Farmers described their run off management as:

'If you are doing your irrigation right, and the fertiliser right, you do not get runoff…. The probes make sure that you put the right amount of water in weekly, so you are not over applying, which produces run off and which produces leaching.'

'We try to be as careful as we can with our irrigation, because one the water starts running, it is not good, best practice to have that happening you know. The water is meant to be going in the ground, and not running off the paddocks. Across the other way where you have got more hilly country, you can expect some run off, even erosion.'

'In certain paddocks we do [get run off] – because the paddock I was in this year – I had to really limit the water on the side of a hill, because of that reason – run off…Before I put the potatoes in, I rip it crossways, and don't have it too fine that it is going to run down the hill.'

Ill-timed thunder storms were a cause of occasional, but major runoff, that had no specific management:

'…fertiliser application – I don't see any problems with that.. So long as you don't get a thunder storm!'

DPI staff and farmers commented on the impacts of thunder storm events , as well as technological problems. Erosion and run-off were also linked to problems with irrigation equipment.

'There is a bit of fall in that paddock over there... I had a bit of a hiccup there this year: when I was last watering the irrigator broke down in the one spot and I went to check it in the morning and it hadn't moved from halfway down the paddock…'

Comments:

There is a general sense of awareness about the links between land management practice and erosion / runoff. Runoff management does not necessarily pertain only to riparian zones: eg grass buffer strips. In areas with slope (which is almost all of the central highlands) provisions such as graded banks, sediment traps and diversion banks all reduce the effect of major storm events on run-off and associated erosion and sedimentation.(Department of Agriculture, 1991). On-farm run-off management has benefits for waterways, and also for farmers crop production. Communication of the environmental and economic benefits of greater run-off management practice would likely result in positive levels of adoption.

Recommendations:

- Expansion of run-off management recommendations to parts of the property beyond the riparian zones is compatible with farmer expectations of how to handle these issues. This message can be in conjunction with the communication of the associated environmental and economic benefits associated with these new management activities.

Farmer Water Management Practices

Key findings

- The most common means of irrigation were the travelling gun irrigator. Many farmers had tried alternatives, but the travelling gun was understood as being the most suitable.

- Drip tape was extensively advocated by agency staff as a water efficient alternative to the travelling gun. Farmers had experimented with this, but had experienced a wide range of draw backs with it and had decided not to continue using it. These limitations included mice eating the tape, difficulties in lifting and placing the tape because of ongoing field rotations, and reduction in yield.

- Centre pivot was also advocated, but this too had it's limitations for many farmers. The major limitation of centre pivot that farmers described was that it was suited to large square paddocks, and their paddocks were too small.

- Changing technology was also significantly restricted by the high cost it incurred, with no guaranteed return. This was exacerbated by the uncertainties associated with McCain's long term plans in the region.

- Water was sourced from either groundwater or dams, or a combination of both.

- A number of farmers did not use all their groundwater allocations, and viewed them as back up to their water supply. This is in direct contrast to agency understandings of groundwater licenses being completely utilised. Several farmers noted drops in their groundwater levels in recent years, and a reduced reliability in the flow.

- The amount of water accessible determined the area of potatoes planted. Some farmers had sufficient water to continue their current practices, whereas others were under pressure due to the reduced annual rainfall since 1996.

- A key concern with water management was the cost of application. There has been a marked increase in pumping costs due to the increase in fuel prices. Over the last year, fuel prices have increased dramatically, leading to a massive rise in the input costs for a crop. This rise has not been incorporated into contract prices.

Irrigation Methods

Travelling gun was the most common form of irrigation practice. Eleven of the twelve farmers used travelling guns as the main form of irrigation practice, and the other one used a lateral boom. Only two of the twelve currently used anything else in conjunction with the travelling guns. Despite this, all farmers were well aware of alternative irrigation methods, but felt that they had limitations. Several farmers were considering changing their irrigation method to solid set, but were concerned about the significant costs associated with the change.

Travelling guns were extensively used for several reasons. Firstly, they were reliable, and fairly long lasting. Compared to other irrigation methods, they were considered to be less expensive. Centre pivots were advocated by many farmers, but they could not use them on their farms. One farmer said:

And to have a big centre pivot, we just can't, I mean we would love to, but we have just got 10 hectare blocks, 20 hectares and 5 hectares, and the little guns, I mean they are not the most efficient way of watering, because they are high pressure, but you don't have any other options unless you have big acreages.'

Travelling guns can be used on small paddocks, which centre pivots could not. Travelling guns can be used on paddocks of irregular shape, but centre pivots necessitated square paddocks. Further, the centre pivots were notably more expensive to set up than travelling guns. Solid sets were a favourable option for many farmers, and cost was the only main restriction in the uptake of solid set .The key advantage centre pivots and solid set was that they reduced the labour intensity of irrigation , as farmers did not need to continually move them, unlike the travelling gun.

You have just got to turn it on, I could really handle that! I am not getting any younger.'

"If you go for all solid sets, all you need to do is jump on the motorbike and go out and do it and ride around on the motorbike and be back, you could do that with a torch, without any work shifting an irrigator at night.'

On the other hand, the travelling gun is easily relocated capacity and this was also an advantage, due to the rotational system of growing potatoes. Potatoes are only grown for one year out of every four, five or even ten years. Solid set could not be moved, and would therefore need to be installed in every paddock that had potatoes at any time, which would be extremely expensive.

The travelling gun was the most prevalent means of irrigation, but farmers noted some disadvantages to using the travelling gun. Travelling guns are particularly labour intensive, as they have to be relocated from paddock to paddock. One farmer who had a larger property than most (1300 acres) employed someone during irrigation season whose job was to move the irrigators. He noted:

'They are pretty labour intensive guns, you have to shift them everyday, and when you have 7 or 8 of them... There is one man and that is all he does, and he won't be able to do it all.'

It was also noted that travelling guns have other costs associated with them, including in the case of one farmer, the upkeep of 14 tractors…one for each paddock. Maintenance of the guns and pipes is also an uncosted (in this study) aspect of the system.

Water management was one of the key reasons why potato production is so labour intensive in this area. (Please refer to discussion on Labour Intensity, page88)

The main practical issue with travelling guns was that water distribution was affected by wind, which meant that water didn't necessarily go on evenly, and sometimes ended up on neighbouring paddocks. One agency staff member noted that travelling guns created

occupation health and safety issues, as water landed on roads, making them slippery. Farmers used their travelling guns at night, for two reasons. Wind was considered to be less during the night, and electricity was at off – peak rates. Some farmers argued that changing irrigation practice, in relation to watering, may not necessarily equate to significant reductions in labour intensity, as it was important to be monitoring irrigation, and monitoring the crop.

'They require time to move, but then, all irrigation systems need monitoring…'

Drip Tape

Drip tape was one of the most contested issues that emerged in this research. Agency staff repeatedly cited drip tape as a means to significantly increase water use efficiency in this area. There was agreement from all agency staff and farmers that drip tape required significantly less water, almost 50% less. Agency staff were often critical of the lack of uptake of drip tape by farmers, and several suggested that there was no real reason why farmers had not extensively adopted drip tape. This is shown in comments such as:

'…And that [drip tape] is just waiting to be really heavily adopted.'

Agency staff involved with farmers on-ground were more reserved in their appraisal of drip tape. Drip tape did equate to significant water efficiency gains, but it had drawbacks. These included pest animals such as mice chewing through the holes, and also, it could not be used on a slope.

No farmers interviewed were using drip tape as irrigation technology in this potato season, although all farmers were aware of drip tape being used in the region, previously. Four farmers interviewed had experimented with drip tape, and had discontinued using it. They also noted the water efficiency gains, but felt that the drawbacks outweighed this benefit. The main limitation experienced by farmers who used it was that the potato yield was significantly reduced. Also, it was labour intensive, was prone to damage from pest animals and was difficult to dispose of at rotation time. It was difficult to transfer between paddocks, and the variation in paddock lengths restricted the transferral of tape between seasons.

The following quotes highlight some of the experiences farmers had with drip tape on their properties.

'So, we decided it was too much work, but the idea was good, but it has got[limits]... rabbits chew holes in it, and if rabbits are living in the fences, you have to have someone checking it out all the time to make sure they haven't got any holes in it, once they're underground, it is hard to tell whether there are holes or aren't holes, and by the time you do it is probably too late, they [the potatoes] are all too wet.'

'It definitely cut water use, but it is expensive and time consuming. And I couldn't see me putting a lot of it in, because the cost of that would finish up costing me more than it was worth… The cost of the tape, the laying it and treating it and all of that is – makes it more expensive in the long run.'

'When you try and roll it up, and then the next paddock may have different length requirements, and then one guy [I know], the bugs got in and ate holes in the drip tape, and it really is the most environmentally unfriendly material to try and dispose of… it is an excellent idea but for

what it costs and returns, look if the returns were there, you could justify it, but the returns aren't there.'

Decision making around drip tape reflected integrated consideration of water efficiency in an increasingly dry climate, the costs of installation and use, the labour input required, the suitability for the local environment, and the suitability for the potato crop.

Restrictions to changing water management

Farmers discussed the pros and cons of travelling guns and also of other technology that was available. The key reason farmers were reluctant to change their water management practice was cost. Significant investment in new equipment was considered to be a risk, as in the current climate of declining contract prices, they could not be sure of a return.

One seed grower was considering changing to solid set, and he noted:

'I'm sort of in two minds at the moment, it's alright if it stable, but if you go out and invest in it and all that, and you get a hiccup like last year, then you are in trouble.'

Other farmers noted:

'*To turn around and spend three or four hundred thousand on a couple of pieces of equipment, you really have got to think twice about it.'*

'To be more efficient with water management costs a lot of money, and you can't guarantee a return.'

Several farmers also considered water efficiency gains to be unrealistic, which was in strong disagreement with the comments made by agency staff, and other farmers. These farmers perceived that a crop of potatoes would always require the same volume of water, regardless of how it was applied. One said;

'Potatoes require a certain amount of water, the ideal is about 4.5ML per hectare, to grow a hectare of potatoes, and basically they will end up using that much water no matter which system you use.'

This argument is not backed by any conclusive evidence.

Water Source

Farmers sourced their water from farm dams and from ground water. Farm dams were frequently physically located on streams or were spring fed. Some farmers pumped groundwater into farm dams. Where wetlands occurred on properties, these were always drained and piped into dams, providing an additional source of water. This practice of shifting water from one place to another raises questions about evaporation. Interviews did not indicate why farmers employed this practice.

Groundwater Use

Groundwater is sourced from the Bungaree Groundwater supply protection area (GSPA – Groundwater Supply Protection Area). The Bungaree GSPA is over- allocated, and for this reason a groundwater management plan is being prepared. There is currently a moratorium on any new groundwater licenses, at least until the pending groundwater management plan is finalised

Farmers reflected on the variability in groundwater reliability, with some farmers needing to deepen bores over the last five years. Several farmers had noted that groundwater had been less reliable in recent times, but this was often attributed to climate change. One farmer reflected that it was hard to determine whether the changes to groundwater availability were due to the delayed affects of over-use, or climate change.

There was considerable disagreement between agencies and farmers as to the extent of use of groundwater licenses. Some farmers commented that they never used their groundwater licenses to the full entitlement. The licenses provided a form of security, and in the words of one farmer they 'drought proofed' the farm. In this way, some farmers saw groundwater licenses as a form of backup, which was become increasingly expensive as licensing costs grew. Landholders referred to 'sleeping licenses, and emphasised the need to not overuse the GW resource. The existence of sleeping licenses is beneficial to the environment, as it is water that is allocated that is not being pumped, and also to the farmer, as it provides water security. Agency staff differed in their assessment of groundwater usage, and commented that farmers would use as much of their licenses as is available.

Farm Dams

Farm dams have received extensive criticism in this region, for their impact on stream flows in the Moorabool River (CRCS, 2003, SKM, 2005). Farm dams intercept water that would otherwise run off into the river, or leach into groundwater tables. A Southern Rural Water staff member noted that in this catchment, urban storages and farm dams are the key impacts on the river's flows. In a discussion around groundwater licenses, he noted that the importance of the licences pales in terms of impact compared to the impact of farm dams in the catchment:

'Don't worry about the [groundwater] licenses, worry about the farm dams, because that is just the way they irrigate. Because there are lots and lots of on-stream dams, and it is just dam after dam after dam. And so when it rains the first guy gets everything, until it fills and then the second guy gets some, and actually get flows down the river is nearly impossible.'

CCMA staff members reiterated Southern Rural Water's c concerns about the impacts of farm dams in the catchment.

In visiting these farms, we observed that most of the farm dams were not concreted or lined. This suggests that seepage still occurs into the regional hydro-geological system.

A major finding in this study is that farm dams are not considered to be a part of regional hydrology by farmers. There was no connection made by farmers during the interviews between farm dams and declining groundwater levels, nor farm dams and stressed flows in the Moorabool River. Farmers did not consider their farm dams to be part of regional waterways. One farmer criticised his upstream neighbour because the neighbour did not let passing flows from his on-stream dam go down a stream that they both had dams situated upon. This

fundamental disconnect is a significant issue for the CCMA in engaging all stakeholders in responsibility for managing towards community outcomes.

Farmers are aware of the impact of urban storage dams on waterways. This disconnection is further confirmed by the fact that almost every farmer commented that construction of new urban water storages was the solution to regional water shortages. According to farmers in the region, there has been no new dams built in the catchment in the last 30 years. Clearly, large storage areas would be expected to catch rainfall that is otherwise 'wasted'. Both the issue of farm dams and urban storages suggest the need for a CCMA communication strategy that assists everyone to understand the hydrogeology of the region and the way that water is distributed 'naturally' in the landscape. As Tim Flannery said in a public lecture at Melbourne University in 2002, most of Australia's older generations grew up believing that the water systems they learned in high school textbooks, textbooks that really reflected northern hemisphere experience, were applicable here. Instead, our rivers fill the last, and have no ice melt to buffer rainfall. Our continent fills first and percolates water to the rivers in a lateral movement, depending on the local geology. It is apparent in this research that the majority of land managers in this region see the water in the river as separate from water in the aquifer.

Farmers contemplating expansion of production area are doing so based on their understanding of water available to them on new properties. One farmer was confident that he had enough water already to purchase new land that had no water source; whereas others were looking at only purchasing properties that had independent water storage already.

The reliability of water storage and the tied cost of water pumping was associated with farmers' profitability in the landscape. One farmer who had recently stopped potato farming due to an inability to make a profit had up to 13 bores being pumped to irrigate 100 acres:

'That has been another big cost to us, we have had to run a lot of small flow bores, and we would have up to 13 pumps running to run 100 acres, mostly on diesel, so big costs, and big maintenance costs too.'

This highlights that it is not just the number of bores that indicates the amount of water, but the size of the bore relative to pressure, and the depth of the bore, relative to distance to bring the water to the surface. Pumping relies on fuel and the rising costs of fuel have to be added to production costs. Some farmers had spring fed dams, which flowed almost year round. This significantly reduces the costs of pumping and water application. Commodity production tends to have the farm business bear all the costs of production, including those associated with fuel rises like increased transport costs, machinery operating costs, etc. In the case of potato farming it is another example of advantage that lies with the corporate buyer.

Irrigation of rotational systems

Only some farmers irrigated their rotational crops: such as pasture, ryegrass, and forage crops. Farmers who did irrigate the rotation crops felt it added value to their stock enterprise.

'There is prime lamb production that we use water for, to grow fodder crops, and along with that there is lucerne. On the dry years with our cereal production we will also irrigate if possible, cereal crops or oil seed.'

Farmers who didn't irrigate considered it to be an uneconomic use of the water resource.

'I guess in terms of value, it is more logical [financially] to put it on the potatoes… so we don't irrigate our pastures at all.'

Another comment made about irrigating rotational systems was that it was hard to co-ordinate: Potato crops required such intensive irrigation, that is was often difficult to find the time to irrigate other crops, let alone allocate water to it.

'Very occasionally you might irrigate a [rotation crop] , just to start it off, or to finish it off at the end of the season, you usually only have an irrigation plan to suit potato crops, so it is very hard to fit watering another paddock at the same time.'

Concerns about water management

The two key concerns that farmers described when talking about water management was the costs of irrigation, and the uncertainty surrounding future water availability. The labour intensity of water management was also repeatedly discussed, and this is reviewed in the section Labour Intensity of Crop Production (page 88).

The costs associated with irrigation were a major concern to farmers as they had dramatically increased over the last year, in keeping with the nationwide increase in fuel costs. Rising fuel costs had a serious impact, as fuel is needed to pump water from bores or dams and to run all tractors and machinery. The rise in fuel costs also affected fertiliser prices. Farmers under contractual arrangements with McCain have been unable to pass the rising fuel costs on: the prices they receive for their potatoes do not incorporate the rising fuel costs.

Irrigation costs were also described in terms of equipment. The different types of equipment all had advantages and disadvantages but the main inhibitor to changing irrigation system for many, was the cost associated with it.

Additional references: [3]

Comments:

It remains unclear where the benefits of improved water efficiency on farm would be received. Increasing the water efficiency of potato crop production would presumably lead to water being used on other crops, on farm, unless that water was legislated 'away' from farmers. In this scenario, if improved water efficiency is about the provision of environmental flows, then there is contention amongst the farming community over this water being provisioned to increase the available water for urban water supply allocations.

Farmers identified crucial restrictions in the adoption of increased water efficiency irrigation technology. These included paddock size, effectiveness of recommended technologies and cost restrictions.

[3] Please refer to the sections Labour intensity of water management (page 88) for further discussion on labour intensity of crop production, and 'Water security' (page 44) for further discussion on climate change and reduced water in the landscape, and 'Urbanisation' (page 84)for further discussion on the restrictions on water availability for farmers.

In an intensive production such as potato farming, water availability and storage are critical. Farmers valued their dams and groundwater bores, but generally detached these from regional hydrological systems. Farm dams and Groundwater bores were often linked to neighbour's activities, but they weren't connected to the regional hydrology. 'Waterways' was considered as specifically relating to rivers and creeks and some farmers didn't identify springs as waterways. This tendency to consider water located on farm to be disconnected from regional systems is dangerous, as it disconnects farmers from their impacts on regional water availability.

Recommendations:

- Communicate the linkages between on-farm dams and the regional hydrological landscape, where waterways are not considered only as creeks, but also as farm dams.

- The restrictions that farmers noted in relation to improved water efficiency irrigation technology need to be considered and incorporated into the provision of future recommendations for irrigation technology.

Commodities in the Landscape

Key findings

- The downward pressure on prices for contract potatoes has resulted in many smaller potato farmers no longer growing potatoes. Larger property owners note that an economy of scale enables them to have a profit margin.

- Over 90% of potato growers in this region grow their crops under contract to McCain, who operate a potato processing plant in Ballarat. Most growers are contracted to grow potatoes for processing, while a smaller number are contracted to grow seed potatoes.

- McCain demands the Russet Burbank variety of potato, which has very high water requirements. It is also requires regular fungicide applications, and the fertiliser requirements exceed those of many other potatoes.

- The contract prices are negotiated by the McCain Growers group for all potato growers. There has been considerable conflict between McCain and growers over the price for the crop. These negotiations often occur well after the crop has been planted. There are almost no alternative buyers for the crop, and in this way, growers are tied to McCain.

- The overall declining profitability associated with these contractual arrangements is on many growers' minds. There is also an awareness amongst growers that McCain is deliberately pushing the number of growers down.

- For many growers, McCain agronomy service is the principal source of extension. Many growers pay a substantial fee for McCain to conduct moisture analysis on their paddocks and nutrient testing on their crop. McCain then provide advice to farmers about watering, fertilising and disease control.

McCain has a significant role in potato production in this area. They contract over 90% of potato growers in the area, either as fresh potatoes for processing, or they contract seed potatoes, which are then sold to their contracted processing growers. Four of the growers interviewed grew seed potatoes, and two of these did not grow for McCain at all. (One had grown seed potato in the past for McCain, but McCain had ceased to contract his product as the size of his crop was reportedly too small.) One grew a small amount of seed potato for McCain, and this was because he was good friends with the growers who would be planting his seed potatoes.

McCain demand for the Russet Burbank variety creates a series of dilemmas for the CCMA. It is well documented that the Russet Burbank uses higher levels of fertiliser, has significant higher irrigation requirements and also requires regular fungicide sprays (Lee, 2004: Wilson, 1999). The high watering, fungicide and fertiliser demands of the crop means that the input costs of the crop are extremely high. (Please refer to the section on land management practice for more discussion on the Russet Burbank variety.) The CCMA recognises that potato farming

is a threatened industry in the area and to assail the farmer management practices without considering their inter-connectedness to the social and economic fibre of the region is unlikely to achieve much support. Therefore, any changes to potato cropping at a production level require an integrated approach on the part of all the stakeholders, with the possible exception of McCain's.

Potato farmers unanimously agreed that the main benefit of growing potatoes under contract to McCain is a guaranteed income- provided the farmers delivered the crop. This guaranteed income not only provided certainty that the crop would be sold, but could also be used to negotiate loans. Growing potatoes on the open market had no certainty. There was no guarantee of selling the crop or of meeting their costs, let alone making a profit. In this the potato farmers recognised that surety of sale came at a high cost. The potato farmer dilemma is common in many commodities and across many nations of the world. Globalised markets put pressures on local environments and regional production networks.

McCain built it's processing in Ballarat in 1975 (McCain website, 2006), and has been contracting growers since then. Farmers commented that initially the contract arrangement was quite profitable, but this had been declining. Agency staff also noted the declining profitability of the contracts, and that farmers were in a difficult position. *'Farmers are price takers, not price makers.'*

Farmers also noted the difficulty of getting a price for their product that reflected the costs. One observed:

'When our inputs go up, we find it very hard to pass them on to the next step…'

Contract prices are negotiated by the McCain Growers Group on behalf of all farmers. During the last potato season, McCain initially tried to decrease the contract price by 14% over the next 3 years (26/10/05, ABC Online). Potato growers were dissatisfied with this, particularly in light of the rapid increase in input costs, such as fuel and fertiliser. Contract prices were only agreed upon as harvest was commencing. For farmers, this was an incredibly stressful and vulnerable position to be in. They had committed land, labour and financial input into the crop, but were uncertain what the return would be. The final contract price agreed upon was a $3 a tonne price cut, bringing the contract price to $227.50 for the next two seasons (Weekly Times,05/06/06).

Farmers described how the scale of operation enabled larger farmers to remain profitable, while smaller farmers were unable to continue to make a profit. One said:

'Being a larger grower, there is generally a bit more margin in there than a smaller grower… If you do the job right on a big scale, well there is margin there.'

The recent occurrence of lower profit margins and increased uncertainty caused several growers to comment that they were considering their options:

'While it is still profitable yes, but I am not going to be working for nothing….It has crossed my mind a few times a bit in the last couple of years – what to do and whether to continue doing this and if I don't what to do.'

Another farmer said:

'We acknowledge the contract does give us security, but at the end of the day, if we have not got a sustainable price, we are better off not growing potatoes.'

This quote clearly highlights a determination to be proactive approach to production. It acknowledges the benefits of contract production, but also shows a willingness to change production if the current contractual arrangement is unfeasible.

Comments:

The current practice externalises the costs of fuel and water and soil, and does not cost a considerably higher labour input. These factors increase the pressure on farmers to maximise their returns, and to intensify their land use. Further, farmers act as indentured labourers on their own land. They do not feel empowered to withdraw their labour, crop or resources. McCain effectively 'beats the drum'. It is important that such a powerful force in the landscape be involved in local discussions about regional resources. Engaging McCain executives in the CCMA committees may be one way of ensuring that McCain understands how it is perceived in its local communities.

McCain Agronomy Service

McCain deliver an agronomy service to growers, at a significant cost to growers. This service is delivered on a per paddock basis, and includes soil moisture testing to establish irrigation requirements, and nutrient testing. Farmers were not obliged to buy this service, and could select to have only one type of testing or both. Some farmers chose not to use this service, others only had the service conducted on one paddock, which was then a guide for other paddocks, others only had problem paddocks tested, while others had all potato paddocks tested. For many farmers this is the main source of direct extension that they receive. Petiole tests were conducted approximately 6-8 times per season, and moisture readings were done two or three times a week. All farmers had positive relationships with the field officers. Any criticisms of McCain were around contractual arrangements, and McCain on-ground field officers were well liked. One farmer commented:

'They are on the farm and they will drop in and if they see a problem they will let you know, so yes, we talk to them quite regularly, during the growing season it is probably two or three times a week.'

One farmer who still grew potatoes under contract but did not purchase the agronomy service anymore outlined his reasoning for no longer purchasing the service. He felt that McCain was willing to give advice, but not take responsibility for the advice. Further, he felt that their advice advocated excessive watering:

'Basically they won't take responsibility for the decision. That's firstly, and secondly there was trouble with the water issues. We could never put enough water on our potatoes, they literally wanted us to drown them… I just didn't agree with what they were doing, so I do it myself now.'

Comments:

The provision of corporate agronomy services raises a number of issues. It is advice that looks solely at the production of the Russet Burbank potato crop. It does not address rotational

systems and there is no integration of environmental messages into production recommendations. Its ultimate motivation is to maximise the quality and volume of the potato crop, for subsequent use in the McCain processing factory.

The capacity of McCain to deliver advice and management practice recommendations to all the farmers who purchase their agronomy service raises more questions about the role of McCain in the regional landscape. Through delivering extension to these farmers, McCain has significant input on land and water management in the area, but no responsibility for the consequences of their advice. Examples of negative consequences could be for the individual farmer through reduced yield, or for the landscape: increased water application, leaching, fertiliser and pesticide use etc.

The cost of receiving the service could quite easily exhaust farm budgets and therefore inhibit farmers from seeking advice from other sources, for example agronomists and private farming consultants.

Recommendations:

- CCMA and other agencies with land and water management responsibilities in the catchment to develop a relationship with McCain, and seek opportunities for input into the land and water management advice that farmers are receiving.
- Explore and promote attractive viable alternative modes of production that are ecologically and socially sustainable, for farmers to adopt to reduce their dependency on McCain contracts.

.

Commodities in the landscape: *issues all interrelate with key theme -- not necessary to read across the page*		
Social	***Environmental***	***Economic***
Individual stress	Diminished priority of environmental considerations in management practice	High level of farmer indebtedness
Lack of control over own future	No incentives provided by processor for EMS	Reduce costs for Company is reduced profits for farmers
Future of potato growers largely dictated by processor- social impact of McCain leaving	No corporate accountability for environmental impacts of their recommended practices	Major economic impact of McCain leaving the region
Differing relationships between small growers and large growers with processor	McCain extension delivers production focussed outcomes not environmental	Lack of alternative market for potato crop
Lack of grower and community trust in processor	Agency expectation that processor will demand EMS (inaccurate)	Accumulated debt restricts changing practice: locked into current practice cycle
Lack of agency engagement with processor - CMA, DPI, CHW,	Processing demand for high water use and high fertiliser, pesticide crop: Russett Burbank	Globalised market of price setting
DPI reliance on McCain to deliver most extension services		Maximise production efficiency focus
Processor interest in consolidation		Farmers price takers not makers: unable to pass on increased input costs
Lack of control over farming enterprise and inputs ie.labour,fertiliser		High water use potato crop prevents water being applied to rotation crop systems
Security of guaranteed income with contract		Contract enables bank loans and decision making about capital investment
		McCain funding and delivery of fertiliser and chemical trials

Extension and Information Sources

Key findings

- Department of Primary Industries extension has downsized its services over recent times, and many farmers lamented the difficulties in accessing DPI services. DPI field days were sometimes attended, and these generally addressed management of the Russet Burbank crop. McCain is the principal source of on-farm extension, and for many growers, have far greater effect on land management practice than any other extension source.

- Consultants provided advice to a small number of growers, but McCain extension dominates. McCain provide an agronomy service to growers. McCain does not include environmental messages into this extension program, as their focus is purely production efficiency. There is no input into this program from any government agency. However, DPI staff have indicated that they intend to provide information to McCain with regard to pest management.

- There had previously been a demonstration farm, which appears to be one of the only sources of environmental messages integrated with production messages that farmers have received. Farmers discussed the demonstration farm in positive terms, and almost all had modified their production practice in some way as a result. The demonstration farm no longer operates, and this is largely due to a failure of initial design relative to its location.

- The Courier and the Weekly Times were frequently cited as sources of information, and several growers used the internet to access information. '*Eyes on Potatoes'* and '*Potatoes Australia*' are the two main industry journals, and all growers received them.

- McCain, DPI and industry journals all provide information about production, and improving production. There is a marked absence of environmental messages being incorporated into advice farmers receive.

It was widely noted by agency staff and farmers that the presence of DPI in the field had significantly reduced over time.

'*They are just non existent these days.'*

Most agency staff and farmers noted the valuable contribution of Bruce Fry, the DPI potato extension officer, and were sorry that he was leaving the DPI soon. (He is being replaced so the position is not lost on his retirement.) They also commented on the large geographical area that he was responsible for as an extension agent. Bruce Fry was based at Colac, and there are no potato extension staff in Ballarat, despite the large number of potato farmers in the areas surrounding Ballarat. (This is subject to change in 2007, with the pending arrival of a DPI graduate entry staff member in Ballarat who will focus on potato extension.)

Farmers described how they had received considerably more extension in the past from DPI than they did now, and that access to staff is restricted these days. This next quote is from a farmer who was disappointed that you could not visit DPI's offices and receive assistance as he could do in the past. He said:

'I've found that if you want to sort of go and approach anybody at DPI now – you just cannot. You may as well just get on the internet.'

Not only can farmers not just turn up and get information as they had done in the past, the closest office with potato extension services is located in Colac, so farmers have to drive to Colac to DPI information on potatoes.

There is an understanding by DPI that McCain will deliver best management practice recommendations, but it is not clear who defines 'best management practice'. As an example, if DPI was defining BMP it would surely consider the other crop rotations and the effects of residual chemicals, the need for buffer zones and the percentage of land out of production that could effectively contribute to other cropping regimes such as analogous tree plantations as hedgerows. If the CCMA was defining BMP, it would want to factor in the amount of water required for each crop, the degree of slope affecting soil erosion, the likelihood of salinity within the paddocks and appropriate mitigation during and after potato rotations. In reality, there is an implicit acknowledgement that McCain's is only interested in BMP as it implicates production goals.

Current DPI practice delivers most extension services through field days. DPI extension for potatoes is part of the Vegcheque program: which delivers extension for vegetable industries. Over the last 5 years, field days have mainly looked at the results of water efficiency trials (drip tape is one example) and disease management trials. A field day held this year looked at the effects of soil amendments and trickle tape on the occurrence of powdery scab, and the effects of pasture spray out on *Rhizoctonia*. The Russet Burbank was one of the two varieties in these trials.

Vegcheque field days deliver practical advice for farmers' current management, but do not explore the possibilities of alternative production systems, or environmental management systems integrated into farming practice. As the name implies, Vegcheque is focused on increasing profitable production. It is offering a similar service to McCain's extension program but McCain's is focused at the level of the individual farmer whereas Vegcheque is generally a group extension process, albeit at no cost to the producer.

Farmers sometimes attended field days, but attendance was often poor. The main reason given for this reduced attendance was that farmers often simply did not have time. It was often commented that these farmers are hard to get off their farms:

'It is a difficult area, they are hard to get off their farms.'

and,

'It is very hard to get people around here to actually go and do it… probably because they are always so busy trying to get their own stuff done.'

One farmer observed that the poor attendance that often occurred at field days was related to the timing of the field day clashing with on farm management activities, but acknowledged the difficulty in finding a day that suited everyone's needs.

'I think everybody just seems to be so busy, sort of trying to make ends meet, and they just find it difficult to attend. I can give you a classic example... often a field day or seminar day is held, but it is in the middle of our lambing program, so you know, we are full on lambing. That's what we are doing so I find it extremely difficult to go. That's held in August… as much as I say that it is hard to find a time and a day to suit everybody.'

Lessons learned from Landcare suggest that it is important to harness the goodwill of community leaders in advancing the aims of the CCMA. While it is important to circulate power rather than keep it captured in the hands of local elite; in the first instance, demonstration events that originate within the groups or communities and are auspiced by accepted leaders are likely to have more of an audience than those understood to be exclusive.

The Demonstration Farm

A demonstration farm was run at Clarkes' Hill up until several years ago. It was formed in 1994, as part of the Food Crop Development centre, and in partnership between DNRE, the potato growers and Central Highlands water as well as Ballarat University and the school of mines. It was established in response to high levels of phosphorus occurring in the river linked to potato farming in the catchment. It's purpose, according to the demonstration farm manager was to:

'Demonstrate better farming practices, and then hold field days, and the like to educate farmers.'

Farmers had all participated in the demonstration farm activities, and almost all had adopted some of the initiatives displayed there. Winter wheat was the most successful crop trial demonstrated, and has been widely adopted across the region. It's success can be attributed to the multiple benefits it provides. Sowing winter wheat following a potato crop provides some additional income to farmers. It also prevents soil loss and sediment run off into waterways. It is relatively simple to sow, and requires little labour input.

Farmers were generally positive in discussing the demonstration farm, and many were sorry to see it no longer in operation. There was no unanimous agreement as to why the demonstration farm no longer operates, but interviews generally indicated that it was due to it's design rather than intent. An objective of the farm was for it to be run as a commercial potato farming property (to explore profitability) and, for it to conduct crop trials. Often the demonstration farm's aims differed from the commercial farmers. The manager also noted:

'I think the real option was that we needed to have our own demonstration farm, away from a commercial farm. And sure we needed to look at, to keep it commercially oriented, but we also needed the independence.'

The demonstration farm integrated environmental and economic considerations into it's operation. However, the integration of experimental work was unsuccessful, as it failed to account for the economic imperative of the commercial farmer. In a social sense, the farm

provided an opportunity for farmers to be a part of experimental work, and to monitor the progress of it by driving past, rather than committing to attending individual field days.

There are a diversity of sources for extension production advice, as highlighted below.

'There is some information coming out from the DPI, especially on the potato side of things. It certainly has got more minimal. You can access the internet if you want to or seek other professional advice. A lot of it, I guess, you rely on past experiences.'

Farmers said that government, consultants or even companies, including chemical and fertiliser distributors were reluctant to give firm advice and recommendations, due to the increasing issue of liability. This is articulated in this quote:

'What I really hate these days is that people really are reluctant to give you advice because of liability, and that's right across the whole thing… Out of government, or even private people.'

Four farmers accessed the internet regularly for production advice, and all farmers received the Australian potato journals 'Eyes on Potatoes' and 'Potatoes Australia'. Like the Vegcheque field days, these publications are strongly oriented around production practice, and maximising production efficiency. They also focus on crops such as the Russet Burbank, and much of the research studies published in the journals are funded by McCain and other corporations who process potatoes. McCain, Vegcheque (through DPI) and potato journals provide the majority of extension to growers, and these are all focussed on production.

Most farmers also subscribed to the Weekly Times and the Ballarat Courier. This provided general information that was not necessarily targeted at potato production, but farmers felt that it was relevant and interesting. Some farmers employed the services of consultants on occasion, but this was more on a one – off basis.

Comments:

In the past, extension was strongly focussed on commodities. Now, farming systems are diversifying and there is recognition that farming systems are complex. Adaptive management that responds to these diversifying and complex systems is more likely to be able to achieve sustainable outcomes than the traditional modes of extension delivery. In the view of the researchers, the CCMA has a critical role to play in the reconceptualising of an integrated extension service approach.

Farmers are receiving advice and information from an increasingly wide range of sources. The reality is that most of these sources are production focused, and fail to account for environmental considerations. There is a considerable disconnect with the DPI expectation that McCain will deliver extension and Best Management Practice recommendations. It is overwhelmingly apparent that McCain's focus is on production efficiency, and the maximisation of profits, and not on environmental or social considerations. It raises questions about whether McCain would provide advice that is at odds with the primacy of potato production. There is no easy solution, especially in light of the declining funding of rural extension services such as DPI.

The demonstration farm was successful in many ways, but was ultimately unsuccessful due to it's function as both a demonstration farm, and its location as part of a commercial potato farmer's production. The successful characteristics of the demonstration farm are valuable in consideration of new directions in extension for farming groups.

Recommendations:

- Integrating environmental messages into the production messages in journals, weekly papers and field days would ensure that farmers receive information about environmental management practices.
- The successful characteristics of the demonstration farm could be translated into a new system of demonstrating farming practice, disconnected from corporate sponsorship.
- Extension needs to shift focus from single commodities to building local capacity around multiple outcomes, so that it is more flexible. Single commodity extension does not have room to acknowledge complexity. Adaptive management may reduce the likelihood of liability and concerns around it, but more importantly, through building local capacity, build resilience in both the decision making process and in the shared responsibility for their outcomes.

Extension / information sources:issues all interrelate with key theme -- not necessary to read across the page		
Social	***Environmental***	***Economic***
Reduced DPI presence in region:	No agency extending messages about water quality on ground	Major reliance on McCain extension : production focus
Significant lack of integration between Agencies:	McCain doesn't provide any NRM advice	Growers pay for McCain crop management program
Extension limited in success off farm: limited attendance at field days etc	Limited NRM extension onground	Reduced Govt spending on DPI extension
Farmer apprehension in seeking consultatitve advice about farming	Limited attendance at Landcare meetings	DPI crop trials delivered through McCain field officer
Financial counselling generally during crisis	Industry journals have production focus: lack of environmental messages	Industry journals focussed on production and profitability
Agency expectation that another agency is providing NRM extension	Varied uptake of Moorabool River project/ willow removal	Industry council focussed on increased competitiveness and profitability
Discussion with other growers regarding land management:	Water efficiency related to limited availability before environmental benefits	Extension from input companies: fertiliser and chemical companies

Lack of Agency Integration

Key findings

- There is a perceived lack of integration between agencies, which occurs at a number of levels. For farmers, there is a lack of certainty about the roles of different organisations. CCMA was frequently confused with CHW, as well as some crossovers with SRW.
- At an agency level, there was a lack of clarity about what other agencies were delivering. Here, staff from CMA's indicated that DPI was responsible for certain extension actions, such as environmental aspects of management.
- There was also some expectation on the part of DPI that McCain would deliver a complete extension program to these farmers.
- CMA's and water authorities have delivered projects on riparian protection, but these are not integrated with the other forms of advice that farmers are receiving.
- There is no sense of a holistic extension delivery, or whole farm management advice. What appears on-ground is that separate parts are managed by separate agencies with little if any cooperation or collaboration.

Farmers frequently confused the roles of the water authorities. Sometimes the CCMA was mistaken for Central Highlands Water, where it was considered to allocate water for urban supply. At other times, farmers mistook the CCMA for having the regulating responsibilities of Southern Rural Water. These agencies all have roles in water management, but there is confusion about what role each has. CCMA staff reflected that this misunderstanding existed:

'There would be a lot of confusion I think, between the CMA and Central Highlands Water in that area. Because Central Highlands obviously has the reservoirs, they are probably being seen more regularly up there.'

Of more concern was the lack of integration between agencies about the extension they were delivering to farmers in this area. CCMA staff deflected questions on best management practice recommendations to the DPI, including environmental management practices. DPI on the other hand identified that their extension was largely production focussed. Further, the geographical region covered by the potato extension officer was significant. However, DPI noted that they were not delivering Best Management Practice recommendations, and it was instead being done by Companies. He said:

' Because of the reduced DPI presence there, there hasn't been much... but you have an increase in the likes of field officers, McCain has there own field officers, the likes of Elders have got field staff now, so the actual, a lot of that best management practices is being undertaken by companies themselves rather than DPI.'

This is of particular concern, as interviews with agencies indicated that there was no communication between McCain and agencies regarding extension, and the land and water management advice that was being given to farmers. CCMA staff member commented that the CCMA sends out information on natural resource management, but farmers did not acknowledge this occurring. The CCMA was linked with the Moorabool River Project, but not land management practice in general.

Interviews conducted with farmers and DPI staff, indicated that currently there is no delivery of environmental messages to this farming group. Extension from McCain was clearly oriented around production efficiency. Their priority was not environmental management. Environmental messages means environmental messages being integrated into production practice, and it does not refer to one-off / occasional participation in stream side revegetation projects. The demonstration farm had been an effective way of communicating information over time, but it is no longer in existence. No farmers made any mention of DSE, nor did any agency staff, suggesting that DSE did not have a strong on-ground presence.

Comments:

Currently, the extension and advice that farmers receive is fragmented. There is information about potato production, cereal crop production, livestock management and riparian management, but there is no sense of integration. What appears on-ground is that separate parts of the landscape are managed by separate agencies with little if any linking.

Recommendations:

- Increased collaboration and partnership programs between agencies with on-ground land and water management responsibilities.
- For example: the development and facilitation of periodic regional workshops with agency staff, would allow for greater inter-agency understanding and integration of extension activities. It would reduce the likelihood of 'gaps' occurring in extension, and enable a more holistic delivery of extension services to the region.

Local Knowledge

Key findings

- Local knowledge is highly valued in this area and is relied upon as a source of information. Many farmers seek advice from other farmers when they have a problem. Often farms were farmed by several family members, with elderly parents still actively involved in on-ground decision making. The average age of Australian farmers was 51 in 2001, and the average age of this farming group is 58 according to local sources.

- Many farmers also conducted their own trials on their properties, or made assessments of a situation based on past experiences. For some, this experiential approach extended to water, fertiliser and pesticide regimes. Crop management decisions were sometimes made based on the 'look' of the crop.

- Knowledge of groundwater resources was often through local mine maps drawn up during the gold rush. These were reportedly 'as accurate' as current groundwater sensing equipment.

Farms in this area are generally part of a long history of farming. Many farmers interviewed farmed their properties with other family members, or other family members had properties in the same area. For several farmers, their parents still lived on the property, and were a part of decision making about changes to production practice. One farmer noted that he had tried to introduce some new practices in the past, but his father was stubborn about changing the farming system.

Local knowledge was a crucial part of land management. This is presumably linked to the long history of farming families in the area. Often farms were farmed by brothers or cousins, with fathers who may be in their 80's still involved in farm decision making. Many of their land management decisions were based on experience and past practice. This quote is the response from a farmer when asked what the main sources he had for farm management were:

'…What's in my head.'

This experiential approach sometimes extended for some to their irrigation and fertiliser regimes. The quote below is the response from a farmer when asked how he determines when to irrigate and fertilise the crop:

'By experience, by looking at it, I can pick when the crop is looking stressed.'

Also, many noted that they discussed their practice with other farmers and if there was a serious concern, they would talk to one of the old farmers in the region. One farmer noted the range of production discussions he had with neighbours.

'…what didn't work well, and how much you were applying, and those sorts of things, and anything else you can discuss with neighbours, like the results they got from certain things, what they did, when, where and how… '

An interesting example of local knowledge is the use of mine maps in relation to ground water bores. A number of farmers described the old mine maps as a source of fairly accurate information about where groundwater is located. There is a historic connection to knowing where the water is in the landscape.

This rich breadth of local knowledge also has downfalls. A farmer commenting on the response in his community several years ago to his fencing out and revegetating a stream on his property, said that he was not seen as undertaking progressive or informed practice. The locals were concerned that this would provide support to the water authority, attempting to legislate for streamside vegetation:

'So that was good [that I did the fencing out], but on the other hand I was ridiculed for doing it by a few of the locals because they said we were creating a precedent.'

Comments:

When conventional wisdom did not embrace a particular change in practice, the practitioner has to rely on time to prove the validity of the activity. Similarly, there are plenty of bad practices associated with traditional and local applications of knowledge. The ability of local communities to critically engage in analysing existing and new practices is central to the work of the CCMA in building resilience in ecosystems and the society to live in and manage them. Walker et al (2004) argue that resilience, in addition to adaptability and transformability is one of the three related attributes of socio-ecological systems that determine their trajectory into the future. They define resilience as 'the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks'.

Recommendations:

- Extension is often about a linear approach to knowledge transfer that can be countered by the CCMA engaging local communities in designing and engaging with new practices that represent and build capacity for the social, environmental and economic systems in this region.

- Similarly, communities can contribute local knowledge to the CCMA planning and management schemes as part of mutually derived outcomes for shared landscape scenarios.

Urbanisation and Land Use Change

Key findings

- Every interview included some discussion of the urbanisation that is occurring in this region. It was not initially in the question schedule, but all participants clearly considered it to be extremely relevant to land use change and water use issues.

- Farmers were concerned about urbanisation in two key ways. The first concern was that the growing urban populations dependent upon the Moorabool catchment would be competing with farmers' needs, leading to reduced water availability for farmers. In this way, urbanisation was seen as a threat to their water security.

- The second major concern surrounding urbanisation was the increasing occurrence of lifestyle farms. Farmers and agency staff were concerned by the conversion of agricultural land to lifestyle farms. Individuals who purchased the lifestyle properties were noted to have significant off farm income, and were therefore able to afford higher and higher land prices. They presumably also have less context for understanding the diversion of water from local farmers to their non-production based needs.

- The increasing occurrence of lifestyle farms has resulted in both an increase in land value and a significant shift in local demographics. There is now a growing percentage of the local population who commute, and anecdotally, are reportedly absent from the local community. This has implications for the social, environmental and economic well being of these landscapes.

Urbanisation was a theme that emerged in all interviews with farmers and agency staff. It was clear that it was considered to be one of the major forces of change in this landscape. Currently, the population of regional centres such as Ballarat is increasing, and the Melbourne 2030 vision identifies growth of regional centres as one of it's strategies. The Central Region Sustainable Water Strategy forecasts the need to provide water to a rapidly increasing population (DSE, 2006). The Ballarat region is approximately an hour from Melbourne, and is therefore within commuting distance. These documented trends and encouragement of increased population are concerning farmers and many agency staff. Farmers discussed urbanisation in two key ways, competing water use and competing land use. Agencies are concerned about the provision of water to an expanding population in an already over-allocated catchment, as well as the impacts of increased numbers of septic tanks within the catchment.

The water demands of a growing urban population are a major concern for farmers. In an already over-allocated catchment, farmers are aware that increasing urban water allocations needs to come from somewhere. The increasing demands of urban population were equated with increasing pressure on farmers:

'Ballarat will be looking for more water. That is our main concern, with growing population.'

'With the urban development of Geelong and Ballarat, they will want to take more and more, and that is going to put pressure on the water farmers will use.'

Many farmers argued that the construction of new storages was needed: In almost every discussion with farmers about water security, new dams were offered as the solution to water scarcity in the landscape. Farmers felt that new storages needed to be built to respond to the increasing demands of urban populations, which would also reduce the pressure on them. For example, this farmer said, it was a way to manage the urban pressure:

'It is no use taking all the water for the cities and leaving farmers with nothing.'

'*With the increase in population, we will need to build more dams.'*

In fact, this response is not rational if we consider that there is only a finite amount of water and if it is in urban storages it cannot also be in on-farm storage.

Water agencies were also concerned about how to ensure the provision of water for urban use, and identified the competing needs for water in an already over-allocated catchment. This next quote is from a CCMA staff member, who describes the challenges facing the provision of urban water supply.

'There is massive over allocation within the catchment. The water that is allocated is extremely valuable to all of the users who receive it at the moment, and the population of Ballarat is getting bigger, and they have limited alternative options.'

The CCMA is caught in the reality of competing regional goals and aspirations. Farmers may benefit in the future with having local populations nearby who want local produce and this potato farming area can provide that surety. The reconnection of local produce to local markets may also assist the CCMA in engaging towns with the realities of local water provision. 'One water system and one landscape.'

The shift in land use to increasing lifestyle farms was a concern for farmers. The proximity to Melbourne meant that it was within commuting distance, and attractive to lifestyle property purchasers. Competition from lifestyle property buyers was reportedly pushing up land value, and, land was being taken out of production. Both of these factors were a considerable concern to farmers. One farmer commented on the trend towards lifestyle farming, and the impact this had on farmers.

'Because we are still in that radius to Melbourne, very accessible to Melbourne because of the freeway… along with that, with this lifestyle business, it is pushing up land prices. It's going to make it harder for the genuine farmer to compete.'

The planning restrictions were understood to affect the survival of local communities as 100 acre blocks are the minimum subdivision allowed; and the issue of population increase directly implicates water allocation in the catchment.

One farmer discussed planning restrictions, where the minimum subdivision was of 100 acre minimum land size. He was critical of this as he perceived it prevented small towns such as Dunnstown from increasing:

'We are in a catchment and we have so many planning restrictions on us that the small townships are actually dying because of the restrictions on us, because we live in a catchment.'

Comments:

There is a tension between the protection of agricultural land, as intended by the 100 acre minimum and rural zoning laws, and the skyrocketing property prices in the area, which are fast becoming unaffordable for farmers wishing to expand land holdings to remain profitable. The reported rise in the number of lifestyle properties and associated decline in the number of potato farmers is evidence of these laws being ineffective at achieving their aims. The 100 acre minimum subdivision affects small townships such as Dunnstown, that are restricted in their capacity to grow and to incorporate new families. Barr (2005: 27) notes that this planning provision 'is an unlikely compromise that is unlikely to achieve the goals of any group'.

Further, there is a tension between new policies such as Melbourne 2030 which promote the growth of provincial towns such as Ballarat, and the location of these towns in an already over-allocated water catchment.

Recommendations:

- These widespread concerns around urbanisation and land use change are an opportunity for the CCMA to take a leadership role regarding water use in the region. This could be in the form of facilitating workshops and community discussions about water use, and planning regional water management for the future.

- Develop planning protocols around land use in consultation with the community to protect this landscape as a production landscape. In the USA this has become a serious issue leading to the formation of Right to Farm activists. Rather than segment the population, it would be an opportunity now, to build some mutual goals and increase civic literacy regarding water provision and water in the landscape.

1. Urbanisation - *linear relationship and interconnectivity between all indicators*		
Social	***Environmental***	***Economic***
Change in demographics in region: increasing lifestylers	Increasing number of septic tanks in catchment	Sale of high value agricultural land - retirement security / a way out. Also loss of agricultural production in region
Growing regional communities eg. Ballarat and Geelong	Increased pressure on Moorabool : water supply catchment	High value of agricultural land: difficult for farmers to expand their holdings, especially without major additional debt
	Provision of Environmental water reserve threatened by increasing water demand of urban populations	
Reduction in number of farm families		Less water available for farming: reduced production and profits
100 acre minimum subdivision - pending council approval		Lifestylers with 'good' off farm income able to purchase ag land.
Lack of cohesive community: commuting lifestylers and farmers	Highly variable riparian management	
Community pressure regarding spray drift from pesticide/ fungicide application	Intensfied production on existing rural land use- increasing pressure on catchment and risk of runoff	Loss of farm income in region
Community pressure regarding on farm water wastage	Increasing water efficiency does not necessarily equate to improved environmental conditions	More cost efficient use of water: Low value agricultural water use converted to high value urban water use

Labour Intensity of Crop Management

Key findings

- Current crop production practice is labour intensive, and has a number of far reaching consequences. Farmers do not have time for activities that are not directly associated with crop production. Also, the labour intensity has on-going effects on families, as well as creating individual stress.
- Farmers do not have time to be involved in social community groups and there is a reduced attendance at industry field days. There are limited opportunities for farmers to receive new information about alternative management practices, and a lack of awareness and adoption of environmental projects on farms.
- In conjunction with the reduced profit margins, farmers are unable to employ additional staff to reduce the individual labour intensity.
- Anecodotal evidence from farmers indicated that labour intensity of production practice was also linked to an increased likelihood of industrial accidents.

The production of the Russet Burbank variety of potato is extremely labour intensive. Farmers noted that it was labour intensive because it required higher levels of irrigation than other potatoes, and it also had a longer growing season than other varieties of potatoes. During irrigation season, some farmers said that they worked up to 20 hours a day, barely sleeping before returning to the field.

The heavy fatigue that farmers experienced was connected to increased occurrence of industrial accidents. One farmer interviewed had stopped growing potatoes after a severe accident that had prevented him from farming for an entire season, and he was still unable to use one arm. Farm accidents were part of one farmers decision to alter his farming system and reduce potato production and increase the size of cattle herds. He said

'We have looked at a few farm related injuries which are down to fatigue from a few neighbours working longer hours and pressure's on… you sort of step back and think when a series of serious accidents have happened to a couple of people we have known. It just really makes you stop and think.'

There was widespread agreement that the labour intensity of crop production had serious impacts on not just the farmers, but also on their families. Several farmers were saddened by comments their children had made, about how much they worked. One showed a card that his daughter had made at school for father's day when she was quite young, which said:

'My dad is a workaholic.'

Another was bothered by this statement his daughter had made:
'Why do you have time for McCain meetings, but not for me?'

Almost every farmer lamented the high labour inputs required for the crop. One consultant commented that what these farmers needed was not actually social research conducted but social work, which is testimony to the considerable stress that these farmers are living with on a daily basis.

In the past, higher profit margins had made the labour intensity justifiable, but with reducing profit margins, some farmers were questioning the feasibility of it. One farmer observed that with improved profit margins, he had been able to employ more workers, which allowed for time off. Without extra staff, there was increasing pressure on him:

'The biggest and most important social issue is the affect on family life, because of the amount if time involved [in water management]. You just don't have time to spend with your family, functions or anything else during the growing season, or harvesting season, you just can't take any time off… If you were getting more money for your crop, you can afford to pay more workers, you could have more irrigators, so you could actually do it in the 5/6 days, so you can have time off, but it is pretty hard when you have got to work around the clock.'

And another noted:

'…look, if you are making money out of it, I suppose it is a compensation factor. But at the end of the day, all work and no reward, you have really got to question what you are doing.'

The labour intensity had significant flow on effects for farmers. It restricted them from participating in community groups and from attending industry field days. Agency staff frequently commented on the low attendance rates at field days. However farmers said that these field days were often at crucial times for their farming operations. (Please refer to discussion on extension for more detail about the lack of participation in field days.) Farmers often commented that farmers generally were too busy to be involved in things. One farmer observed this pattern of non- participation and related it to farmers being too busy:

'*It's very hard to get people around here to actually go and do it {field days}, probably because they are too busy trying to get their own things done.'*

It is also worth noting that interviews with farmers were notoriously hard to arrange. Actually talking to farmers was difficult, as they were often only home for a short time at lunch, and then not home until late in the evening. Often, conversations occurred with farmers after 8.00 at night. Farmers were in harvest when interviews were being arranged and conducted, which is less labour intensive than the irrigation season. Appointments with some farmers were changed a number of times, as farmers were constantly juggling daily events.

Farmers who grew seed potatoes had significantly lower labour demands than their contract growing colleagues. Two farmers grew seed potatoes, where the Russet Burbank variety was only one of a number of varieties grown. These farmers did not always irrigate their other potato variety crops. They observed that the amount of irrigation required and the time they spent irrigating was far less than farmers who were growing Russet Burbank potatoes.

Comments:

The labour intensity of crop production has far reaching implications on farmers and their families. Ultimately, it isolates many farmers from their local community, and restricts them from exploring or even experimenting with different production systems, or best management practices. It effectively locks many farmers into a regime of production that is difficult to escape. Farmers are particularly interested in labour saving, and reducing the labour intensity of their farming practice, but at present, it is not clear how to make changes within the McCain's network. It is apparent that they cannot break out of the Russet Burbank cycle on their own.

Recommendation:

- Meetings and communicating issues may need to depend on radio programs rather than face-to-face contact in potato growing season.
- Design an adaptive management framework for the potato farmers to create opportunities to re-think the production imperatives associated with the crop in the context of a wider systems approach.

labour intensity of crop management practice: *issues all interrelate with key theme -- not necessary to read across the page*		
Social	***Environmental***	***Economic***
Extra labour required for irrigation activities	Climate change / reduced annual rainfall	Increased fuel costs due to increased irrigation
Effect on families	Intensified land use	Off farm labour contributing to farm / household
Reduced involvement in social / community groups	Lack of time for engaging in tree planting / restoration projects on farm	
Reduced attendance at Industry field days	Lack of time for managing any fenced out areas for weeds and pests	
Limited new information received about alternative managment practice	Lack of time for Landcare meetings and NRM oriented field days	Lack of awareness and adoption of viable new crops
Risk of industrial accidents	Individual stress	Environmental degradation
Reduced succession / aging population	Lack of adoption of EMS	Costs of purchasing more labour efficient irrigation equipment often exclusive
Rural counselling services		

Succession

Key findings

- Farmers are facing a succession crisis as their children are not prepared to continue farming potatoes under the current conditions. This succession crisis is consistent with the wider population of farming families in other commodity groups.

- Farming potatoes is not desirable for the younger generation as it frequently may entail inheriting significant debt, and working extremely long hours. Further, the current contract arrangements are insecure, and profitability of potato farming is declining. There are also attractive employment opportunities in nearby towns with reasonable levels of income.

- The reduced transfer of farming businesses is also linked to the increased sale of properties, and the subsequent conversion of productive agricultural land.

There was widespread agreement that potato farmers are facing a succession crisis, as their children are not prepared to continue farming potatoes. Only one farmer who had an adult child was continuing farming potatoes, and only one other anticipated that his son would also continue farming potatoes. The adult children in the other four farm families had all studied trades or were at university, and would not be relying on potato farming as their primary source of income.

The key reasons for the next generation of farm families to discontinue this type of farming were: potato farming is highly labour intensive, often requiring 7 day weeks, and in irrigation season, 20 hour days. Despite this considerable labour input, many potato farms carried significant debt, and this would also be inherited. In comparison to the attractive income that could be gained in nearby towns after an apprenticeship, or, after studying at university, continuing potato farming was not attractive. Further, in this landscape, expanding a farm enterprise to improve viability and profitability was an extremely expensive undertaking, and many were reluctant to take this option. The fact that others stereotype them as potato farmers only means that the next generations don't feel empowered to invest in land use change because the current economic situation is locking them in to potato infrastructure.

Neil Barr describes the farm family succession crisis trend across Victoria. He observes that 'when farmers cease their farming, then there is little chance of an intergenerational transfer' (2005:31). He also observes the trend that new generations of traditional farming families are moving to the city, consistent with these research findings. Barr captures the forces at play in this lack of succession when he states:

> The city is attractive because of it's educational facilities, its social and cultural opportunities, and its diverse career opportunities. These attractions are compounded in areas of high landscape amenity, where many farms are in a declining business phase and offer no opportunity for the next generation to achieve a reasonable standard of living.

Comments:

Remembering the farmer who planted for 500 generations reminds us that it may well be the insistence on these landscapes as 'potato paddocks' that is instrumental in turning local youth away. Identification of this region as a productive horticultural and livestock area of regional importance in the sustainable landscapes of the 21st century can help to re-orient landscape scenario planning and may re-engage locals or bring in other potential farming generations. It may also be true that people or corporations will manage these landscapes in the future, but at the current time, the potato farmers do not seem to be included in regional planning.

Policies from water authorities such as CHW, and planning provisions from local governments need to protect productive agricultural land, in the first instance.

Recommendations:

- Potatoes are closely associated with this landscape and the way that agencies describe farmers is as 'potato farmers'. If this land is not to be lost to farming because of failed succession planning, it is important in the first instance to provide a wider set of alternatives to farm families than dependency on potatoes and McCain's.

Succession: - *linear relationship and overall interconnection of issues*		
Social	***Environmental***	***Economic***
New generation do not want high labour intensity irrigation system		Inheritance of debt
Succession on basis of reduced labour input irrigation equipment		Cost of upgrading equipment
Ability to gain income in nearby towns attractive		
Increasing insecurity of contract		Reducing profitability of contract farming
Loss of young farmers in region, aging population		Pressure to sell property due to lack of succession
Young farmers proactive in adopting new systems, practice change		
Old farmers reluctant to change practice	Impact of traditional management practices	

Landscape History and Landscape Change

Key findings

- A key change is the ongoing decline in the number of potato farmers. This was closely linked with the reduced profitability of growing potatoes, and the associated increasing acreage required to be profitable. Each year, there are farmers who stop growing potatoes.
- Almost every farmer interviewed was at least a 3rd generation farmer in the area. For many, their families had arrived during the gold rush of the 1850's.
- Native vegetation reportedly increased over time, as more trees and shelter belts were being planted. For these farmers, the landscape had been cleared as long as they could remember, dating back to the major clearing of trees that occurred in conjunction with the gold rush.
- Land is generally 'tightly held', however there was significant evidence that land was leased out to other potato farmers by those who had stopped potato farming. This continuity with potato farming *per se* was always noted by the farmers involved. As well, long term neighbours are likely to be the ones leasing the land, so it felt as if the land was still in the local community.
- The regional demographics have also changed, as an increase in the number of lifestyle farmers and part time farmers has occurred. There is a close relationship between potato farmers being unable to continue farming viably and the trend towards lifestyle farms, as small farms get sold or subdivision occurs.

All farmers interviewed had lived and farmed in this landscape for their entire lives. Some were farming the same properties that their parents had farmed, while others had bought new properties, but had stayed in the same local area as their parents. For many of these farmers, their families histories could be traced back to the gold rush of the 1850's. Evidence of this was also observed in the names of roads: many farmers lived on or near roads that bore their surname. Their ancestors had not necessarily come to the area to look for gold, but had come to grow produce for the rapidly growing population. Potatoes were the principle crop throughout the generations for many of these families. Farmers noted that potatoes did not account for the vast majority of income for past generations, unlike now. Other crops were produced to respond to the regional demands. One farmer described how his family had originally produced hay as well as potatoes when they settled in the area:

'When they settled here, hay was just as important, may have even been more important, because everyone had horses, and everyone in town had horses, and all the deliveries had horses, and they needed to eat hay.'

Another farmer described potatoes as being a continual feature of production in conjunction with intermittent dairy production:

'Potatoes and dairy, but yeah, there has been potatoes probably all the time from what I understand…'

The quote below highlights the shifting patterns of production that occurred on many farms, and a historical response to shifting patterns of profitability in different commodities:

' My father started growing potatoes, and then shifted to dairy, then he farmed both potatoes and dairy. Now I farm potatoes and beef cattle.'

This long history of mixed farming practice in the area is noteworthy. Farm families have farmed in this landscape for over 150 years, and while potatoes have been a significant part of that farming, there is no expectation of growing just one crop. One DPI staff member noted that this long history of potato farming linked created a confusion with farmers considering their practice to be sustainable because it was traditional or inter-generational. By contrast, farmers noted that there had been significant changes to how potatoes were produced: their fathers had initially produced potato crops without irrigation, and had produced a range of different varieties. They saw the evolution to the current situation with one buyer and one species as the anomaly rather than the other way around. This leads us to consider why the emphasis in the extension services community is on the identity of these farmers being 'just potato farmers'.[4]

Farmers often reported that there was now more native vegetation and trees in the landscape than there was in the past. No one interviewed had any recollection of any areas of native vegetation being cleared during their lifetimes. For these farmers, the landscape had been cleared long before they were born, linked to the major clearing that had occurred during the gold rush. This is consistent with the findings presented in the Ballarat Heritage Study, (Stage 2) —which noted that the areas around Ballarat were rapidly deforested to construct the mines in the gold rush, for building of houses and for fuel (Hansen Partnership, 2003).Several farmers also commented on the impact of the gold mines on regional vegetation . They said:

'They took all the decent logs off it and it basically all went into Ballarat to timber the mines and of course all the mills were run by timber in those days as well.'

'A lot of timber from around here ended up in the mines… and to power the mines.'

The reality of the landscape as having had timber trees fitted with farmer expectations that they could put trees and native vegetation back into the landscape if they wanted to do so. The limiting factor was considered to be economic productivity, associated with loss of productive land to trees, and not a sense that trees were inappropriate in this landscape.

Another major change in the landscape over time is the amalgamation of properties. Several farmers referred to the smaller acreages that there fathers had farmed. Farms of as little as 40 acres were reported to be able to support a family in the past, where as now, this would be impossible. The amalgamation of farms has led to significant changes in the social structure of these rural communities. (Please refer to discussion on Communities, page 39). It is too soon to know if amalgamating properties enhances revegetation zones or land management for salinity or similar issues. It is also not clear if riparian zones and similar creek side revegetation is widened because of the removal of property boundaries.

[4] These issues are also visited in discussions on Diversified farming systems (page 52) and Sustainable futures (page 36)

Farms have been amalgamated, and with this has come changes to land use patterns. The number of potato farmers has declined. Farmers interviewed all knew other farmers who had recently stopped growing potatoes. The main reason for no longer growing potatoes was the difficulty in farming potatoes profitably. With declining profit margins, many smaller farms needed increasing acreage to be profitable, and this was not feasible, due to the extremely high property prices. One farmer considered it a necessity to expand in order to keep the contractual arrangements. He stated:

'*We have been required to get bigger if we are to keep the contract job. It is not even sustainable to stay as you are.'*

The use of 'sustainable' refers to being economically viable. However in discussion, this conversation always led to the intensive lifestyle associated with potato farming and the sentiment that emerged was that big or small, current practice was rarely seen as 'long term sustainable'.

This next quote highlights the high expenses associated with expanding landholdings in this area, which were considered to be prohibitory by many landholders.

'…100 acre block on last week sales is $800, 000 without a house…'

Farmers considered there to be a number of effects from the reduction in potato farmer's numbers. One commented that the potato farmers left were all good farmers, farming the land most suited to potato production.

'If you went back 20 or 25 years, all the marginal farmers were growing potatoes... Basically, the farmers that are left now – like there is only half of the potato growers that there was say 15 years ago, they basically all do everything the way it should be done. There aren't any bad farmers, bad potato farmers left now.'

'Bad farming' was related to the timing of management activities, rather than a fundamental difference in practice.

Despite the number of potato farmers reducing, the acreage under potato production is currently being maintained. The reason this is happening is because farmers are often leasing land to potato farmers who are expanding their production. Paddocks are leased in rotation, so that the farmer who leases land is always growing potatoes in the leased areas. The farmers who own the land then plant rotation crops and run stock in the paddocks. This arrangement seems to work for both parties: the leasing potato farmer does not have the major cost of purchasing new land; while the farmer who is leasing the land is able to retain the property and generate an income. It ensures that land stays in production and in the family. Land was generally well held and this was associated with this leasing arrangement. It was less common that farms were being sold to other growers. Farmers were frequently concerned about land being sold and being out of production.

One farmer observed that it is the smaller farms that are generally unable to continue farming viably due to the economy of scale. When discussing growers stopping growing potatoes, he noted:

'They will all be smaller growers, they are all generally smaller growers. Some will [lease land to other growers] some will not. Some might be sold and if they are sold, then the problem with

smaller growers is the smaller holdings, and the smaller holdings are very attractive to hobby farmers who have got good sources of income and pay a lot of money. And some of that ground will go out of production in the long term.'

The conversion of production farms to lifestyle / hobby farms is leading to a shift in the regional demographics. This is discussed in further detail in the section Urbanisation and Land Use Change.(page 84)

Comments:

Increasing cost pressures associated with crop production on small acreages near provincial towns is resulting in changing patterns of land use. At this point, properties are remaining relatively 'well held' but it unclear how long this will continue, as pressures increase. Patterns of production have historically fluctuated with available markets, and farmers have responded to this in their landscape management.

For almost every farmer interviewed, the landscape had been cleared well before their birth, and land clearing was generally associated with the Gold Rush. There is no living memory of an original native vegetation community, or a recognition of it's belonging in the landscape

The reality of deep and fertile soils in this area means that the agricultural land use zone needs to be protected in this region. The future will undoubtedly depend on local and regional food production for the burgeoning provincial towns.

Recommendations:

- Historical records can be used to remind stakeholders of revegetation models. However, there is more likely to be support for landscape scenario planning that takes into account historical and contemporary expectations of land use.
- Planning protection for good agricultural soils needs priority given increasing fuel costs in the future and likely global warming implications for the region.

Riparian Management

Key findings

- Farmers whose properties were adjacent to the Moorabool River and it's tributaries managed it in a diverse number of ways, from fencing out and revegetating to enclosing it in a pipe.
- Recommendations for riparian management were often at odds with farmers practice: for example, fencing out was not feasible for farmers who relied on the stream for stock water. Here, many felt that stock access was not detrimental to water quality.
- Pest plants and animals were the main issue raised in discussions about fencing out and revegetating riparian zones.
- Time and money were other main reasons associated with a lack of specific riparian management
- Grass buffer strips were the standard management of riparian zones
- There was widespread agreement about the poor condition of the Moorabool River, which concerned many farmers.

There was considerable variation in the management of riparian areas along the Moorabool and it's tributaries. This included fencing out and revegetating riparian areas, cementing waterways into drains and enclosing waterways in pipes.

A benefit or priority associated with revegetating (either through planting and natural regeneration) and fencing out was improved water quality. One farmer who had revegetated and fenced out a riparian section commented that it has been good as the water now doesn't get muddy, and there was no need to use an excavator to clean the creek out. This farmer also observed the impact of cattle access on his neighbour's riparian zone. He said

'*Because what has happened- the cattle get in the stream instead of going down, and they gradually pug it all up and the stream is actually getting like it's a just a big marsh.'*

Another farmer who had also participated in the Moorabool River project had removed willows and revegetated extensive sections of the Moorabool River occurring on his property, as well as one of it's tributaries. In the tributary he still had controlled stock access. Here, stock were allowed access to the entire frontage at certain times of the year. He felt that this had very little impact on the water quality, and what he saw as a problem was stock watering points, which created situations similar to the one described above.

Another farmer only had stock access to a seasonal spring during summer when there was no flow in it. Another spring on his property flowed year round, and this was fenced off. Conversely, one farmer who did not fence out waterways noted that stock did not have a

serious impact on stream flow. In reference to revegetation and fencing projects he commented:

'I basically wouldn't do it anyway, because the sheep – I don't believe contaminate the area, and all we do in this district is control gorse… Once you lock the land areas up, they become a haven for weeds.'

Pest plant and animal invasions were frequently cited as a concern linked to fencing and revegetating riparian zones, by farmers and agency staff, regardless of whether they supported / engaged with fencing out activities or not. This concern is further discussed in the box below on the Moorabool River Project.

All wetlands referred to by farmers were drained, and this was then piped to storages.

Overall, there was a diversity in the interpretation of riparian zones. Some farmers fenced out waterways, while some fenced out drained wetlands. Only one farmer interviewed did not have any waterways or wetlands, but had actively participated in assisting neighbours in fencing and revegetating waterways. Other farmers did not fence out waterways, and described them purely in utilitarian terms. For these farmers, waterways were consistently referred to as drains, and on stream dams had been constructed on these. These farmers managed this area either through piping water underground, the use of cement blocks to maintain the form of the creek or through grass buffer strips.

Recommendations for riparian management by agency staff and CCMA publications generally revolved around fencing out and revegetating. For farmers who rotated their stock and potato crops in the same paddocks this created management difficulties. Troughs in paddocks would directly conflict with potato production practice.

Recommendation:

- CCMA staff and local land managers, in partnership, develop context specific recommendations for riparian management that reflect the complexity of local land management practice.

The Case of the Moorabool River Project

The CCMA delivers the Moorabool River Project to farmers in this part of the catchment. The principal aim of this project according to CCAM staff is to protect and improve water quality. This project operates in collaboration with farmers: the CCMA provides funding (or part there of) for willow removal, revegetation and fencing out of riparian zones. It's goals are closely linked to the provision or clean water supply to urban townships dependent upon the Lal Lal and this is in the farmer's catchment.

Three of the eleven farmers interviewed had participated in this project on their properties, and were pleased with the results. A fourth farmer who did not have any waterways had been actively involved in his neighbours' project. Several of these farmers were also concerned about the degraded condition of the Moorabool, and considered the project an important way of improving the health of the river.

These farmers all had positive reactions to not only the project, but also to the CCMA. They were impressed with the relatively smooth process associated with participation, and were happy with the results.

A repeated concern raised by farmers who had not participated in the project, but were aware of the project's activities in the local area was the impact on the populations of pest plants and animals. Fencing out these moist areas was seen to lead to a rapid increase in weeds, and to provide a haven for foxes and rabbits. One farmer who was not involved in the project commented that he knew where the CCMA was fencing out, because he then went hunting in those areas.

In this example, extension practice initiated by the CCMA had the effect of organising the farmers on several issues that are important to them. The positive outcomes associated with on-ground 'environmental' works create social cohesion and link wider landscape values to local sites.

Comments:

Agency staff generally indicated that farmers engaged in very little specific riparian management practice, apart from the existence of a grass buffer strip. This research did not confirm this, as almost half of the farmers interviewed had fenced out waterways, and of these, four had participated in the Moorabool River Project.

For many farmers there was a direct connection between fencing out and maintaining production values: clean water supply for stock and for irrigation. For some though, it was also seen as a contribution to the environmental health of the river.

Agency staff and most farmers agreed that almost every farmer had grass buffer strips along waterways, which acted as a nutrient filter. Grass buffer strips intercepted run off and contributed to improved water quality. In previous years, there has been significant effort on behalf of agencies staff to facilitate the widespread adoption of grass buffer strips along waterways. On ground, it was evident that this had been successful, highlighting a synergy between agency recommendations and on ground practice change. It is proof of recommendations making sense on ground.

Eleven of the twelve farmers interviewed had waterways such as springs, wetlands, creeks and rivers. occurring on his property.. The other farmer had participated in the Moorabool River project on his neighbours' property and felt that if he had waterways on his property, he would have far more contact with the CCMA. This highlights how farmers are understanding waterways and farm dams: dams are generally not considered part of the regional hydrological landscape.

Recommendations:

- Model future agency recommendations on the successful synergy that has occurred between agency recommendations for grass buffer strips and on ground practice change, where recommendations 'made sense' on ground.
- Communicate the links between on farm dams and the regional hydrological landscape, where a systemic approach to water means that waterways are not isolated as the only sources; springs and farm dams are understood to be part of the same supply.

NB: Both riparian management practices and native vegetation management practices are considered within the same matrix, as many indicators are relevant to both of these management practices. Please refer to the matrix following the findings presented on native vegetation below.

Native Vegetation Management

Key findings

- Native vegetation plantings were considered valuable on many properties with significant stock operations. Here, native vegetation provided benefits such as being a shelter belts or a wind breaks.
- Small landholdings and intensive production practice were identified as key reasons for limited native vegetation plantings: every acre planted was an acre out of crop production.
- The local Landcare group was only attended by a small number of potato growers. A lack of time was the most frequent reason for non participation

Farmers often planted trees, and retained existing native vegetation in areas that stock occupied. It's principle use was as shelterbelts for stock. For farming enterprises with increasing cattle herds and lambs, planting shelter belts provided valuable protection from wind and sun. Several farmers also retained stands of mature remnant vegetation for this purpose. One farmer had also gained great pleasure from the presence of a koala living in a remnant stand of mature trees.

Another farmer was in the process of fencing out a remnant vegetation stand and planting seedlings that he had grown from the stands' seed stock. One farmer noted the plentiful regeneration that had occurred when he fenced out a drained wetland area. He said,

'*…it surprised me how many gum trees and other stuff are growing in it'.*

One farmer had planted trees around his horse stud and trotting areas, but had not planted dams. Trees around dams were noted to undermine the bank of the dam by this farmer. This is at odds with recommendations included in the Environmental Best Management Practices delivered in the area (DPI, 2003).

Potato farms are relatively small in acreage on high value agricultural land: the average size of properties involved in this study was 350 acres. A DPI staff member who had been involved in the past in delivering environmental best management practices to potato farmers noted:

'There wasn't a lot of adoption of trees because of the land value……they are trying to use the most productive land right to it's limits I guess, so every acre costs them loss of production.'

A farmer who didn't fence off or revegetate waterways agreed, and also reflected that if all creeks were fenced off and revegetated, then half the area would be treed;

'*…Like they can ask you to fence off creeks in the district, but you know the ground would be too valuable… for them to really plant 100 acres or anything like that, but you know, fence off a creek at a minimum of two chains each side… half the countryside would be bush… so I don't think they can do any of those…'*

Landcare Participation

The Local Landcare group, the Lal Lal catchment Landcare group was only attended by a small number of potato growers. The president of this group indicated that there was between 3 and 5 potato growers in the group, out of 30 Landcare members. Attendance at meetings was about 12 farmers. The president was concerned about this non attendance, and had tried a number of different approaches to attract new members and existing members to come to Landcare meetings. He was unclear why attendance rates were so low.

Farmers often cited time as a reason for non-participation in Landcare groups. The labour intensity of potato production restricted their capacity to attend meetings.
One of the farmers involved in Landcare had been slowly changing his farming enterprise, with increasing cattle herds and decreasing potato crops, while another had stopped growing potatoes recently, but leases property on his land to other potato growers. He noted:

'I wasn't able to do that when I was farming [potatoes], because it requires a bit of work and attention, and you are flat strap in the summer time. Once the spring starts you are sowing potatoes. They have to be direct cultivated and once you have finished that you are starting irrigation. You go around like this, in a cycle. You don't have time to do that sort of thing [Landcare].'

An interesting observation is that involvement in Landcare activities was often not on farmers own farms, and this could be a key reason for the low participation. While one farmer had Landcare plantings on his property, another Landcare member and a Landcare president

described Landcare regeneration and planting works on a public waterway. When one farmer was asked whether he was involved in the local Landcare network, he responded:

'I'm better off to grow more trees for myself than by the time I do their's'.

Comments:

The issue of public or private plantings as being more or less useful or valuable to the farmer in their landscape requires some consideration. Arguably if a land manager is thinking of the landscape they manage and effect as being just to the boundaries of their property, there is a serious issue of both hydro-geological and soil management that needs to be addressed by the CCMA. The concept of landscape connectivity is probably the first step in affecting land management change. On the other hand, if the resistance to works on public lands is based on economic judgement, that is, there is not enough reward or time in the day to focus there when I am already stretched by the crop demands—then the CCMA needs to 'back up' a step in making the landscape connectivity argument among land managers. It would be our expectation that the long term economic gain needs to be understood as part of a landscape scale of management associated with interconnected soil and water systems.

This is consistent with the idea of opportunity costs. In the short term, native vegetation planting is linked to a loss of income due to loss of production acres, as well as the cost of associated pest plant and animal management. In the long term however, plantings would ensure increased biodiversity and a more complex and diverse landscape mosaic, which is a long term gain.

Recommendations:

- Increased communication of the link between native vegetation and short term benefits for stock may improve the adoption of native vegetation plantings on properties.
- Develop a communication campaign that demonstrates landscape connectivity. Part of this is communicating that responsibility doesn't stop at your property boundaries.

Native Vegetation and Riparian Management: *issues all interrelate with key theme -- not necessary to read across the page*		
Social	***Environmental***	***Economic***
Lack of time to engage in tree planting projects	Limited attendance at Landcare meetings -- limited planting of native vegetation on properties	Every acre of Native Vegetation planted equated to loss of production
Common perception that environmental management relates only to tree planting, not reducing chemical and water use on farms.Link not widely established between reduced fertiliser and pesticide use and environmental benefits	Shelter belts and native vegetation plantings more frequent where diversified farming system. Eg. with cattle	Savings associated with less inputs
Lack of engagement of local communities regarding Natural Resource Managementby NRM agencies eg CMA, DSE	Difficulty in integrating natural systems into high intensity horticultural systems	Reducing profits and reluctance to spend on voluntary projects
Diverse understandings of native vegetation: shelter belts, habitat, loss of agrcultural land	Lack of on-ground extension regarding Native Vegetation planting and management on farms. Only project noted was Moorabool River project	Lack of incentives for specific riparian management that are connected to rotational farming systems
Land cleared during gold rush: no recollection of native vegetation in landscape. History of landscape affects actual expectation of landscape.	Revegetation patterns not established. Historic knowledge of local water	Costs of vegetation
CCMA not linked with native vegetation management onground. Eg. Landcare	Grass riparian zones: good filters, native vegetation planting provide ecological values	Long term soil and water quality -- opportunity
High pressure of contract arrangments diminishes priority of NRM		
Participants in Moorabool River Project positive about CCMA and project. Non participants unengaged by the CCMA	Limited involvement in Moorabool River Project with CCMA	Cost of managing land not in production. eg pest plant and animal management associated with fenced out areas-- Opportunity costs

6. Discussion: One Landscape

The Corangamite Catchment has been experiencing a long dry spell, which is now in it's 10th year. Rainfall has been below average: this year Ballarat experienced it's lowest winter rainfall on record with only 87mm falling over the three months (*The Courier* 1/09/06). There is uncertainty within the farming community as to whether this reduced rainfall is simply a phase that will pass or part of a long term shift. The reduced rainfall has affected water availability and placed pressure on farm water storages: namely on farm dams, as well as on groundwater. It is unclear how long this 'dry spell' will last, and how it will ultimately impact upon farming communities. Alternative irrigation options that are more water efficient and would reduce farm water use are a risk for many farmers: there is uncertainty surrounding yield improvements and risks relating to the significant cost of investment. The 'dry spell' correlates with global warming at both a local and a global scale.

This 'dry spell', and the increasing likelihood that this may in fact be the 'normal' of the future has more complicated implications in the landscape than water efficient irrigation technology. For the increasing populations of provincial towns such as Ballarat, as well as smaller rural towns such as Ballan that are also reliant upon the Moorabool Catchment for water supply, continued reduced annual rainfall will impact upon the reliability in the provision of urban water supply, as well as the ecological health of the catchment.

This complex system is wracked with uncertainty: rainfall, future farming practices and future water availability in the landscape are not predictable. What is certain, is that competing demands for water within the Moorabool Catchment will increase. Therefore, the CCMA and local agency response needs to factor in ways of organising and operating within systems that are uncertain and risk prone. We argue that an adaptive management approach allows for uncertainty, and caters for multiple outcomes in the landscape. This approach is highly participatory, requires time and itself, is not predictable as communities build their internal capacity to address change in the wider landscape in which they live. The complex social systems of farming communities and the growing provincial towns, the complex environmental system of the Moorabool River catchment landscape and the complex economic systems of production and urban water sales all interact. A flexible reflective approach that responds to changes and plans around multiple outcomes will lead to more effective management of this complex economic, social and environmental system.

Part of adaptive management strategies is continuously questioning and reflecting upon the suitability of current management practices at all levels. Adaptive management demands consideration of whether and how irrigation belongs in a water supply catchment that is already highly stressed and over-allocated. It also requires consideration of how this farming community might adapt their practice to move forward into the future, to secure better outcomes for themselves, and for the landscape.

Planning protocols are currently detached from the complexity of this landscape. The current 100 acre minimum subdivision neither promotes the retention of agricultural land (due to rapidly increasing land values) nor does it foster the growth of rural townships, leading to what could be described as the death of small country towns. Dunnstown is a prime example of this. Planning

protocols also prevent farmers from subdividing sections of their properties, which would be able to free them from long term debt, and provide a form of superannuation.

Planning provisions must be responsive to the needs of an expanding population of Ballarat, as well as managing / preventing the decline in small country towns. Towns located within the study area such as Dunnstown are declining: some farms are expanding, and farm families are leaving the area, while other farms are unable to subdivide and sell off small sections of their land. Further, planning protocols need to be sensitive to the position within a water supply catchment, and the affects of land use upon an already highly stressed and over-allocated river system. The development of effective planning protocols requires simultaneous consideration of all aspects of the triple bottom line.

Discourse around water availability highlighted a divide between urban users and rural users and this is counterproductive. The needs of the growing populations of urban users were placed as a priority and detached from the needs of the farming community. There are different expectations and understandings by agency staff of the needs of farming users and urban users of water. This needs to be overcome to reflect a unified catchment, where there is one water source, and one landscape, and ultimately, one catchment community, as opposed to the currently fragmented approach to water entitlements and subsequent water management. The identity politics of the potato farmers is a case in point. They are both admired and demonised because of the one commodity label. In fact, they belong to other catchment relevant community networks that can contribute to evolving a more rounded understanding of their issues. This is synonomous with the ideas of landscape connectivity. By distinguishing and separating use, and separating environment from production there is a disconnect in the landscape.

Water use varies significantly depending on the type of potatoes grown, and the main potato crop the Russet Burbank, requires notably more water than alternative varieties that are grown for seed. The major difficulty is that there is only limited market opportunity for alternative varieties. There is no certainty or guarantee that the crop will be purchased, nor at what price. The small acreages of these potato farmers compared with seed and fresh potato growers in other regions (eg South Australia) suggests that they would be unable to compete on prices. This requires a holistic and adaptive approach, where farmers and agencies work in partnership to create viable alternative production solutions. This may entail exploring new crops, such as horticultural crops for local and regional markets. A regional food strategy based on local ecosystem capability would be an important step towards facilitating discussion about what constitutes a resilient community for the future.

McCain generates significant employment in it's processing plant in Ballarat, and is a key industry player in terms of water demand, separate to the water demands of farmers. Economically it has significant power in the region, however the environmental and social consequences at a regional level and the economic hardship at an individual producer level remain unaddressed. Agencies such as the CCMA can engage City and other management groups with McCain around issues of corporate citizenship. Undoubtedly these networks already exist. At the landscape level, we reiterate the value of working with producers to create alternative viable production systems, that are not dependent upon a one company market, and that have benefits for the previously ignored social and environmental aspects in the landscape.

Current agency interaction with farmers regarding management practice is built around a 'transfer of technology' approach. Much agency extension regarding farm management also specifically addresses the Russet Burbank variety, with only limited consideration of alternative farming systems, or, of rotational systems. Environmental management practice advice and recommendations comes from entirely separate organisations or departments, resulting in an inconsistent and fragmented approach to landscape management. In order to engage more systematically, crop management advice needs to be integrated into landscape management advice. Further, for the farmers to move beyond McCain dependence and ultimately unviable production systems, the CMA could take a leadership role. This would require reconceptualising their relationship with farmers, where farmers are stakeholders and really a part of the CMA community. Here, farmers would be involved in not just the final stages of extension, but throughout planning, designing, implementation, monitoring and evaluation associated with land and water management. This reconceptualisation of extension is an opportunity to negotiate adaptive management strategies across the catchment, reflecting and incorporating an awareness of the triple bottom line links in a way that assists those social, economic and environmental indicators to define the sustainable landscapes to be made in the 21st century. The current levels of mistrust between farmers and the CMA can be overcome with a transparent and inclusive approach that recognises the on-ground reality in the changes that are required. With transparency in planning and operation, trust between stakeholders is far more likely (Luhmann,1979).

Similarly, an increasingly transparent and inclusive approach would also be relevant to water use and water use planning, to overcome the current division that exists between farming and urban users, and between farmers and water authorities. Shared understandings of sustainable water use in the catchment need to be established, so that dialogue surrounding sustainable water use is reciprocally created and then 'owned'. A mutally acceptable definition of sustainable water use would then have the capacity to affect more meaningful outcomes in the landscape. A catchment community vision of sustainable water use could overcome the current divide between stakeholders, and allow for longer range planning. Discussions on water use within the catchment community can emphasise the idea of landscape connectivity in order to attract the 'players' to the discussion 'table'.

There were many suggestions about the construction of new urban storages as a solution to regional water use, and this needs to be seriously addressed. Here, the idea of landscape connectivity again has relevance. The current expectation among many of the locals that new urban storages would create 'new' water is fundamentally flawed, and is testimony to the disconnected vision of landscape held by members of rural communities. There are many benefits to communicating this landscape connectivity, where storages on farm and urban groundwater and river flows are all seen as interconnected: and part of the one hydrological system, in the one landscape.

The ongoing emphasis in this discussion is on inclusive, transparent and adaptive strategies, where there is no single rigid solution that is being passed down to the community but a partnership between all stakeholders in planning for a future. In light of the uncertainty and potential difficulties the future entails for all within this community, an inclusive and adaptive strategy will enable better, more resilient outcomes. It will help to build local capacity within the community to withstand and adapt to further change. Increasing levels of transparency at all levels of landscape management will foster trust within the community, which will further enable the

development of local capacity, leading to a stronger, more resilient landscape. Adaptive management recognises that the landscape is complex and can never be fully known (Jiggins and Röling, 2000), but allows and supports communities within that landscape to be responsive and flexible to such complexity and uncertainty.

Potato farmers in the catchment are planning for the future: we went into the field with stereotypes about farmers being 'conservative', 'unwilling to change' 'uninterested', and 'frustrating' people. What we found were people caught in situations that were rife with uncertainty and pressures to keep making simple and isolated decisions as responses to complex and often unresolved scenarios. Even so, they were planning for the future, and intending to live in the landscape. This research points to a significant capacity on farmer's behalf to adapt to change. While they are embroiled with potatoes now, they would not be in the future. Agencies need to support and encourage this adaptability, and take a leadership role in harnessing local knowledge and a desire to live in these landscapes with the CMA understanding of water and land issues affecting the ecological assets and threats in the region. In this way, all participants can define what living in the landscape of Corangamite will involve.

Complexity, we said, in the opening pages of this report, is translated from Latin as 'embracing' or 'entwining'. In this report we have listened to the voices of the stakeholders in the CCMA landscape and presented the conflicting views, while building a matrix for each key theme that demonstrates the links between the simple idea and the 'web' it connects to in this landscape. We have emphasised the social aspects that trigger as those that will trigger change. Overall, change with regard to this small area of the catchment will depend on how effectively the CCMA is in engaging the potato farmers of today with the rest of the community. We have argued that this requires more than a communication strategy per se. It requires a communication strategy that itself is acknowledged as requiring input from all the landscape voices; and that in foreseeing the risk and uncertainty ahead, supports on-ground activities with clear structures for building trust and credibility between all those who live in the landscape.

7. Summary of Recommendations:

1. Reinvigorate strategies for local engagement, and local connection. Be seen and heard on ground to re-establish local, grass roots connection.

2. The CCMA would also benefit from transparently communicating it's role in the landscape, as well as it's priorities.

3. Facilitate greater levels of community discussion, where farmers really are part of the catchment community. This entails farmers being involved not just in the final stages, but throughout planning, designing, implementing, monitoring and evaluation.

4. The CCMA could lead community dialogue on the subject of sustainability, so that an agreed and shared understanding of what sustainability means within this catchment is established. This discussion around sustainability needs to focus in the first instance, on how sustainability manifests in water management practices.

5. Plan for the future via an adaptive management approach: reconceptualise extension around the delivery of Triple Bottom Line outcomes and adaptive management strategies.

6. The CCMA and other agency staff have to take the initiative in breaking through the stereotyping barriers prevalent in the region before productive outcomes that generate practice change can eventuate. An example of the first step could be organising the transition from processing potatoes to seed potatoes or other crops.

7. Community is central to the success of the CCMA. The economic and environmental systems require a social system that is driven by indicators such as social coherence, social capacity and social equity. The CCMA can adapt many of its current strategies and policies to include people in the landscape rather than just the assets and threats to the biophysical region.

8. The CCMA can foster notions of catchment community through dialogue tables and discussion, where there is *one landscape* and *one water* source.

9. The CCMA can engage all community members in dialogue about the landscape and it's futures.

10. The idea of landscape connectivity is of significance here, so that all users are aware of their reliance on what is in reality, one landscape and one water source.

11. Water security could be used as a topic by the CCMA for creating dialogue and a civic space. Capacity building within the regional community, including provincial towns and rural farming communities, would enable more holistic solutions for the broader community around water security.

12. The CCMA can lead dialogue between all stakeholders in the catchment around regional water use, and changing water availability in the landscape.

13. The CCMA to actively monitor its consultative groups and ensure that they are part of the civic dialogue and participants in the planning and monitoring of river related and ground water related programs.

14. Recommendations for mixed farming systems need to be responsive to the diversity of land management practices, in order for farmers to adopt them. It suggests a need for crop management advice to be integrated into landscape management advice rather than separated. This is an adaptive management approach that reintegrates the currently fragmented support to land managers.

15. Further studies are required on alternative viable profitable production systems.

16. Partnerships depend on transparency of purpose and anticipated outcomes in order to build trust. We recommend that this sort of relationship be a goal of the agencies and farmers, because trust is fundamental to credibility on both sides.

17. Expansion of run-off management recommendations to parts of the property beyond the riparian zones is compatible with farmer expectations of how to handle these issues. This message can be in conjunction with the communication of the associated environmental and economic benefits associated with these new management activities.

18. Communicate the linkages between on-farm dams and the regional hydrological landscape, where waterways are not considered only as creeks, but also as farm dams.

19. The restrictions that farmers noted in relation to improved water efficiency irrigation technology need to be considered and incorporated into the provision of future recommendations for irrigation technology.

20. CCMA and other agencies with land and water management responsibilities in the catchment to develop a relationship with McCain, and seek opportunities for input into the land and water management advice that farmers are receiving.

21. Explore and promote attractive viable alternative modes of production that are ecologically and socially sustainable, for farmers to adopt to reduce their dependency on McCain contracts.

22. Integrating environmental messages into the production messages in journals, weekly papers and field days would ensure that farmers receive information about environmental management practices.

23. The successful characteristics of the demonstration farm could be translated into a new system of demonstrating farming practice, disconnected from corporate sponsorship.

24. Extension needs to shift focus from single commodities to building local capacity around multiple outcomes, so that it is more flexible. Single commodity extension does not have room to acknowledge complexity. Adaptive management may reduce the likelihood of liability and concerns around it, but more importantly, through building local capacity, build resilience in both the decision making process and in the shared responsibility for their outcomes.

25. Increased collaboration and partnership programs between agencies with on- ground land and water management responsibilities.

26. For example: the development and facilitation of periodic regional workshops with agency staff, would allow for greater inter-agency understanding and integration of extension activities. It would reduce the likelihood of 'gaps' occurring in extension, and enable a more holistic delivery of extension services to the region.

27. Extension is often about a linear approach to knowledge transfer that can be countered by the CCMA engaging local communities in designing and engaging with new practices that represent and build capacity for the social, environmental and economic systems in this region.

28. Similarly, communities can contribute local knowledge to the CCMA planning and management schemes as part of mutually derived outcomes for shared landscape scenarios.

29. These widespread concerns around urbanisation and land use change are an opportunity for the CCMA to take a leadership role regarding water use in the region. This could be in the form of facilitating workshops and community discussions about water use, and planning regional water management for the future.

30. Develop planning protocols around land use in consultation with the community to protect this landscape as a production landscape. In the USA this has become a serious issue leading to the formation of Right to Farm activists. Rather than segment the population, it would be an opportunity now, to build some mutual goals and increase civic literacy regarding water provision and water in the landscape.

31. Meetings and communicating issues may need to depend on radio programs rather than face-to-face contact in potato growing season.

32. Design an adaptive management framework for the potato farmers to create opportunities to re-think the production imperatives associated with the crop in the context of a wider systems approach.

33. Potatoes are closely associated with this landscape and the way that agencies describe farmers is as 'potato farmers'. If this land is not to be lost to farming because of failed succession planning, it is important in the first instance to provide a wider set of alternatives to farm families than dependency on potatoes and McCain's.

34. Historical records can be used to remind stakeholders of revegetation models. However, there is more likely to be support for landscape scenario planning that takes into account historical and contemporary expectations of land use.

35. Planning protection for good agricultural soils needs priority given increasing fuel costs in the future and likely global warming implications for the region.

36. CCMA staff and local land managers, in partnership, develop context specific recommendations for riparian management that reflect the complexity of local land management practice.

37. Model future agency recommendations on the successful synergy that has occurred between agency recommendations for grass buffer strips and on ground practice change, where recommendations 'made sense' on ground.

38. Communicate the links between on farm dams and the regional hydrological landscape, where a systemic approach to water means that waterways are not isolated as the only sources; springs and farm dams are understood to be part of the same supply.

39. Increased communication of the link between native vegetation and short term benefits for stock may improve the adoption of native vegetation plantings on properties.

40. Develop a communication campaign that demonstrates landscape connectivity. Part of this is communicating that responsibility doesn't stop at your property boundaries.

8. References

1. ABC Online (2005) 'Farmers want new offer from McCain', 26/10/05Ballarat News http://www.abc.net.au/news/australia/vic/ballarat/200510/s1481117.html Accessed 21/11/05

2. Adamson, K. (2006) 'Potato Deal Struck' Weekly Times, 05/04/06, http://the weeklytimes.news.com.au/common/story_page/ Accessed 07/04/06

3. Barr, N. (2005) The Changing Social Landscape of Rural Victoria. Department of Primary Industries, Bendigo

4. Beardsworth and Keil (1992) 'The Vegetarian Option: Varieties, Conversions, Motives and Careers', Sociological Review 40: 253-93 in Bryman,(2001) Social Research Methods, Oxford University Press, Oxford. p315

5. Beilin, R. (2001a) Underlying it All: 'Faceless Landscapes and Commodified Views', Rural Society. 11(3)147-162

6. Beilin, R. (2001b) 'The Brave New Order: Power, Visibility and the Everyday landscapes of Australian Farmers', in Environment, Society and Natural Resource Management: Theoretical perspectives from Australasia and the Americas Lawrence, G, Higgins V and Lockie, S (eds) Edward Elgar, Cheltenham, UK.

7. Beilin, R. Paine, M. and Pryor, R (2003) Reconceptualising extension to deliver triple bottom line outcomes for the Rural Industries Research and Development Corporation, University of Melbourne, VIC.

8. Beilin, R., Paine, M., Njoba, J. and Pryor, R. (2006) Reconceptualising extension: a framework for managing complex social, economic and environmental issues in practice Faculty of Land and Food Resources, University of Melbourne, Victoria, Australia

9. Bluett, C. (2005) personal communication 30/11/05

10. Bryman, A. (2001) Social Research Methods, Oxford University Press, Oxford. p265,314 and 98.

11. Sheridan, G. Oswin D. & Grant, D. (2005) Minimising Erosion Resulting from Irrigation of Potato Crops in the Ballarat District Centre for Forest Tree Technology, Ballarat, Australia

12. Cicero, Marcus Tullius(45 BC) in Disputationes Tusculanae Accessed: http://www.utexas.edu/depts/classics/documents/Cic.html

13. Corangamite Catchment Management Authority (2000) Corangamite Regional Nutrient Management Plan, Corangamite Catchment Management Authority, Colac: Australia

14. Corangamite Catchment Management Authority (2004) Draft Corangamite River Health Strategy, Corangamite Catchment Management Authority, Colac: Australia

15. Corangamite Catchment Management Authority (2003) Corangamite Regional Catchment Management Strategy 2003-2008, Corangamite Catchment Management Authority, Colac: Australia

16. Department of Agriculture (1991) Caring for Cultivated Soil: 'How potato growers in high rainfall Gippsland are maintaining soil productivity and avoiding erosion' Department of Agriculture

17. Department of Sustainability and the Environment (2006).Draft Sustainable Water Strategy, Central Region, Victorian Government, Department of Sustainability and the Environment.

18. Eastern Canada Soil and Water Conservation Centre (2005), Crop Rotation: The future of potato industry in Atlantic Canada, http://www.ccse-swcc.nb.ca/ Accessed 1/04/06 Eastern Canada Soil and Water Conservation Centre, Canada

19. Egan, Carmel (2006) 'Water deal leaves farmers dry' The Age 17 September, 2006, Accessed: 20/09/06 http://www.theage.com.au/news/national/water-deals-leave-farmers-in-the-dry/2006/09/16/1158334735077.html

20. Elliott, G.L, and Cole-Clark, B.E. (1993) 'Estimates of Erosion on Potato Lands on Krasnozems at Dorrigo, NSW., using the Caesium 137 technique' Australian Journal of Soil Resources, 31, 209-223

21. Fletcher, T.(1998) The Cumulative of Recent Land and Water Use on the Moorabool River Phd Thesis, The University of Melbourne, Australia

22. Geertz (1973) 'Thick descriptions, towards an interpretative theory of culture' in The Interpretation of Culture, Basic Books, New York, p3-30

23. Gershenson and Heylighen (2005) How can we think complex? Centrum Leo Apostel, Vrije Universiteit Brussel, http://www.vub.ac.be/CLEA

24. Hansen Partnership, Jacobs, W & Naga Services, (2003). Thematic History, volume 1. Ballarat Heritage Study – Stage 2. Victoria

25. Hansen, E.C (2006) Successful Qualitative Health Research, Allen and Unwin, Crows Nest

26. Jiggins, J. and Roling, N. (2000) ' Adaptive Management: potential and limitations for ecological governance' Int. J. Agricultural Resources, Governance and Ecology Vol 1, No. 1, pp28-42

27. Lee (2004) Potato Farmers fight for Market Share' ABC Landline 01/08/2004 Online source: http://www.avc.net.au/landline/content/2004/s1162182.htm Accessed 03/10/05

28. Luhmann, N. (1979) Trust and Power, Wiley, New York.

29. MacKinnon, W. (2003) Let's talk …Crop Rotation 15/05/2003, Eastern Canada Soil and Water Conservation Centre).http//www.eFarm.ca Accessed 02/11/2005

30. McCain website (2006) http://www.mccain.com/index.htm Accessed 01/04/06

31. Murphy, A. (2000) 'Agriculture Restructure and Farm Families: Emerging Points of Conflict'. Centre for Rural and Regional Health Website (no longer in operation), Ballarat University, Ballarat

32. Nexus Consulting (2004) Central Highlands Agribusiness Project, Nexus Consulting, Bairnsdale

33. Norman, Laurie, (2005) FARM Consulting, personal communication, 30/11/2005

34. Orlando, Y. (2006)Extension in a changing rural landscape – a review of Agriculture Development extension in Victoria. Practice Change Platform, Department of Primary Industries accessed: http://www.regional.org.au/au/apen/2006/refereed/6/3216_orlandoym.htm

35. Phillips Agribusiness (2001) Land Capability and Farming Practice in the Moorabool Shire, Phillips Agribusiness, Geelong

36. Sinclair Knight Mertz (2004) Moorabool River Water Resource Assessment, Sinclair Knight Mertz Consulting, Melbourne, Australia

37. The State of Victoria, Department of Primary Industries (2003) Environmental Best Management Practices on Farms, Workbook 1 & 2 Department of Primary Industries, Geelong.

38. UBD (2004) UBD Country Roads Atlas Universal Publishers, Australia.

39. Walker, B., C. S. Holling, S. R. Carpenter, and A. Kinzig. (2004). Resilience, adaptability and transformability in social–ecological systems. Ecology and Society 9(2): 5. [online] URL: http://www.ecologyandsociety.org/vol9/iss2/art5/

40. Wilson, G. (1999) 'Potato Varieties' in Agriculture Notes AG0332, State of Victoria, Department of Primary Industries, Victoria

41. Yin, R. K. (1994) Case Study Research Design and Methods, 2nd Edition, sgae Publications, Thousand Oaks, USA. p41

9. Appendices

Appendix 1:

Scoping Report: The Social Context of Land Management Practice and Decision Making in the Moorabool Basin

Melbourne University and Corangamite CMA.

Scoping Project

Aims:

Gain knowledge of area and priority issues for policy makers
Examine the policy context of the CCMA and its partnerships with other agencies, groups and individuals
Determine current perceptions within the CCMA and other agencies of landholders, their attitudes, practices and participation in NRM
Obtain general information on landholder issues from on-ground staff working with multiple land holders
Identifiy stakeholders
Analyse gaps in information that may be evident

Methodology:

Literature review of journal articles, theses, technical and social research reports and policy documents and review of available maps and databases.

General, informal interviews were conducted with individuals from state government, agencies, conservation groups and farmer groups

1.0 Background Bio-physical Issues

1.1 Condition of Moorabool River

The Moorabool river is reported as one of the most stressed rivers in Victoria. The overall condition of it's waterways are assessed as being of marginal to very poor condition as classified by the Statewide Index of Stream Condition (Corangamite River Health Strategy draft 2004). This index takes into account the hydrology, physical form, streamside zone, water quality and aquatic life.

The poor condition of the Moorabool waterways is stated as most likely due to extensive demand for water within the basin from both rural and urban uses with more than 60% of available surface water supplies utilized (Corangamite Regional Catchment Strategy 2003).

1.2 Salinity

Primary salinity is thought to be the origin of 50% of the salinity mapped in the Corangamite region (CSAP). Secondary salinity has occurred as a result of land use change and the subsequent adjustment in soil hydrology and raising of the groundwater table. The increase in salinity threatens agricultural productivity and biodiversity across the Corangamite region. It is also a concern to water supply authorities.

Salinity increases down the Moorabool due to salt additions from its tributaries (personal communication Felicia Choo). Salinity in the upper and lower reaches of the river frequently exceed WHO limits for potable supply (National Land and Water Resources Audit, Australian Catchment, River and Estuary Assessment, 2002).

Table 1:Provisional estimates of the loss of farm gross margin from salinity ($M/yr) Taken from CRCS 2003

Year	Low Projection	High Projection
1996	2.8	2.8
2020	2.9	9.6
2050	3.0	29.4

2.0 Background Information

2.1 Local population

The population of the region is a mix of farming families and rural (lifestyle) dwellers. Regional centres are Bannockburn, Gordon, Lethbridge, Maude Meredith, Morrisons and Sheoaks. The population in the Corangamite region is increasing each year. This increase is uneven and the population is said to be expanding rapidly in several areas including the peri-urban fringe (40km from urban centres). This category applies to much of the Moorabool Basin. There is little demographic information available at the River Basin scale, however, regional demographic information is supplied for the Corangamite catchment (Demographics and characteristics of

Corangamite People) and for the Moorabool Shire which extends beyond the Corangamite Catchment boundary (Moorabool Shire Council Social Development Plan). In addition, maps of the upper part of the basin show property boundaries and from these, an approximate estimate of the number and size of properties can be made.

2.2 Landuse

Table 2: Landuse in the Moorabool basin (National Land and Water Resources Audit, Australian Catchment, River and Estuary Assessment, 2002)

Land Use	Land use as a percentage of whole Moorabool Basin
Nature conservation	4.5
Minimal Use (mainly crown land)	11.7
Forestry	3.3
Livestock grazing	39.1
Dryland agriculture	33.7
Irrigated agriculture	0.4
Built environment	7.3
Water	0

Maps available for the area between Morrisons and Sheoaks show property sizes ranging from less than 1 ha to greater than 500 ha. The majority of property lots are in the group ranges of 25-100 ha and 100-500 ha with the smaller lots of less than 25 ha being mainly situated around the communities of Morrisons and Sheoaks.

70% of the land in the Moorabool basin is privately owned (DPI). Any remediation of threats and maintaining of assets, it will be essential to engage private landholders on a large scale.

In the upper reaches of the Moorabool, the predominant land use is grazing modified pasture with patches of production and plantation forestry and some cropping. There is a small amount of irrigated perennial horticulture along the west branch and small patches of livestock grazing in the lower reaches of the east and west branches of the Moorabool.

2.3 Water Supply and Management

There is some complexity in the management of the water systems within the Moorabool Basin (Nathan 2004). Responsibility for groundwater, crown frontages, water supply, agricultural water and waterway health all rest with different agencies. Groundwater, irrigation and farm allocation are administered by Southern Rural Water; storm water is managed by the relevant municipalities, urban supply by the water authorities, Central Highlands Water and Barwon Water, and river health is managed and monitored by the CCMA.

A report commissioned by the CCMA[5] states that water resources in the Moorabool Basin are over committed and that passing flows are well below desirable minimum environmental flows. The

[5] Moorabool River Water Resource Assessment SKM, Final 2 22/10/04

report examined the competing demands for water and the degree to which environmental flows can be improved. The objective was to estimate the impact of water use and entitlement, i.e.the full uptake of licences, on the 'natural' flow conditions. Key issues identified were: the over allocation of water; the significant and increasing urban water use; and the impact of farm dams on flows. The social assets of the river basin described in the report were: the river's high aesthetic value for residents and visitors; heritage values, for example historic bridges; and recreational values such as parks, picnic areas and wineries.

The flows are regulated by on-stream storages. On the west moorabool, at the Moorabool reservoir and the Lal Lal reservoir, and on the east moorabool at the Korweinguboora and Bostock reservoirs. The upper reaches of the Moorabool to the holding station at Sheoaks is a designated water catchment area. The Western reservoirs being managed by Central Highlands Water and the eastern by Barwon water. The farm dam licences and licences for water pumped from groundwater are administered by Southern Rural Water.

The White Paper 'Our Water, Our Future' introduces the concept of Environmental Water Reserves to the management of river health. This is the proportion of river flow which is set aside for the environment. The Moorabool Basin is a fully allocated catchment, and as such, the initial Water Reserve will recognize the existing entitlements. The White Paper states that the consumption of water will be capped and the exact nature of this will be decided by the water authorities. Currently, water extraction licences are capped (PC SG).

Bulk entitlements specify the amount of water an authority can extract. In the past, this has been assessed by taking into account the historical use. For example, the infrastructure that is in place and what load this can take. The environment would get what was left. The CCMA will have the role of managing the Environmental Water Reserve. This role will include participating in any new negotiations on bulk entitlements, providing environmental input and yearly auditing and monitoring bulk entitlements when in place. Bulk entitlements will be reviewed when there is new environmental information.

2.4 Recreation and Social Amenities

Local Shires
The Moorabool Basin is situated within three shire authorities, Moorabool shire in the north, great plains shire in the central region and The City of Greater Geelong in the very southern most area.

2.4.1 Local community services

There are an extensive number of sporting clubs, community groups and facilities in the area which cater for the local rural population. To demonstrate this, Appendix A gives a list of groups in the Meredith district, sourced from the Great Plains Shire Community Directory. The sporting groups include Australian rules football, tennis, cricket and golf clubs. Community groups include the senior citizens' group and the country women's association. Other amenity and services include the rural fire brigade and a district nurse. Similar groups and services are found throughout the Moorabool Basin, based in the communities of Bannockburn, Gordon, Lethbridge, Maude and Sheoaks.

2.4.2 Services available to the greater community

Services and amenities which are available to the local community but which are also accessed by people from outside the area include the use of park land and angling on the surface waters in the basin.

The Moorabool basin extends into the Brisbane Ranges National Park and a regional park, the You Yangs Forest Park. People both inside and outside the local community use these parks as a social amenity and recreation area for drives, walks and picnics (Parks Victoria)

There is extensive fishing available on the reservoirs and along the Moorabool river. The Moorabool Reservoir is particularly popular for fly fishing. Fishing permits are required to fish on the reservoirs and these are available free of charge from the appropriate water authority. Along the river, much of the access is through private land and the DPI asks that permission is sought prior to entering. The stretch of the river from Morrisons to Sheoaks is described as particularly good angling waters and the Moorabool river is considered to be one of the better brown trout fisheries close to Geelong. Other fish found in the basin include short-finned eel, redfin, tench, roach, carp, goldfish, flat-headed gudgeon, mosquitofish, Australian smelt, blue-spotted goby, carp, common galaxias, spotted galaxias, mountain galaxies, redfin, tupong, small-mouthed hardyhead, blackfish, black bream and southern pigmy perch (DPI website at 31 May 2005).

2.4.3 Heritage

There are approximately 70 Aboriginal Heritage sites in the Moorabool Basin (taken from information supplied on the CCMA map database)

2.5 Proximity to urban centres and tourist attractions

Much of the Moorabool basin is within an hours drive of the urban centres of Geelong and Ballarat and an hour and a half from Melbourne and one of the most popular tourist attractions in Victoria, The Great Ocean Road.

2.6 Landcare

2.6.1 Local Landcare Groups

Bamganie/Meredith and District Landcare Group

The Bamgamie/Meredith Landcare Group includes around 50 memberships (one membership will include at least one property, possibly two if owned within the same family). The group was established in 1990 and priority issues have been rabbits and salinity. The group have been situated in a salinity hot spot over the past five years but the focus has moved from this issue recently. The group's accomplishments have included planting 174,210 trees and treating 11,105 ha of active soil erosion and salinity. The membership is a mix of ages and a mix of large and small farms. When the group initially formed, nearly all members were full time farmers. Currently, the membership is mixed and there is a large proportion of farmers who have smaller properties and earn off farm income to subsidise this. The trend has been due to the older generation not passing the farms on to offspring in this area. They have gained more money from sub dividing

their land than farming. The Bamgamie/Meredith Landcare Group is associated with a network but this is not a landcare network. The group has affiliated itself with the Victorian Farmer's Federation (VFF). One main reason for this is that the VFF provide public liability for injuries sustained during landcare work (Personal Communication, Helmut Woener).

East Moorabool Landcare Group

The East Moorabool Landcare Group covers the area from Greendale/Ballan to Morrisons and falls within the regional catchment administrative areas of Corangamite and Port Philip and Westernport. There are 34 members (properties) involved with the group, who have a range of areas and an approximate mix of large and small farms 40:60. The members are mainly sheep and cattle farmers with some diversity in agroforestry and the growing of blue gums and pines. The groups was established in 1989 on a short stretch of the east Moorabool river and the particular issues which were of initial concern included, serrated tussock, rabbits, foxes, erosion and loss of farm productivity. The group receives information and support from both Port Philip and Corangamite. (personal communication, Elspeth Swan)

Lal Lal Catchment Landcare Group

Maude Landcare Group

The Maude Landcare Group has around 25 members and the area they cover stretches from Maud and Sheoaks and across the highway to Bannockburn. The group was established in 1989 in order to focus on rabbits and serrated tussock (Personal Communication, Lex Stray).

2.6.2 Local Landcare Networks

The Corangamite Catchment Authority recognises three landcare networks in the Moorabool Basin: Moorabool Gorge Project, Maude Landcare Group/Anakie Tree Planters and Barrabool Hills.

The Maude Landcare Group and the Anakie Tree Planters share a facilitator and do not work on projects together (PC LS).

The landcare groups in the north of the catchment, Lal Lal Catchment Landcare Group and East Moorabool Landcare Group, belong to a landcare network which stretches across two catchments, Corangamite and Port Philip and Westernport. The meetings are attended by landcare groups and environmental groups. This network is an advisory body to the Moorabool shire (Personal Communication, Elspeth Swan)

2.7 Other groups and projects active in area

Greening Australia

Greening Australia works to engage the community in vegetation work. The office in Colac covers work in the Corangamite Catchment area including the Moorabool Basin. Engaging the community is facilitated through running education projects such as environmental workshops for the public. Some of these projects will be geared to landholders. For these more specialized workshops, landcare co-ordinators are the main source for supplying the network of contacts, however, other groups such as 'Friends of..' groups may also be used. Some land managers who are not in

landcare may get involved if they are interested in the projects they see on the website and contact Greening Australia directly. On ground work is undertaken by mainly subcontracting to work on projects for agencies such as the CCMA and assisting landcare groups in the area. Some projects are initiated by Greening Australia but the majority are ultimately initiated by the CCMA since this is where the funding is sourced (RCIP). Greening Australia also fulfill an advisory role, for example, supplying the DPI with a list of species for biodiversity programs.

Moorabool Gorge Recovery Project

The Moorabool Gorge Recovery Project was formed out of work initiated and developed by the East Moorabool Landcare Group. The group had been very successful in securing funding for projects in this area and a facilitator was employed to concentrate on the issues of fencing the gulleys and planting trees (Personal Communication, Elspeth Swan). The Project continues to be successful with landholders having a lot of confidence in the current co-ordinator (Personal Communication, Lucy Pike). The project focuses on re-vegetation and assists land managers with fencing the river frontage and protecting remnant vegetation. In the northern area workshops and courses are offered to farmers including whole-farm planning (Personal Communication, Ralph Cotter)

Land for Wildlife

The Land for Wildlife project is a state government program which offers support to land managers who provide habitats for native wildlife on their land. It is a voluntary scheme that land managers can participate in. The program has an internet site which provides information and land managers who access this, and are interested in pursuing this further, will contact the Land for Wildlife EO. There is no further funding for the project in the Moorabool area and the Land for Wildlife EO will put interested land managers in contact with an appropriate local group such as Landcare or Birds Australia (Personal Communication Elspeth Swan)

Other Groups in contact with Land Managers

Meredith/Bamganie Farm Safety Action Group
Flockcare
Cattlecare
Beef check
Lamb check
Southern Farming Systems
Projects initiated by water authorities and shire municipalities
Victorian Farmers Federation

2.8 Discussion

A better understanding is required of the on-ground land production practices of land managers and their decisions in relation to Natural Resource Management decisions. The work will be looking particularly at the social context of land management with regards to salinity. There are a variety of land uses in the catchment and therefore a range of water uses. It will be necessary to identify land managers within each type of production and examine their water management decisions and practice.

The proximity of the urban centres of Melbourne, Ballarat and Geelong and the tourist attraction, Great Ocean Road, has an impact on local populations within the basin. The future projected population change and the type of people moving into the area will be influenced by these factors. The type and amount of off farm income available to property managers in the basin will be to some extent determined by these factors, affecting those already farming and the type of people who may buy up property in the future. For example, lifestyle farmers will be attracted to the area due to the proximity of urban centres and the potential to earn off farm income. An understanding of the different type of landholders and their attitudes to this change would be useful.

Landcare groups in the Corangamite region represent approximately 30% of farmers (Alan Curtis, Personal Communication). It will therefore be important to access land managers through groups such as those listed in section 2.6.4 as well as Landcare. Although the stewardship ethic that land holders have to their land is not necessarily synonymous with landcare membership (Curtis) other differences between land managers may be present between those who participate in landcare and those who do not.

It needs to be established whether the work of groups such as the East Moorabool Landcare Group and Lal Lal Landcare group and the CCMA are integrating their work and sharing knowledge at the network level. It is not clear whether landcare farmers in the north of the catchment are represented in any way at the CCMA strategic level. The Moorabool Gorge Recovery Project is involved at this level and it should be established whether this project and facilitator are representative of these other groups.

There are a range of projects and agencies working in the area. There has been some feedback that land managers as well as agency staff have some difficulty in tracking the number of projects that are being carried out, which group or agency is co-ordinating each project and the extent of projects available to interested land managers.

In addition, much of the work of those groups examined in sections 2.5 and 2.6 above, is influenced by funding available and this is primarily directed from the state and commonwealth governments through the CCMA. The project priorities of much of the on-ground work are therefore those of the CCMA and the assets and threats identified in the Regional Catchment Strategy. An important part of this scoping exercise has included an examination of the CCMA, the teams, strategies and partnerships the CCMA has with other groups. This not only provides the context for much of the work going on in the catchment but is also a starting point for scoping the aims and objectives of the research project itself.

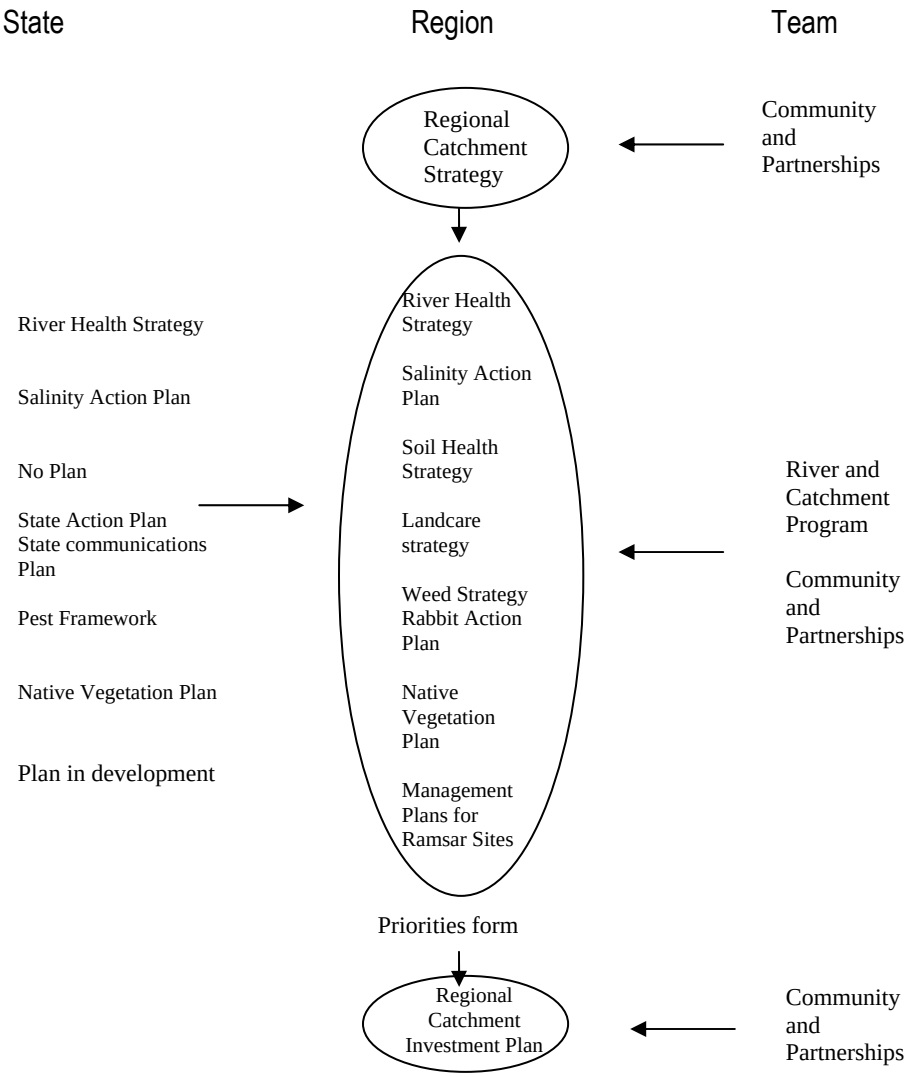
3.0 Policy Context

3.1 Regional Catchment Strategy

The Regional Catchment Strategy (RCS) is an overarching strategy for the catchment and covers assets and threats to the whole range of ecosystems within the CCMA's responsibility. It provides guidance to the supporting strategies, each of which is a more detailed version of the areas examined in the RCS. The priorities which are identified in the supporting strategies inform the Regional Catchment Investment Plan (RCIP).

The Corangamite RCS outlines the key assets and threats in the corangamite region. The regional plans and strategies most relevant to this work are shown in the figure below with the state and regional input to their formulation.

Fig.1 Regional Plans and Strategies and state input (source: Author's own)



Approach of RCS

The current RCS runs from 2003-2008. The previous RCS took an issue based approach which focused on the general threats in the region. The DSE, in giving guidance to CMAs on the content and approach of the current RCS, decided that an asset based approach focusing on what the region values, and maintaining this, would be preferable. This guidance included who should be involved in the process of deciding assets but did not state how these assets should be determined. Across different CMAs different processes to determine assets, and different interpretation of assets, can be seen. This approach gives each RCS a regional focus. Each CMA came up with similar, slightly different, sets of assets with individual priorities within these. For example, a cohesive community and atmosphere and climate are priority assets within the West Gippsland RCS. (Personal Communication Patricia Geraghty, West Gippland RCS 2004-2009)

Community Involvement in the RCS

The assets identified in the CCMA RCS were decided within stakeholder focus groups. This was facilitated by two series of workshops held across the region. These were not public meetings and were invitation only. Seven host groups decided on invitee lists, the host groups included Environmental Committee, Geelong, Ottway Agrofrorestry and West Vic Dairy Board. The first series was to identify what the community wanted to see conserved or improved and the second was to identify what the strategies for this should be. The workshops involved community stakeholders and 'technocrats' including CCMA, local government and state departments. There was some tension between the different groups present and a balance between the two, technocrat and community, had to be found to agree on a set of assets and threats (Personal Communication, Peter Codd).

The RCS lists the groups and individuals consulted during the development of the RCS. Within the community in the Moorabool basin, these were stated as Anakie Maude Landcare Group, Bamganie/Meredith Landcare Group, individual farmers and land managers, Lal lal landcare group, East Moorabool Landcare Group. There were no workshops in the upper reaches of the basin and stakeholders from here were asked to travel to workshops in other sub-regions.

3.2 Individual Strategies within the RCS

Supporting strategies within the CCMA take on different approaches, for example, with regards to management tools and on-ground works.

The River Health Strategy

The River Health Strategy (RHS) outlines goals which relate to specific aspects of river health. These are all biophysical and relate directly to environmental outcomes. The current condition of the rivers is assessed using the Index of Stream Condition (ISC). The assets identified within the Moorabool basin are:

Table 3: Major Assets of the Moorabool basin as identified in the RHS

Environmental	Social	Economic
Native fish, including: the vulnerable Australian grayling, Australian smelt, Black Bream, Galaxias, Southern Short Finned Eel, Tupong, Blackfish, Hardyhead and Southern Pygmy Perch Remnant threatened flora species, including: Hairy Anchor Plant	Fishing Passive recreation Camping areas	Water supply to Ballarat and Geelong Stock, domestic and irrigation demands including diversion licences

The threats include human threats and biophysical manifestations of these, for example one set of threats are given as: uncontrolled stock access, bank erosion, sediment transport, pest plant and

animal problems and water quality degradation. Other sub categories are instream barriers, altered flows, nutrient levels and salinity.

The Salinity Action Plan

The Corangamite Salinity Action Plan 2003 (CSAP) outlines the salinity processes within the region and prioritises management activities across twelve target areas. The plan has implemented the policy framework of the Victorian Salinity Management Framework 2000.

The Plan identifies twelve interim target areas where assets are under threat from salinity. Within the process of identification of these areas, importance was placed on whether there was a regional groundwater flow system. The salinity risk was assessed by taking account both of the number of assets at risk in an area and the agreed importance of those assets. The assets classes were: infrastructure; utilities; agricultural land; water reservoirs environment and cultural and heritage. Within the Moorabool basin there are two priority areas identified, Upper Moorabool (upper section of West Moorabool river) and Morrison-Sheoaks. In both cases the asset under threat from salinity is identified as urban water supply.

The Base of the gravel caps in the Morrisons-Sheoaks, identified as a priority area for management of saline groundwater discharge, is thought to contribute 30-50% of increasing salinity in the Moorabool river (Personal Communication, Felicia Choo). If no action is taken in the upper moorabool area the predicted outcome is that salinity in the Lal Lal reservoir, which supplies drinking water to Ballarat and Geelong, will increase and that, in the Morrisons-Sheoaks area, salinity will increase in water storages that supply Geelong's urban water needs.

Salinity Management plans for the target areas included engineering, biological and planning solutions. Agricultural land managers were one set of asset managers identified whose participation will be required to implement management actions.

An action of the CSAP is to investigate the cause of rising salinity in the Moorabool river. Programs initiated by the plan, which involve the participation of landholders, include three programs in the Morrisons-Sheoaks area: saline discharge area revegetation program, to be implemented by the Moorabool Gorge Recovery Project, tree planting work on areas immediately above discharge sites, to be implemented by the DPI and a rabbit control program. Other benefits of the work in the Morrisons-Sheoaks area are stated to include the reclamation of agricultural land, return from plantations, reduced cost of salinity to urban water users.

3.3 Multiple Outcomes Project

A Multiple Outcomes Programme is to be implemented in the Morrisons-Sheoaks area. The MOP is being driven by the state which has a strong influence on the CCMA through the large amount of funding it provides, see table below:

Table 4: Funding of CCMA (source: Personal Communication, Peter Codd)

State	Commonwealth
DSE holds money – 6.6m Put into regions: river health, pests and plants, soil health, salinity	National Action Plan for Salinity and Water Quality – 5.4m Salinity work and will include landcare and other projects Natural Heritage Trust – 2.1m Broader that NAP

The MOP will be trialled in Victoria in four regions and the state have chosen Corangamite as one of these. The CCMA then proposed that Morrison-Sheoaks be the area of focus. Illabarook had originally been chosen but the CCMA have now settled on Morrison Sheoaks due to there being more diverse issues, particularly urban water supply. In addition, the work completed in Morrison Sheoaks can be more easily verified due to the regional groundwater flow system. Monitoring of the regional groundwater system can be directly linked to on-ground work in the area.

3.4 Strategic Partners

The range of agencies, groups and organizations that the CCMA will undertake to form partnerships with in the future is informed by the Communication, Engagement and Social Change Benchmarking report series, in particular the Report on the Engagement Strategy[6]. A current priority is the tourism industry (personal communication Stewart Anderson)

Currently, a large proportion of the groups which implement on-ground work and education in the Moorabool Basin are funded and effectively sub-contracted by the CCMA. The range of groups and agencies who are currently partly funded by the CCMA include: Environment Protection Authority, DPI, Greening Australia, Landcare Networks, Regional Water Authorities, CSIRO, Local government, coastal boards, Central Vic Farm Plantations Committee, Trust for Nature and Universities.

3.5 Current programs/grants in the Moorabool Basin (Felicia Choo, CCMA)

CMIS
High Value Rivers

[6] Prepared for Corangamite Catchment Management Authority by URS Australia and AgInsight 200

Nutrient Management Incentive
Second generation landcare
Significant wetlands
Targeted waterway program
Threatened vegetation program
Salinity
Victorian volcanic plain tender
Bush tender (Personal Communication, Felicia Choo)

3.6 Discussion

Due to the large majority of on-ground works following the priorities identified by the CCMA there is a good regional focus and integration of the work carried out by groups undertaking conservation work in the Moorabool Basin. It should also be noted that in this way, groups and individuals are somewhat constricted to the type of issues they can address in their work. Land managers and other on-ground experts may find that the issues they are facing and assets they feel need to be protected may change over time in advance of strategic targets and goals set by the CCMA. These targets may not even be aligned with issues and assets identified on-ground in the first place. It is necessary to identify whether landholders and other on-ground experts have sufficient avenues of discourse to feed their knowledge of the local area, and assets and threats that they identify, into the work which is carried out. One part of this research will identify the values that landholders have with regard to their landscape and compare these with those identified at the strategic level[7]. This will enable the CCMA to see whether the projects being offered to land managers address the issues that they are facing and the assets that they wish to protect.

Land managers are being approached by different groups and agencies to work on a range of conservation programs. It is necessary to identify whether landholders see an integrated approach of these agencies and whether they see a consistency in the type of issues that are addressed.

It is foreseen that the MOP will focus much of the region's resources in the Morrisons-Sheoaks area. It will be important to ensure land managers are interviewed both inside and outside this area. They will be experiencing different levels of access and opportunities to engage with projects. It will be interesting to note whether there is a difference in priorities and land management practice at the landholder scale from within and outside this area.

The direction that the CCMA takes with regard to strategic partnerships, the assets that are identified as strategic level and the available projects to landholders, will all have an influence on land managers and their decision-making. To assist with the scope of this research and to ensure that factors of influence on land managers are identified fully, a summary of the findings are displayed in the model below. This not only summaries the initial research findings but will also assist analysis of future research .

[7] In addition to community involvement in the RCS, see section 3.1, stakeholders were consulted for individual strategies. However, it is noted that this involvement was small relative to the number of active land managers in the area and this involvement becomes diluted with the layers of strategic planning.

The model summarises information gained from literature, interviews, policy documents and research carried out in the area. At the centre of the model is the land manager and the first circle is his/her reality. Each sector of the model has connections, influences and synergies not only with the three sectors but also with each of the circles increasing in size with increasing distance from the land manager.

Participation

Within the participation (politics) sector, the next level of influence from the land manager's reality are groups in direct contact with the land manager such as the DPI, Landcare Groups and Greening Australia. The CCMA is more distant from the land manager, having a more strategic role and less on ground contact that the agencies who facilitate most of their programs. The land manager's ability to participate in decisions is dependent on the avenues of discourse available and the participation and engagement policies of these agencies. Groups within the closest circle are more informed with regards to on-ground issues and more able to engage with land managers than those further away.

Bio-physical conditions

The bio physical conditions at the farm scale and the biophysical conditions at the regional scale, such as weather systems and river flow, affect the type of issues in the area and the assets and threats identified. This in turn determines the type of projects available which will eventually, assuming projects are implemented effectively, come full circle and determine the bio-physical conditions. However, if this inner circle of influence is interrupted by outside influence from the other spheres, the bio-physical needs of the area may not be met.

Income

The land manager's income will be determined, and impacted by, the type of enterprise and size of holding and outside influences such as fluctuation of markets and access to off-farm income. The land manager's decisions will be determined and impacted by land regulation and planning policy and changes in property prices.

Social Context

The Social Context will be the focus of this research whilst taking into account the connections and synergies with other sectors. This is a contentious area and there have been conflicting perceptions and findings from various agencies, groups and research papers during this scoping study. It will be important to establish a clearer picture of the social context of the decision making within the Moorabool Basin. This sector very clearly impacts on the landholder's participation in local NRM projects, the land management practice which is undertaken on the farm and therefore the bio-physical conditions.

4.0 Summary and Conclusions

The next stage of the research will identify how current social policy within the Moorabool Basin is impacting on land manager decisions. This can be explored using the model above. The table below shows examples of local and regional policy which will impact on land managers' decision-making due to the factors shown.

Table 5: Factors of influence on land managers' decision-making

Influencing factors	Policy which may impact on this

Ability to sub divide land Ability to develop on land Reduction in property price as result of inability to develop land Blocks of high quality agricultural land being taken out of production	Protecting Water Quality in the Moorabool Shire: Water Catchment Protection Policy Moorabool Shire planning policy Great Plains Shire planning policy
Pressure for land in rural areas	The Melbourne 2030 Strategy
Water restrictions downstream	White paper 'Our Water Our Future'
Future water resource use	Water EcoScience report

Water Catchment Protection Policy

The Water Catchment Protection Policy was developed by the four water authorities which work in the Moorabool Shire area. The policy was drafted in consultation with officers from Moorabool Shire, the Departments of Infrastructure (now DSE) and Natural Resources and Environment (now DSE and DPI) and Planning Panels Victoria (Esther Kay). This policy is used to inform water authorities when assessing planning applications which require a planning permit and are directed to them from Moorabool Shire Council. The applications will include developments such as domestic dwellings, subdivision of land and to use land for industry in a rural zone.

Influencing factors

Policy guidelines include: that dwelling density generally should not exceed 1:40 hectares; an application to develop a second dwelling on a lot will be supported should it meet pre-set conditions set out in the guidelines; regarding land use, industry and intensive animal industries are discouraged outside of township areas and land managers are encouraged to adopt the appropriate best practice environmental management system. Guidelines are given for building and works, subdivision and lot design, effluent disposal system.

Land managers are concerned that the 40ha minimum area for new dwellings will result in good agricultural land being taken out of production as these are the smallest plots hobby farmers will be able to buy when only 2-3 ha is necessary for a hobby farmer.
(Report on Consultation Forums 2003)

Consultation Forums were held during the Moorabool community after the drafting of the policy. Other landholder concerns which were raised in addition to those above were:

- Distribution of costs and benefits
  - Water authorities are taking water for use outside the shire
  - There is no return to landowners for water that is used outside the shire
  - Farmers who fence off creeks will lose land and still have to pay maintenance and rates on this
  - Emphasis of remediation on landholders – no focus on technological responses of water authorities

- Property prices

Fall in land prices if development is not permitted in rural areas. Farmers had expectation they one day would be able to develop.

- Policy

  Different policy players with responsibilities and rights to decide – incremental erosion of landowner's rights

- Social issues

  Unwilling to sell good agricultural land to hobby farmers or other non-agricultural use
  Now more pressure to do so as next generation do not want to farm

  In order for the next generation to stay on farm needs right to excise land for a home – farming culture and the people who are best able to tend the land

  Absentee farmers will not look after the land

These attitudes and concerns above should be taken into account when preparing to interview landholders within the Moorabool Basin for this research.

Objective:

Investigate the community and network context for catchment land management and planning for salinity in the Moorabool basin through:

Aims:

- Explore the local practices and understanding of landholders regarding Natural Resource Management issues

- Examine participation in agency initiated NRM programs
  Look at number of projects available to landholders and changes in priorities and focus of programs and level of support offered

- Investigate further the priorities and concerns significant to landholders and compare these with assets and threats identified at the strategic level
  Focus on socio-economic assets which interact with natural resources and social, economic and environmental values attached to their landscapes and its long term viability

- Develop a framework of triple bottom indicators for the landscape from the social, economic and environmental values with stakeholders (agencies and land managers) to plan for future change and the integration of community and CCMA strategic directions.

Questions:

Do the issues experienced by, or threats significant to, landholders tie in with the CMA projects available in the area?

How do community practices engage with changing water management in the Moorabool Basin landscape?

References

Corangamite Regional Catchment Strategy

Corangamite River Health Strategy – summary report and draft for public comment

Corangamite Landcare Support Strategy

Corangamite Catchment Management Authority (2003). *Corangamite Salinity Action Plan 2003 – Salinity Action Plan (Technical Report 2)*. Corangamite Catchment Management Authority, Colac: Victoria.

Corangamite Soil Strategy – draft

Hydrological Report – draft

Project Summary *Community Strategies – developing targets for community engagement and capacity building for NRM outcomes*

Communication, Engagement and Social Change Benchmarking:
- Demographics and characteristics of Corangamite People
- Communication Strategy
- Engagement Strategy
- Corangamite communities – their values, beliefs, attitudes and behaviour in managing natural resources

Moorabool River Water Resource Assessment, SKM 2004

Victorian River Health Strategy
Healthy Rivers, Healthy Communities and Regional Growth
- overview
- full doc

Water White Paper *Securing our Water Future Together* June '04
- summary doc
- full doc

Guidelines for review and renewal of regional catchment strategies 2002-2007

West Gippsland Regional Catchment Strategy 2004 - 2009

North East Regional Catchment Strategy

DES Guidance Note *Asset Based Approach* 2005-06 Regional Catchment Investment Plan

Providing Social Data to Underpin Catchment Planning in the Glenelg Hopkins Region

Corangamite Salinity Implementation Survey, A survey of Landholders Attitudes, Practices and Intentions for Salinity Control in the Corangamite Region
Produced by NRE June '97

Water and Land Use Change study

Moorabool Shire Council Social Development Plan

CSIRO LAND and WATER
Victorian Volcanic Plains Scoping Study,
Peter Dahlhaus, Jim Cox, Richard MacEwan and Peter Codd

Environment Hydrology Research Report Series
- Central Highlands Water and Centre for Environmental Applied Hydrology
- Data Consolidation and Management Report 2 Robert Argent CEAH, Jane Bateson CHW, Tim Fletcher CHw, Jennie Thompson, CHW October 1995

DPI http://www.dpi.vic.gov.au/angling/32-Moorabool/Basin%20TEMPLATE%20Waters.htm
A Guide to the Inland Angling Waters of Victoria, Angling Waters of the Moorabool River Basin 32

Moorabool Draft Water Catchment Protection Policy: Report on Consultation Forums
Prepared by Bruce Turner, Phoenix Facilitation Pty Ltd
21 March 2003

Protecting Water Quality in the Moorabool Shire: Water Catchment Protection Policy
July 2003

Melbourne 2030 Strategy – Planning for Sustainable Growth

Personal Communication:

Informal interviews were undertaken with:

CCMA
Stewart Anderson
Felicia Choo Regional Salinity Co-ordinator
Peter Codd
Darren Cotham
Leigh Dennis
Simone Gunn
Polly Hall
Greg Peters
Mark Shirma
John Turner

DPI
Paul Carroll
Liz Hamilton

DSE
Patricia Geraghty

Moorabool Gorge Recovery Project
Ralph Cotter

AKD Softwoods
Neil Harris

Personal Communication with:

Alan Curtis, Charles Sturt University

John Rees, Greening Australia

Lex Stray, Maude Landcare Group

Elspeth Swan, East Moorabool Landcare Group and Land for Wildlife

Helmut Woerner, Meredith/Bamgamie Landcare Group

Appendix 2: Interview guide for interviews with farmers

Purpose: developing an understanding of the sociology of the potato farmers in Dunnstown

- social context of land and water management practices of landholders in the Moorabool Basin
- Develop a set of environmental, economic and social indicators that reflect the local management practices around water management
- Particular focus: social influences and impacts on water management
- Identify priorities and concerns of landholders in the context of current social policy set by govt, CCMA etc

The Moorabool River

- do you have any river frontage in your property?
- How do you manage the riparian zone?
- What soil types occur on your property?

Landscape History;

- How long has your family been farming potatoes in the region for?
- Going back, do you know what attracted them to the area?
- How would you describe the current landscape?

Landscape Change

- What did the landscape look like when your family arrived? Was it cleared??
- Has their been much change in property ownership over time?
- How has the landscape changed overall? What do you think is the most significant change that has occurred?
- Do you think these changes have been positive or negative for the local community?

Local Community

- Are you involved with any local community groups? Which ones?
- What is important about the area to you?
- Do you have much to do with other potato growers? What is your relationship with other potato growers like?
- I understand that there was a fairly big turn out for a protest against McCains during contract negotiations last year. Did you participate? Why, why not?
- Are you involved in any local land or water groups in the area? Such as landcare, waterwatch?

Water management practices

- Where does water used on the property come from?
    - licenses
- Are these monitored as part of any regional ground water monitoring programs?
- Do think this supply of water is secure?
- Do you think your current access to water will change? Has it changed in the past?
- What are your main concerns about the security of this supply?
- What will you do if your current access to water does change, or the price increases?

- I understand there has been a drought in the region… do you keep rainfall records? Does this influence how water is applied?
- how are potato crops irrigated? How are rotation crops irrigated?
- What are the advantages and disadvantages of irrigating the crop this way?
- How do you determine when the crop is irrigated sufficiently?

- What options do you have for irrigating crops in other ways?
- How would these options change your practice?
- Would they would reduce some of the disadvantages you mentioned??
    - What difficulties would you experience if you explored these options?
- Has your water management changed in the last 10 years?
- Who do you see as the main decision makers influencing water management in the area?

- What are the most important economic issues to you regarding water management?
- What are the most important social issues to you regarding water management?
- What are the most important environmental issues to you regarding water management?
- How would you prioritise these issues? Why
- How would you define sustainable water management in your farm practice?
- Are there any options available to you to manage water sustainably in relation to these issues? What are they?

Land management practices

- What type of producer would you say you are?
- What sorts of crops and livestock do you produce?

So with potatoes..

- How are fertilisers applied to crops? How frequent are applications?
- How do you determine when to fertilise, and how much fertiliser is needed?
- How are pesticides and fungicides applied to the crops?
- How do you determine when to apply pesticides and how much to apply?
- What are the main issues surrounding fertiliser and pesticide application?

With the rotation crops,

- Why do you grow these crops?
- Are they harvested and sold, or are they ploughed back into the soil?
- Are these fertilised?

How are do you manage the lamb fattening?

- Do you lease land from CHW?
- What is your relationship with Central Highlands Water like?
- Is runoff an issue on your property? How do you manage it? Does it happen often?

In this area,

- What are the main economic issues that you see regarding land management overall?

- What are the main environmental issues that you see regarding land management overall?
- What are the main social issues that you see regarding land management overall?

Contract Growing

- How long have you or your family been contracted by McCains?
- Why did you or your family to initially sign contracts with McCains?
- What are the main benefits for you to grow potatoes on these contracts?
- What are your main concerns regarding these contracts?
- What aspects of production do the contracts specify? Do they specify water use, or irrigation schedules?
- What are the consequences of failing to meet the specifications of a contract?

Extension

- What are the main sources of information that you have for your farm management?
- Who or where do you receive general land management advice from?
- What sort of extension or support services do you think would be most beneficial to you?
- What is your experience of government extension services? Particularly those dealing with environmental issues? Eg the recent EBMP program run by DPI?
- Do you have much contact with DPI extension officers? What is your relationship to them like?

- What is your relationship with McCain extension officers like?
- How regularly do you see the extension officers?
- What sort of advice do they provide you with?
- Do you use McCain crop management program? What does this provide? Is there a financial cost associated with this program?
- Are you confident that you will be able to continue contract growing for the perceivable future? Why, why not
- How viable in the long term do you think the current contractual potato growing is in this area?

- How difficult would it be for you to stop contract growing or even change farming systems?
- What farming options would be available to you if you did not contract to McCain?
- What would need to change to make it easier to change your practice?
- Is there any support available from agencies to enable you to change your current farming practice?

Sustainabl;e futures

- How do you think potato farming fits into a sustainable future for the Moorabool River Catchment?
- What social, indicators do you think could be used to describe and measure the sustainability of the landscape? How would these integrate with env and eco??
- What environmental indicators do you think could be used to describe and measure the sustainability of the landscape?
- What economic indicators do you think could be used to describe and measure the sustainability of the landscape?

Specific Potato Industry Participation

- Do you subscribe to industry journals?
- Do you participate in vegcheque meetings, or any other industry organised networks?? Why or why not
- Do you participate in CHFS? How would you describe your relationship with CHFS?
- Do you attend potato industry specific workshops or forums that they run?
- Any crop trials on your property?
- Have you adopted any of the crops trialled successfully in the area, such as the ones grown at the DNRE demo site? Eg Canola, mustard, freen manure crops etc…. Did you change any of your farming practices because of demonstrations you saw on the farm? Can you tell me how this is going?
- I understand there has been water management trials in the area, such as drip irrigation trials, and cut off switches for lateral moves. Have you adopted any of these water management recs, why, why not
- Have you experienced any difficulties when it comes to implementing new initiatives? What are they?

Native Vegetation

- Do you have any native vegetation, either remnant vegetation or plantings occurring on properties?
- How is vegetation occurring on your property managed?
- How important is the management of native vegetation in your production system? And for local recreation?
- Has the amount of native vegetation changed over the course of your lifetime? What do you think has made it change?

Catchment management

- What involvement has the CCMA had in this area?
- Are you aware of the role of the CCMA in the region?
- If familiar with the CCMA, what is your relationship with them like?
- What do you think the priorities of bodies such as the CCMA and CHW in regard to their water management practice?
- Has the CCMA produced any specific recommendations for you and other potato farmers regarding water management practices that you are aware of?
- Do you participate in any CCMA or DPI projects that are directed towards natural resource management? Why , why not
- What would you change in regard to your interaction with CCMA?
- Do you know anyone on the CCMA board?

Appendix 3: Interview guide for interviews with agency staff

Purpose: developing an understanding of the sociology of the potato farmers in Dunnstown

- social context of water management practices of landholders in the Moorabool Basin
- Develop a set of environmental, economic and social indicators that reflect the local management practices around water management
- Particular focus: social influences and impacts on water management
- Identify priorities and concerns of landholders in the context of current social policy set by govt, CCMA etc

The Moorabool River

- How do growers with river frontage manage the riparian zone?
- Do you have any concerns about their influence in the river catchment?

Water management practices

Licensing/ Access to water

- Where does water used on the property come from? (water source)
- if water is licensed, what is the nature of these licenses?
- How secure is the supply of this water?
- Do you think that farmers current access to water will change?
- Are there any initiatives that address the issue of water security? How successful have they been?
- What monitoring / or research projects are occurring in the region?

Water application

- how is water applied to potato crops? And rotation crops?
- What are the main issues that you see surrounding these types of water application?
- *II understand there has been a drought or water shortage lately. Do many farmers keep rainfall records? Has the drought affected how much water is used every year? What else influences this?*
- What other options do potato growers have for applying water to potato crops? In terms of what other technological options are available for applying water, and also, are there any options for changing the source of water?
- How would these options change local practice?

Key issues

- What are the most important economic issues regarding water management in the area?
- What are the most important environmental issues regarding water management in the area?
- What are the most important social issues regarding water management in the area?
- How would you prioritise these issues?

- How would you define sustainable water management?
- Are there any options available to manage water sustainably in relation to these issues previously discussed ?
- What do you understand is the core reasoning behind grower's use of water?

- How is this connected to the landscape?
- How do growers understand water management in relation to their impact on salinity, sedimentation and stream flow?
- Is salinity a concern in this region? For who?

Land management practices

- Apart from potatoes, what other crops are grown in rotation?. Why are these crops grown?
- Could you describe the affect of current potato farming practices on their farm's soil and water (eg the presence of chemical residues prevents farmers from growing organic vegetables)
- What work is going on in the area with management or implications for production practices?
- Are there any best management practice recommendations that specifically address potato growers land management?
- How are these communicated to growers?

Fertilisers and Pesticides

- What are the main environmental issues regarding fertiliser, herbicide and pesticide use on potato farms?
- What are the main economic issues regarding fertiliser and pesticide use on potato farms?
- What are the main social issues regarding fertiliser and pesticide use on potato farms?
- Are there any programs that address these issues?
- How are these programs communicated to the community? By whom? When and where do they occur? Is there any monitoring? (ie. Success of meeting, implementation etc

Runoff

- How is runoff and erosion managed on farms?
- Is there any distinction between nutrient rich runoff and sediment rich runoff?
- Are there any specific best management practice recommendations that address potato farmers runoff?
- How are these recommendations communicated to potato farmers? By whom? When and where? Is there any monitoring?

Contract Growing

- What aspects of production do the contracts specify? How is this ensured?
- What choices can growers make within the context of contract growing?
- What do you think is/are the main motivation(s) for growers to produce under these contracts?
- What concerns do you think growers have regarding their contract arrangements?

Mccain

- Are there any policies or programs that are directed at the contractor; Mccain, especially those regarding natural resource management? How does your organisation engage / communicate with Mccain?
- What is the relationship between you/your organisation and Mccain like?
- What contact do you have with them?

Key issues

- Are there any environmental issues associated with potato growers current management practice?
- Are there any economic issues associated with the potato growers current management practice?
- Are there any social issues associated with the potato growers current management practice?
- How would you prioritise these issues??

Other options for farmers

- What options are available if these growers do not contract to McCain?
- What would inhibit/prevent farmers from choosing other production practices? – I am wondering about chemical residues, specialised capital investment
- Are there any initiatives or support programs available to support growers in changing or modifying their farming system?

Triple bottom line Sustainable futures

Triple bottom line refers to the use of economic, environmental and social indicators to guide decisions about land management ,in order to produce more holistic, beneficial outcomes. It requires consideration of each of these aspects in the form of indictors.

- How do you think potato farming fits into a sustainable future for the Moorabool River Catchment?
- What social, indicators do you think could be used to describe and measure the sustainability of the landscape?
- What environmental indicators do you think could be used to describe and measure the sustainability of the landscape?
- What economic indicators do you think could be used to describe and measure the sustainability of the landscape?

Landscape History

- How long have potato farmers been in this region for?
- Apart from potato cropping, How else has this landscape been used over time?
- How would you describe the current landscape? Economically, environmentally, socially??

Landscape Change

- What did the landscape used to look like?
- How has the landscape changed over time?
- What is the most significant change that has occurred in the region?
- Do you think these changes have been positive or negative for the local community?

Potato Industry Extension

- What initiatives does your organisation deliver to potato farmers?
- How successful have they been? Could you define successful in the context of the industry..
- What are the main inhibitors to the uptake of the initatives?
- How extensively do potato farmers participate in either CCMA or DPI/ vegcheque projects? (check understanding of extensive..)

- particularly that are directed towards natural resource management? What motivates them to be involved/ is a deterrent to being involved?
- What are the main sources of information for growers on their crops?
    - Who or where do they receive general land management advice from?
    - What sort of information sources do you think potato growers are most likely to access? What evidence do you have of this?
    - How willing are potato farmers to receive information about land and water management from government NRM agencies.

Native Vegetation

- Do potato farmers generally have any native vegetation, either remnant vegetation or plantings occurring on properties?
- How is native vegetation occurring on p. farmers properties managed?
- How important is the management of native vegetation in their production systems? And for local recreation?
- Have you noticed any change in the amount of native vegetation in the area? What do you think has contributed to the change?

Catchment management

- What involvement has the CCMA had in this area?
- Are landholders aware of the CCMA and their funded projects? How do potato growers understand the role of the CCMA in their local landscape?
- If familiar with the CCMA, how would you describe landholders general interaction with the CCMA:
- Do you think that the CCMA has engaged the potato farming community in Dunnstown? What strategies exist to do so?
- What approach does the CCMA take to influencing water management in the area?
- Has the CCMA produced any specific documented recommendations for potato farmers regarding water management practices that you are aware of?

Appendix 4: Integrated Matrix of environment, economy, society linked to relevant policies

Social	Environmental	Economic	Relevant policies
Inability to employ additional labour, so more labour committed to regain profit: stressed families	lack of funds to spend on environmental projects	Reduced profit margins	McCain corporate policy of economic rationalism
labour intensity of potato farming: lack of time with family, or in community groups. Effect on family and the individual	lack of time to spend on environmental projects ie. Tree planting. Nb. Environmental projects were not identified as proejcts that reduce pesticide and fertiliser use	maintained farming system and income.	Environmental Management Systems (DSE) DPI: CAS / Clean green production systems + State Agricultural policy: World class and green * Ecologically sustainable Agricultural Initiatives
Inability to employ extra staff - increased time to manage system	<<Increased pressure on land and water resource, farming of marginal land>>	increased indebtedness	Aust Government: AAA Farmbiz - Assistance for business and NRM training _CAS delivery
Locked in' to current production regime: Limited alternative production options: Difficulty in stopping potato farming:	<<tendency to work land to highest capability to recoup funds, and to maintain all land in production rather than fence off, revegetate>>	Level of indebtedness :	Aust Government: AAA Farmbiz - Assistance for business and NRM training _CAS delivery
Limited time for land care meetings or voluntary NRM activities on farms eg. Tree planting << reduced social cohesion and sense of belonging>>	<<environmental degradation>>	Maximum land and labour committed to production	Landcare: CCMA CRCS, Australian Govt Funding policy
Financial commitment to potato growing 'locks' farmers into high labour production regime	increased fertiliser and pesticide use	High level of specific capital investment in potato farming equipment	

Social	Environmental	Economic	Relevant Policies
Loss of farm families: demographic shift to lifestyle farming as land comes on the market	Pressure on waterways from increased urban demand and waste (septic)	high agricultural land value is becoming restrictive to landholders expanding enterprise to increase profitability <<Reduced economic return in region: due to shift in land uses to lifestyle>> bigger equipment and increasing technology	Growth of regional Cities: Melbourne 2030: City of Ballarat & Moorabool Shire planning protocols
Farm consolidation: reduced number of potato growing families: Loss of communities, reduced voice in region	Efficiencies of scale linked to improved environmental management practice	Increased profitability for expanded farmers, (in the context of reduced profit margins)	Rural Zones Policy Local Shires and DSE, CHW minimum land allotment 40ha
Growing urban populations in Geelong and Ballarat who need water supply: increasing bulk entitlements for urban water supply companies << social issues around who is community for the CMA>>	Increased pressure on the Moorabool's water and continuation of unnatural flow	Increased competition by all stakeholders for the water resource	Melbourne 2030: growth in regional cities CRSWS- redicomg water demand
Availability of time to engage in NRM projects, time to manage pest plants and animals understanding/ commitment to long term benefits	Riparian land areas fenced out and revegetated :variation in width	Small acreage of high agricultural land value means that this is often linked to a loss of income through loss of productive land. Costs of pest plant and animal control	Moorabool River Project: CCMA River health strategy
Control of spray drift to neighbouring lifestyle properties; application practice change	sediment and nutrient runoff control: Grass buffer strips	reduced cost of urban water treatment: costs of modifying application practice	

Social	Environmental	Economic	Relevant Policies
High labour intensity of frequent irrigations and long cropping season (5.5months vs 3.5 months)	Very high irrigation demand crop, as well as fertiliser and fungicide applications: nutrient runoff and sedimentation concerns	Russet Burbank variety grown to meet company demands (no other variety currently accepted)	
Irrigation timing and practice linked closely to economics..	nutrient rich runoff and sedimentation	equipment, timing and intensity of water application, bare ground management, bare ground	Corangamite Nutrient management plan
Local knowledge and experience deemed more accurate in determining rates	soil and plant monitoring for nutrients and moisture: reduces overwatering and overapplication of chemicals	Significant Additional cost of company testing (1100-1600 / paddock)	McCain crop management program.
Lack of awareness about agency and Water authority grants and programs in region	CCMA NRM projects infrequently undertaken on farm		CMA community engagement strategy : CAS service delivery
Decision to diversify farming production system	reduced pressure on soil and water resource	Loss of 'guaranteed' income from McCain contract	farm biz
Decision to Change potato variety	Less water and fertiliser/fungicide use	Financial insecurity of open market.	farm biz
Consumer preference for clean skinned potatoes that are grown in sand	Red soils produce 'dirty' potatoes	No market for supermarket contracted varieties -	Change in market perception of Agribusiness: DPI (VIC Agribusiness services) / Vic Agribusiness Networks Program (CAS)

Social	Environmental	Economic	Relevant Policies
Increased pressure from international product threatens growers security	Diminishing environmental consideration in regards to overall management practice	Contract prices based on world market prices	Free trade agreements and globablised markets
Increased labour intensity due to increased need for irrigation <<uncertainty about water-- risk society>>	Reduced annual rainfall / climate change << downstream environmental cost>>	Increased fuel costs due to increased water application	
High labour input for intensive production / form of superannuation non agricultural outcomes	Tendency to maximise intensive production on small acreage; risks of erosion, runoff	High Agricultural land value	Town Planning Protocols
Water traded out of region / loss of livelihood	Full licensed volume used rather than partial / increased pressure on GW and SW resource	water trading economic costs to region	Our Water Our Future DSE: SRCWS : interconnecting water supply systems / water trading
High labour intensity: increased occurrence and likelihood of industrial accidents		<<Loss of labour- loss of production or increased costs of production due to employment of extra staff>>	Farm safety campaign: Workcover