Insights into **mixed farming** in Australia

Stories of successes and challenges

Grain & Graze
Profit through knowledge




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Profit through knowledge

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The Grain & Graze Program

The Grain & Graze Program aims to boost the profitability of mixed farms, while helping to protect natural resources. One of the strengths of the program is the direct involvement of farmers and farming groups in local trials and extension activities.

Grain & Graze is a collaboration between four leading Research and Development Corporations - Land & Water Australia, Grains Research and Development Corporation, Meat & Livestock Australia, and Australian Wool Innovation Limited – and over 60 farmer and landcare groups, research providers and regional management authorities.

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Grains Research and Development Corporation (GRDC)

The Grains Research & Development Corporation is one of the world's leading grains research organisations, responsible for planning, investing and overseeing research and development, delivering improvements in production, sustainability and profitability across the Australian grains industry.

The GRDC's mission is to invest in research and development for the greatest benefit to its stakeholders – grain growers and the Australian Government. The corporation links innovative research with industry needs.

Collaboration with other Research and Development Corporations (RDCs) in the Grain & Graze Program to find a more profitable and sustainable balance between growing grain, producing meat and wool and enhancing bio-diversity on-farm, will help all of the RDCs work better together which will, in turn, contribute to achieving the GRDC's mission.

For more information about the GRDC visit www.grdc.com.au

Land & Water Australia (LWA)

Land & Water Australia commissions, manages and delivers research and development (R&D) to farmers and natural resources managers.

Its aim is to increase the profitability of Australian farmers and natural resources managers through innovation, research, development and communication.

R&D has helped Australian agriculture double its productivity over the past 25 years.

Land & Water Australia works directly with farmers, farming groups, agribusiness and regional bodies to identify local needs and produce results that can be taken up by farmers and land and water managers.

Some of the research priorities are grazing cereals, soil compaction, feedbase management, social analysis and integrated pest management – to name a few.

For more information about LWA visit www.lwa.gov.au

Australian Wool Innovation (AWI)

Australian Wool Innovation is a fully independent public company limited by shares and owned by Australian woolgrowers. AWI's mission is to drive research, development, innovation and marketing that will increase the long-term profitability of Australian woolgrowers.

AWI initiates, commissions and delivers research and development (R&D) to Australian woolgrowers. The company works through alliances and contracts and, where possible, R&D outcomes are commercialised with the primary aim being the adoption of technology - on farm and along the global wool pipeline.

Grazing management is one area of AWI's focus for R&D. The productivity and profitability of many grazing enterprises in the high rainfall and sheep-wheat zones of Australia can be improved by increasing the attention paid to grazing management. AWI investments in grazing management are focused on providing wool growers with knowledge, tools and practices to improve the productivity and sustainability of their business.

AWI has invested in the Grain & Graze Program because it helps producers in the sheep-wheat zone identify what combination of livestock, pastures and crops will increase profitability and improve the natural resource base on which they farm.

For more information about AWI visit www.wool.com.au

Meat & Livestock Australia (MLA)

Meat & Livestock Australia Limited is a producer-owned company that provides services to livestock producers, processors, exporters, foodservice operators and retailers. MLA has around 40,000 livestock producer 'members' who have stakeholder entitlements in the company.

MLA's mission is to deliver world-class services and solutions in partnership with industry and government. The company's core activities are building demand for Australian red meat, improving market access for its products, conducting research and development (R&D) to provide competitive advantages for the industry, and collaborating with its partners to build capability within the industry.

As part of its goal to develop competitive advantages for the red meat industry, MLA is involved in a broad range of research and development on-farm and throughout the supply chain. On-farm projects include grazing management, parasite control, meat quality, animal genetics for improved efficiency and environmental management. Grain & Graze is an important component of both MLA's grazing management and environmental management R&D.

For more information about MLA visit www.mla.com.au

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Introduction

Making decisions on mixed farms is a complex process. Research by the Grain & Graze Program shows farmers often talk about things with each other to test out ideas and weigh up the many factors they need to consider when making decisions.

These stories from 26 farms across Australia are about families, businesses and environments. They show something of how farmers consider different information and make decisions which are right for them, taking into account their financial, social and environmental sustainability.

But there's more to these case studies than just telling stories. Grain & Graze research has shown farmers can greatly improve their profits by making farms more efficient. Farmers who are able to use all the moisture available to them through productive livestock systems should be able to improve profit by up to 50%.

So a bottom line benefit comes out in these stories too.

We hope you enjoy these farmers sharing their 'warts and all' stories of how they manage the ups and downs of running mixed farms in Australia.

The farming families who have given their time to tell their stories were incredibly generous and open. This is a valuable gift to other farmers.

We hope that by reading these stories, you'll be encouraged to think about mixed farming systems in a different way, and put some of this thinking into practice.

Note: To protect the privacy of the families involved, we have used fictitious names in this booklet.

Nigel McGuckian

Leader, Social Research Project
Grain & Graze Program, 2007

Improving profitability and sustainablity for mixed farmers

As part of the Grain & Graze Program, RM Consulting Group analysed 40 mixed farms across Australia including the Northern Agricultural and Avon regions of Western Australia, the Eyre Peninsula and Mallee in South Australia, South West Victoria, the Murrumbidgee and Central West regions of New South Wales and the Border Rivers region of New South Wales and Queensland. This report gives an overview of what they found, and shares stories from 26 of the farms.

The case studies were challenging in a number of ways - the timing of the project, the amount of time and energy the producers needed to put in and the sensitivity of sharing detailed financial information.

There are plenty of insights and valuable lessons here for other farmers.

The Grain & Graze Program aims for a ten per cent improvement in livestock profitability and a five per cent improvement in cropping profitability, while addressing sustainability issues.

These case studies illustrate the different ways that farmers have attempted to improve profitability in livestock and cropping and at the same time, address sustainability issues.

National findings

Overview

Mixed farming systems are complex and require a high level of skill to run profitably. Interestingly, the researchers found that some farms made a strong separation between the crop and livestock enterprises. For example, some cropping paddocks were never grazed due to concerns over damage to soil structure.

Across the eight regions, farmers' knowledge and management of soils was excellent and a real strength. They achieved good production figures and generally ran at least two sound enterprises.

Attitudes to natural resource management (other than soils) varied across the group, as did the group's business management skills. These are areas where there is potential for skills development.

The case studies show that producers understand and are good at managing their individual enterprises, There is scope to capitalise on the mutual benefits between the enterprises. This requires an understanding of how and where the enterprises can be fitted together better - sometimes a complex and difficult task.

Links and trade-offs

The researchers came across many examples of producers making decisions based on experience and/or intuition. For example, some producers avoided grazing crop stubbles because they were worried about the impact on soil structure and crop yields. However, the benefits in feed value, reduced herbicide use and direct drilling often outweighed the impact on crops.

Similarly, producers were sometimes unsure about the value of grazing winter wheats (designed to be grazed), and whether to use lucerne in a crop rotation rather than a grain legume. They had trouble knowing exactly how it would benefit the livestock enterprise.

These are all examples of the complex and difficult decisions producers need to make in mixed farming systems. Farmers might find it easier if they were helped by a logical decision making path, like that used in leading farm discussion groups.

Business profitability

This table shows the average business and physical performance of high-profit farms and low-profit farms from the case studies. The farms in the sample vary enormously in climate, system and soil type and so cannot be widely compared. Care must be taken in using these figures.

Indicator	Average of high profit farms (sample size 8)	Average of low profit farms (sample size 8)
Area farmed (ha)	3626	3263
Farm business profit ($) (1)	372,806	226,611
Return on capital (%) (1)	10.8	-1.9
Equity (%)	92	76
Farm income ($/ha)	371	230
Farm operating costs ($/ha)	199	205
Farm operating surplus ($/ha)	172	25
Farm operating costs (OC) as % of income (%)	46	89
Financing costs as % of income (%)	5	19
Farm operating surplus (OS) as % of land value (%)	20	3
Productivity		
DSE/labour unit (2)	3170	3132
Wheat yield/ha/100mm GSR (t) (3)	1.01	1.29
Stocking rate/ha	23	3
DSE/ha/100mm GSR (DSE) (3)	5	2
Meat yield/ha/100mm GSR (kg)	46	33
Wool yield/ha (kg)	36	10

1. Allowance for labour of $30,000 per labour unit.
2. Adjusted for % of farm under grazing.
3. No allowance for stored moisture.

Financial performance

- The farms were similar in size
- Farm business profit varied very significantly from excellent to very poor
- Return on capital of the high-profit farms was competitive with most businesses. (This does not include capital gain)
- Equity percentage was significantly lower for the low-profit farms
- Farm income per hectare was 60% higher on the high-profit farms
- Operating costs per hectare were very similar in both groups
- Overall operating costs were around 50% of income on the profitable farms and almost 90% of income on the least profitable farms.

Productivity

- DSE per labour unit was similar
- Wheat yield was lower in the high-profit farms
- Livestock productivity was many times higher on the high-profit farms.

In summary

Within the limitations of the data, the significant findings are:

- Profitability is influenced by the farmer's ability to generate income per hectare, not by reducing costs
- Finance costs are a burden to the low profit farms
- Debt is a burden because it means return on capital is low. It could be argued the profitable farms could operate at lower equity, because they would earn a high rate of return on borrowed funds
- The profitability of the livestock enterprise is very high on the profitable farms. This demonstrates the potential profitability of a mixed farming business.

Decision making

Sound business decision making is the key to a profitable business.

The ability of farmers to make good business decisions varied significantly. When discussing how or why decisions were made, some farmers didn't use logical and informed analysis. For example, they may not have analysed buying machinery versus using contractors, or the difference between employing labour and sticking with family members. They may not have compared the profitability of enterprises, analysed business performance or monitored cash flow.

Farmers often used agronomists, but rarely used business consultants.

Land values

Many businesses have experienced a rapid increase in land values in recent years, despite a severe drought and poor wool prices. Farmers often said 'land values have doubled in the last five years'. In some regions this increase can be partly explained by improvements in technology and profitability – for example in South West Victoria land use has changed due to raised bed cropping.

This increase in land values has given farmers confidence, but great reluctance about expanding their farms. Return on capital is low across the sample of farms, which indicates that land prices will drop and/or that businesses are content to rely on capital gains to increase returns to be competitive with other investments.

Soils and water use

Farmers had a strong focus on maximising water use in the grain enterprises, probably because of many years of improving crop management through Topcrop groups and using consultant agronomists. However, they had much lower awareness of how to maximise water use across the whole farm system.

There was often a large quantity of wasted feed in stubble, in lucerne and in pastures due to low stocking rates, timing of the livestock activities or grazing management practices (although some producers are still restocking after the drought). This is probably where there is the greatest potential for mixed farms to lift profitability.

Producers had a strong awareness and knowledge of soil health and management. They are working to overcome problems of subsoil sodicity and acidity which are limiting crop and pasture production. For example, the South West Victorian case studies highlighted work done to overcome soil drainage and waterlogging problems through raised bed cropping and lucerne.

Risk management

Most farms in the sample were significantly affected by drought. In most cases it made farmers very risk averse, led to low stocking rates, led to quitting an enterprise – either sheep or cattle, led to delaying expenditure on farm improvements or natural resource management and even led the farmers to consider leaving farming altogether.

Some farmers coped with the drought by using risk management strategies such as feed reserves or getting rid of stock, whilst others used less successful strategies. Overall the drought and rainfall variability has made farmers more risk averse. This affects their attitudes to employing labour and investing in natural resource management.

NRM attitudes and practices

Attitudes towards natural resource management (NRM) varied from extremely progressive and totally committed, through to low awareness and ignorance. Some farmers were actively managing their properties to improve the environmental health, while at the other end of the spectrum, some farms were developing their capital base at the expense of their natural resources.

Only a minority of farmers adopted a whole farm approach to NRM. The focus for NRM was often the soils, and awareness of soil health issues was high. Producers would benefit from a better understanding of the environmental impacts of their enterprises and a long-term monitoring initiative.

Future directions and suggestions

Business improvement of mixed farms is extremely complex. There are no recipes. Farms in these case studies have achieved success through a wide range of approaches.

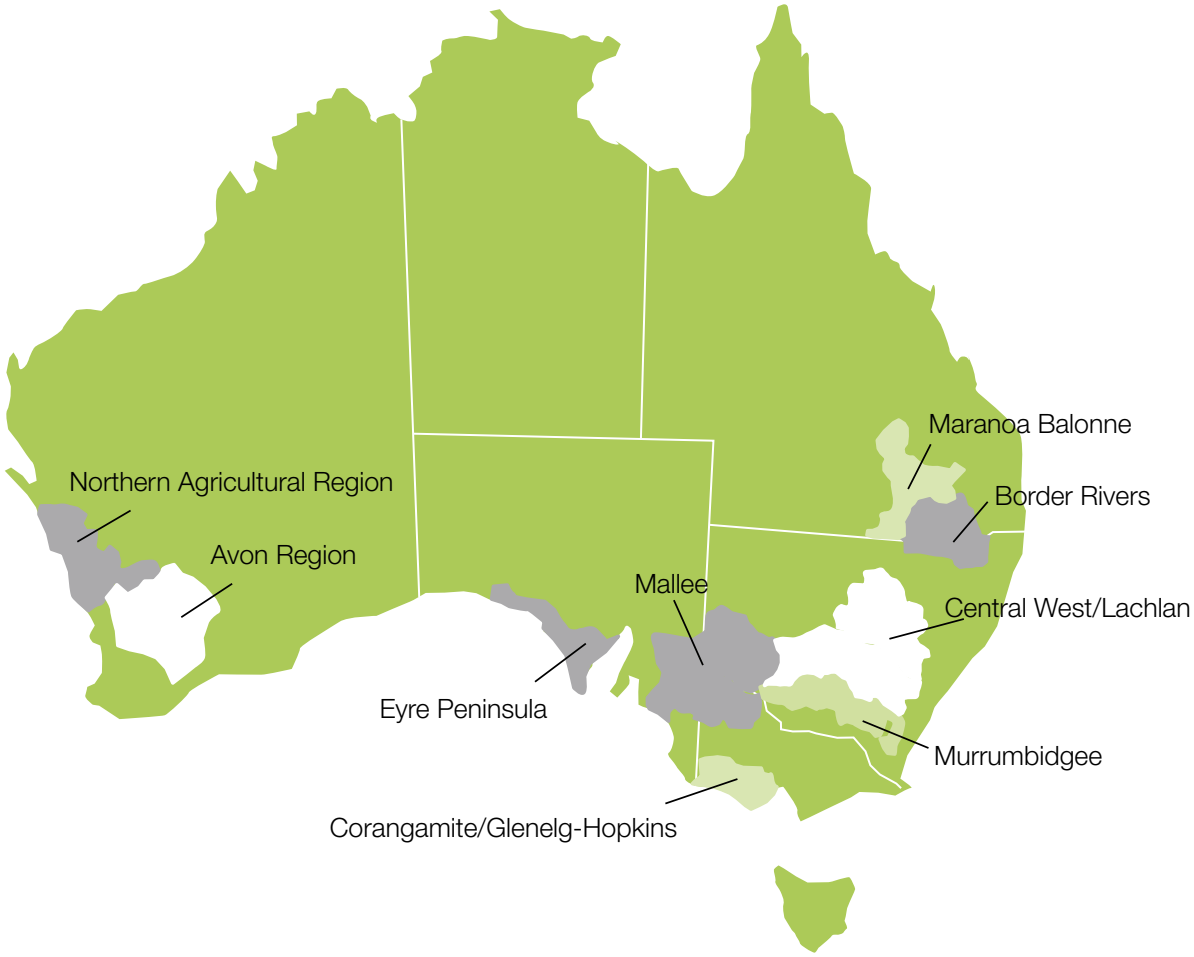
There is a common opportunity that exists across all regions for producers to understand the interactions and dynamics between crops, pastures, people, markets and natural resources in a way that enables them to respond with flexibility to climate, location, assets and personal and family aspirations. There is no single formula to achieve this, only a process of collaboration in discovery.

Farmers should be encouraged to share and debate all aspects of their businesses with each other. This requires a high level of trust and honesty.

There must be a strong focus on business success. Although farmers can make productivity gains by adopting new technology, they will often be able to achieve major improvement from better decision making or subtle changes in the business.

The case studies show some ways that farmers have built up their understanding of the breadth and complexity of mixed farming systems and the factors that have most helped them to succeed.

The Grain & Graze Program Regions



Border Rivers

New South Wales and Queensland

The project studied five properties in the Border Rivers region, of which three are included here. The farms were located between 100km west of Goondiwindi and 100km east of Moree.

It is difficult to consider most of the farms in the sample as mixed farms, as there is a clear separation between grazing and cropping enterprises. The farming systems are characterised by intensive cropping on the better soils, growing fodder crops on more marginal soils, using native pastures for extensive grazing and minimum tillage for cropping. Crops are grown on stored moisture. Sodic soils contribute to variability in crop yields.

The climate is extremely variable and some people have moved to trading steers and away from breeding cattle to improve their flexibility and risk management. Major concerns are woody weed infestations and future clearing restrictions – which have led some of the landholders to clear land for development.

The table below provides a summary of farm performance. The year 2003/04 was a severe drought year which resulted in poor financial performance for most farms in the sample.

Indicators	King	McPherson	Tyrell
Area farmed (ha)	3200	560	4400
Farm business profit ($)	134,134	-37,580	-1,099,955
Return on capital (%)	-2.3	-1.7	-8.8
Farm income ($)	435,263	312,849	998,572
Farm operating costs ($)	446,045	280,839	1,349,371
Farm operating surplus ($)	-10,782	32,010	-350,799
Farm income ($/ha)	136	501	227
Farm operating costs ($/ha)	139	450	307
Farm operating surplus ($/ha)	-3	51	-80
Farm OC as % of farm income (%)	102	90	135
Farm OS as % of land value (%)	0	6	-3
Crop intensity (%)	41	71	43
DSE/labour unit (DSE)	2017	6184	1951
Wheat yield/ha/100mm GSR (t)	1.56	2.82	NA
DSE/ha/100mm GSR (DSE)	2.9	5.0	0.5
Meat yield/ha/100mm GSR (kg)	57.42	24.86	NA
Wool yield/ha (kg)	NA	NA	NA
Farm income/100mm/ha ($)	23	91	34

Opportunities for improvement

The level of awareness and knowledge of soil health and woody weed management is generally high, especially in relation to the major issue of sodic soil. However, the level of awareness of catchment management and planning is low and concern about biodiversity is very limited. Farmers see retaining native vegetation as an obligation rather than a strategy to improve their properties.

In general, it appears that landholders do not make decisions on the basis of business analysis and improving financial performance. Although they use technical advisors for crop agronomy, they rarely seek advice from business consultants.

There is a significant opportunity in this district to improve livestock performance with a more accurate system of assessing feed availability from pasture and fodder crops and storing feed for dry periods.

Joe and Debbie King

Border Rivers NSW

550 mm average rainfall

3200 hectares

Factors for success

- Changing from a breeding to a finishing operation to improve profitability
- Adopting zero-till for cropping
- Adopting rotational grazing to improve native perennial pastures
- Setting clear and detailed goals for the business, the people and the environment
- Protecting natural resources through fencing
- Using specialist consultants where they can add value
- Understanding performance through data collection and analysis.

Production and conservation working together

Over the past 10 years, second generation farmers Joe and Debbie King have faced challenging times on their mixed farm at Boggabilla near the NSW/Queensland border. Rainfall has been at serious drought levels in three of the past 10 years and below average for five years, leaving only two good years in the past decade. While the property is profitable in good years (with operating costs at around half of income), poor years mean an increase in debt for the family (operating costs are greater than income).

The property is 54% grazing and 41% farming land. The most important reason for running a mixed farming system in this environment is for risk management. Traditionally mixed farming is a cropping monoculture with cattle occasionally grazing stubbles. Joe believes it is important to do much better than this. His aim is to balance cropping and livestock to give a more reliable income each year. Joe and Debbie would like to run more stock and grow fewer crops, as they believe it would improve returns in the long term.

Vegetation clearing controls introduced in 2003 limit the amount of cropping land, so the amount of land for livestock can only be increased by growing fodder crops and /or pastures on the farming land. There is now a strong emphasis on increasing the health and productivity of the grazing land.

Many pastures in the district are in very poor condition due to over-grazing and set stocking. This has led to bare areas and soil erosion. Joe and Debbie see the regeneration of native pastures as their major natural resource management challenge. They are using rotational grazing which allows plants to rest and regenerate after grazing and develop deep root systems which use soil moisture more effectively. Conservation and production are closely linked under this grazing system.

The Kings use specialist consultants for advice and place a high priority on excellent business systems. They do all of their accounting, paddock recording and analysis at home, making the information readily accessible for decision-making.

The goals

Debbie and Joe have a detailed set of goals for themselves and the property, which cover specific economic, ecological and personal outcomes. They work towards the following vision:

- To enjoy a healthy and happy life in the company of family and friends
- To continually learn and develop new skills and strategies to effectively achieve personal and business goals
- To create and operate an ecologically sustainable, profitable and productive farming and grazing business so that the family can live in a healthy and wealthy environment
- To share experiences and knowledge (good and bad) to help others
- To invest in off farm assets to create an alternative income stream to provide for retirement and succession.

The cropping system

A few years ago Joe and Debbie wanted to separate the cropping and grazing parts of the business as they wanted to minimise soil traffic. However they now believe it is important for the enterprises to work together as closely as possible in every way.
The biggest change in cropping has been a move to zero-till, which has improved timing and moisture use.

The cropping land grows wheat, barley, chick peas and grain sorghum. The Kings are very interested in introducing lablab (a summer fodder crop) into the cropping rotation. This will provide valuable grazing, nitrogen for crops and weed control. They are also interested in trying annual winter legume crops such as snail medic and vetch.

The grazing system

The property traditionally ran breeding cattle – however with variable seasonal conditions the cost of fodder was high and productivity couldn't be maximised. When Joe compared the gross margins of breeding versus finishing, he found that breeding had a gross margin per live steer unit of $67, while finishing had a gross margin of $220. The figures made the choice relatively straightforward and over the past two years Joe and Debbie have completely overhauled the cattle enterprise to a more flexible finishing operation, which better suits the variation in feed supply throughout the year. They are aiming for growth rates of 0.6 kilograms per day, which would make the stock enterprise as profitable as growing crops.

The Kings introduced rotational grazing throughout the property, with the aim of keeping as much pasture vegetated as possible. The rule of thumb is 'eat a third, trample a third, leave a third'. Paddocks have been subdivided into 27 hectare blocks, with up to six paddocks accessing one water point. Rest periods range from 90-180 days when the growth is slow, through to 30-60 days when the pasture is actively growing.

The native pastures are open grasslands of Mitchell grass, Queensland blue and windmill grass. Weeds are a significant problem in the pastures, particularly in flooded country and control methods are often limited. The best control method is often good grazing management.

Strengths and weaknesses of the mixed farming system

When Joe came back home to the farm several years ago there were three full-time employees on the farm. There is now just one, because Joe has dramatically reduced the amount of cultivation. The Kings have moved to contractors for harvesting and some spraying, which reduces the capital investment, gives improved technology and is cheaper than owning.

'It may be worth choosing to own very little machinery in the future,' says Joe. 'It is easier to make the decision to crop or not to crop, as we won't be pressured to put in a crop in a poor year just because we have the machine in the shed.'

The results from rotational grazing have been dramatic, with pastures showing increased ground cover and re-establishment of large, deep rooted native perennial species.

Debbie and Joe have made protecting the farm's natural resources a high priority. They are in the process of fencing out 35 kilometres of creek and river frontages, which will lead to major improvements in water quality. The fenced off areas along creeks will be grazed occasionally in a very controlled way. Trees are regenerating along the river banks after only two years.

The Kings sell their meat through a meat marketing alliance which has successfully established markets in Taiwan, Singapore and Japan. Exporting has been a joint venture between three beef meat marketing groups and a meat processor. The joint venture is trading profitably and at this stage the outlook is positive.

Joe and Debbie still have unanswered questions about the future of their enterprise. Can they successfully incorporate grazing into the cropping system? Will grazing damage soil structure? And will they be able to juggle competing demands for time and skills, plus two sets of new technologies? Their longer term aim is to move towards a system which has minimal chemical inputs.

Michael and Sarah McPherson

Border Rivers NSW

660mm average rainfall

560 hectares

Factors for success

- Making decisions together, with outside advice if needed
- Managing soil and reducing erosion as a top priority
- Trying new crop varieties to achieve the best results
- Planting a higher risk, higher profit cotton crop when conditions are suitable
- Focusing on cattle trading rather than breeding
- Fencing out riparian areas for conservation and allowing limited grazing in them.

Experimentation for young farming family

Michael and Sarah McPherson have already had their first lucky break as young mixed farmers. They recently bought their 560 hectare mixed farm near Moree from Michael's parents. Luckily for them, land prices increased not long after the purchase, giving them something of a windfall in starting their farming lives.

As experienced farmers will know, the couple will need all the help they can get. They are experimenting to find the right mix of enterprises for their farm to improve productivity and protect the soft black and grey organic self-mulching clay soils from erosion.

Dry land cropping and beef cattle are the two farm enterprises. Unlike many mixed farmers, the McPhersons keep their cattle and cropping enterprises completely separate, as they believe that cattle can compromise the timing of crops if they are mixed.

The goals

Sarah and Michael intend leasing land and share farming in the future, hoping to have a two or threefold increase in the land area they farm. They intend to make the property as efficient as possible and trade cattle all year round.

The cropping system

The McPhersons are experimental and willing to try new crop varieties to achieve the best results for their expanding family. They currently grow wheat, barley, chick peas, and grazing oats on 110 hectares, plus they occasionally grow sorghum on around five hectares. They are looking to introduce perennial dolichos, a form of quick growing legume that out-competes weeds and provides ample feed. This would be sown on oat paddocks in September/October to provide groundcover over summer when rainfall intensity is highest.

Michael and Sarah have taken a pioneering step in experimenting with growing dryland cotton on 88 hectares, which they see as a risky, but profitable crop.

'We never jump into it without everything being ready for it,' says Michael. Cotton is only planted when the market is suitable and the paddocks have subsoil moisture. This is partly because of the high operating costs ($1000 per hectare). The McPhersons used up to 13 sprays on the last crop.

To break even, the McPhersons need to produce two bales of cotton per hectare at $500 per bale. Their past crop achieved 4.4 bales per hectare harvested. Michael believes they should be able to achieve five bales per hectare.

The McPhersons are looking to grow Bolgard II cotton in the future. This genetically modified cotton is resistant to Heliothis and requires less spray, operating costs are similar, but are unlikely to blow out if high insect pressure occurs.

The grazing system

Michael and Sarah trade 150 steers, giving a stocking pressure of 1800 dry sheep equivalent (DSE). They believe it is important to have cattle to spread financial risk, supply new income and use grazing country that is too steep for cropping. All pastures on the farm are native and have not been sown besides sub-tropical pastures.

Michael has fenced off his grassed waterways and a 32 hectare section of vegetation along a waterway under government contract. The fenced out areas can be grazed for two to four weeks each year, and this feed source has been a useful supplement when needing good quality feed for cattle.

Michael has focused on cattle trading rather than breeding as a way of reducing risk. If there is no feed, he sells stock instead of grazing cattle in cropping paddocks. The McPhersons traded 300 cattle in the year prior to the case study, and believe they could trade 400-500 cattle all year round if they used grain assistance. Michael's father also uses the farm for agistment of his cattle if plenty of feed is available.

Strengths and weaknesses of the mixed farming system

The McPhersons value the productivity of the cattle enterprise, but believe it also has many negative effects including helping to spread weeds, creating bare tracks and pads that can erode, and compacting the heavy clay soils.

'Erosion is a big issue here because of the soft country we're on,' says Michael. 'You can't replace soil. My number one priority is managing soil because I don't want to lose it. Cattle make a mess of the black country'.

The McPhersons have contours on their paddocks and have used tramlines across these in cropping areas. The tramlines go straight down the slope and over the contours so that water runs more evenly down them. There is still some erosion, but they believe this is better than having tramlines running across the slope as storm water can break out at the contours and cause even more erosion.

Michael also has mixed feelings over some of the crops he is growing. Wheat yields have improved from fertiliser applications with the last crop producing 4.2 tonnes per hectare. Michael is not keen on the chick pea crop because of its low value, and the annual oats crop leaves little groundcover after hard grazing, meaning soil erosion is more likely. Similarly, growing lucerne as a monoculture provides little groundcover over summer and allows erosion to occur, so Michael would prefer to use a lucerne/grass mixture.

There is little synergy between the cattle, cropping and cotton enterprises and they remain on separate parts of the property. Michael has identified two positive interactions between the enterprises. The first is that having stock grazing on grass in the waterways prevents water backing up and flooding cropping areas. The second is that cropping provides grain to steers grazing grain sorghum stubble. This only happens in dry periods and if absolutely necessary. As soon as it is likely to rain, he takes cattle off crops to avoid soil compaction.

Michael and Sarah think their system can be improved by making the livestock enterprise more efficient. Grazing may occur on smaller paddocks in the future on a rotational basis once a good pasture base is established.

Michael and Sarah make decisions together, with Sarah encouraging Michael to be less cautious. When deciding whether to buy the property, Michael and Sarah had a meeting with their family, their accountant and a third person. 'The meeting was a good idea and people don't do enough of it,' says Sarah.

Kath and Barry Tyrell

Border Rivers QLD

550mm average rainfall

4400 hectares

Factors for success

- Being sustainable – at the end of each year or five year period soil health should be greater
- Being opportunistic – producing financially worthwhile crops depending on market values
- Having good farming practices, such as rotation cropping
- Keeping cattle off cropping land
- Being highly efficient with irrigation water
- Using the seasons to the best of their ability
- Being prepared to put crops in when the chance comes.

Developing the farm for irrigation

Kath and Barry Tyrell's property west of Goondiwindi in southern Queensland came with a 1000 megalitre water licence when Barry purchased it in 1968. He bought the land because of its heavy black self-mulching clay and water availability. In flood periods the entire property could be inundated and the Tyrells had to flood-proof their cropping land.

However, they didn't use the water licence for a long time, instead concentrating on beef cattle and sheep. In 1991 they first planted cotton, and once they realised its potential, they removed sheep from the system altogether to reduce land degradation. Currently the farm enterprises are grain, cotton and beef.

Barry manages the cropping side of the enterprise with help from five non-family workers, while Kath manages the cattle enterprise on her own. There is virtually no interaction or compromise between the cropping and cattle enterprises. The Tyrells separate them to avoid land degradation on their cropping land, as they don't want to risk compaction from cattle in the paddocks where they use direct drilling.

The cropping system

Soil health is very important to Kath and Barry. They direct sow all crops into stubbles using minimum tillage and reduced traffic. Growing several legume crops in the rotation has also improved the soil.

The Tyrells grow a variety of crops on the property depending on market values. Grain crops include wheat, durum wheat, barley, faba beans, chick peas, mung beans, sunflowers and sorghum. Wheat is the biggest crop, with 465 tonnes produced over 245 hectares.

Barry and Kath have developed their land for irrigation since 1991 and irrigated cotton is now a major focus of farm production. Cotton is the main source of income and covers 255 hectares.

The Tyrells have carried out significant development in order to grow cotton. They have developed more than 1000 hectares of flood protected irrigation land and constructed three large water storages, along with supply channels and a surge area. The irrigation licence is for 1000 megalitres, of which 65% is usually available. Dam storages on the farm can hold 86% of the license volume. If the Tyrells use the 86% and the supply reservoir refills, they may receive more water. However, this is unlikely given the dam is over-allocated. Kath and Barry pride themselves on their water efficiency, monitoring their use to ensure that not a drop is wasted.

Kath believes they will be able to grow cotton continuously for 10 years. To help do this, the Tyrells apply gypsum and increase organic matter by growing wheat in cotton areas. Barry and Kath used to pull stalks out of the ground after cotton cropping, then rake them up and burn them. Over the last few years they have instead pulled the stalks out, mulched them and left them on the soil, which they believe helps break the soil down and improve moisture levels. These techniques have resulted in higher crop yields.

The grazing system

Kath runs a mixture of cows, bulls, steers, weaners and heifers, with around 430 head currently on the property, resulting in a stocking pressure of 3.1 DSE (dry sheep equivalents) per hectare. Each year she sells 180 heifers to a feedlot at about 320 kilograms and 70 steers are sold at 400 kilograms to another farm for fattening.

Pastures on the farm are native medics and perennial bambatsi, which is suited to the heavy soils, floods and frosts. Kath does not want a bambatsi-only pasture because of the low protein levels and the cattle not liking it on its own. The Tyrells are accredited under the European Union Cattle Accreditation Scheme, but they are considering discontinuing their accreditation in the future, as they find it too restrictive for buying replacement cattle.

Strengths and weaknesses of the mixed farming system

To use direct drilling, the Tyrells think it is important that no compaction of the soil occurs, so they only graze cattle on land that is not suitable for cropping. They do not graze any crops or any pasture areas that are not fenced off from cropping paddocks. This means stocking is restricted because of inadequate fencing.

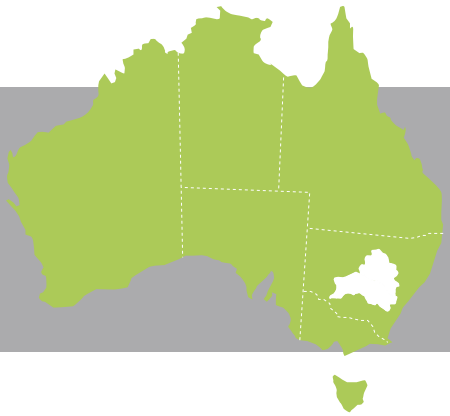
'Overstocking is a complete no-no as far as we're concerned',' says Kath. 'I've been cautious. I haven't lost stock and I've kept them looking well by supplementing their feed with powder. But stock numbers could triple if we had suitable fencing.'

Cattle numbers have also been low because of drought conditions and the current stocking level does not reflect the full capacity of the farm – however, this means the Tyrells have not needed to agist their stock during the drought.

There is likely to be little interaction between the cattle and crop systems in the future, as Kath believes that grazing cattle on crops is an inefficient way of using feed. 'If you run out of feed the cattle are only half finished, and if there is too much feed it is wasted,' she says.

Kath and Barry have raised a number of questions about the future of their enterprise. What is the most productive way to graze cattle? How big should grazing paddocks be? How long should pastures be grazed? And how can they better manage lipia and woody weeds?

While the Tyrells love their farm and have enjoyed raising their two children on the property, Barry sees farming as hard work and would like to try other activities. They say they would probably leave if they were offered the right price for the property, but aren't sure what they would do instead.



Central West/Lachlan

New South Wales

The four properties profiled from the South West Slopes and Western Plains are mixed dryland farming systems, typical of the Central West region. They are characterised by cropping rotations based on wheat and canola with minimal cultivation and direct drill, sowing either directly into stubble or pasture cropping, sheep and wool production for both meat and wool from Merino ewes, using lucerne for grazing and using both native pasture and improved pasture.

Canola is not a popular crop in the properties studied, as it had failed for all in the last three years. Pasture as a rotation is being seriously considered for profit and risk reasons, and cropping is being closely examined for profitability.

The table below provides a summary of farm performance in 2003/04. Farm performances were heavily influenced by a severe drought the previous year (2002) and, in some instances, locust plagues. The financial figures do not accurately reflect the level of performance which is being achieved over time, but are a useful snapshot.

Indicators	Day	Rudd	Hewitt	Langman
Area farmed (ha)	1235	5000	1490	5900
Farm income ($)	292,107	988,139	711,570	507,195
Farm operating costs ($)	245,842	677,538	637,863	455,572
Farm operating surplus ($)	46,265	310,601	73,707	51,623
Farm income ($/ha)	236	167	309	84
Farm operating costs ($/ha)	199	114	277	76
Farm operating surplus ($/ha)	37	53	32	9
Farm OC as % of farm income (%)	83	68	90	90
Farm OS as % of land value (%)	2	2	2	8
Crop intensity (%)	95	19	38	28
DSE/labour unit (DSE)	800	2366	NA	2892
Wheat yield/ha/100mm GSR (t)	2.22	0.18	NA	NA
DSE/ha/100mm GSR (DSE)	0.13	0.49	NA	3.04
Farm income/100mm/ha ($)	59	41.76	59	21

Opportunities for improvement

All farms achieved an operating profit, though in some cases profit was not sufficient to cover drawings, finance and depreciation costs (non operating costs). Farm operating surplus on land value was low in all cases. This is due in part to poor seasonal conditions, but also due to land values having doubled over the last three to four years in most areas.

All the farms studied are searching for a more profitable and lower risk enterprise mix and system.

Several of the landholders are keen to continue to develop their native pastures through improved grazing management (cell grazing or planned grazing) as they found this more profitable.

Several families indicated that two programs (Grazing for Profit and Allan Savory's Holistic Management®) helped them think differently.

They have a strong grasp on the system they are managing and are able to clearly outline their goals for the system (people, landscape, paddock ecology and profit) and how they plan to achieve those goals. They feel that existing/ traditional extension networks are lagging behind in this understanding.

Peter and Nicole Day

Central West Plains NSW

600mm average rainfall

1235 hectares

Factors for success

- Developing the ability to think outside the square, through education
- Seeing beyond symptoms to the root causes of problems
- Caring for soils and improving the land base through permanent plant cover
- Focusing on profit NOT production
- Keeping production costs low
- Getting grazing management right (rotational, cell or planned grazing)
- Protecting perennial grasses
- Working with nature as much as possible
- Having an enjoyable life.

Profit – not production – is the key

Ten years ago Peter and Nicole Day returned home to the Day family farm, having established themselves in non-agricultural careers. They bought out other family members over time, until they were the sole owners of the business.

It wasn't long before Peter and Nicole became aware of some longer term trends, especially the increasing costs of machinery, crop inputs and labour. Although 95% of the property was arable, soils had to be carefully managed to prevent soil movement. Growing saline spots, soil compaction and increasing weed problems were also contributing to a downward profit spiral. The Days found themselves with little free time and a lot of pressure.

Eight years ago Peter completed a Grazing for Profit school, which transformed how he and Nicole viewed their farm. They were able to better plan their future, reduce ineffectual activities and address some of the causes of problems on the land, rather than responding to symptoms.

The Day family are now pioneers in the new technique of pasture cropping. This allows them to run a very low cost, low risk and high profit operation, which has also created a dynamic and healthy ecosystem across the farm.

The goal

The Day family set itself the following goal:

'In 10 years time we will see a land full of perennial native grasses growing in an organic system, which supports up to 15,000 DSE [dry sheep equivalents] over summer. We will be achieving 150% return on crop costs, and a 10-20% return on our total farm investment, with substantial off farm investments. We will travel overseas, educate our kids and maybe Nicole will run a business two or three days a week. We may farm up to 20,000 acres, but do it contract.'

The pasture cropping system

One of the major changes that has positively impacted the business is the pasture cropping enterprise. Peter and Nicole have been pasture cropping for four years. They are developing a strong and diverse perennial pasture base, into which they direct drill winter crops (using a Conserva Pak) without killing the perennial pasture. A typical program involves spraying Roundup onto the perennial pasture prior to sowing, and direct drilling wheat. After harvest, Peter and Nicole trade in stock, with up to 5000 DSE coming onto the property, to be sold prior to winter crop sowing.

The pasture crop operation has a significantly lower cost structure than the no-till paddocks. When the additional grazing over summer is taken into account, the pasture cropping enterprise is a key success factor in the farm's strong profit performance.

Most importantly, the soil surface is covered all year round by living plants. The soils are becoming softer and stubble is breaking down in the pasture-cropped paddocks at a remarkably fast rate. The perennial pasture base is expanding in species diversity over time. This is attributed to more active soil biology.

'We no longer have to wait for that "one great year" to make money from cropping; we aim to do it every year,' says Peter.

The simplicity of their production approach also allows Peter and Nicole to spend more time with their young family, to take regular family holidays and to reinvest in their own personal development.

Strengths and weaknesses of the mixed farming system

The Grazing for Profit school and Peter's strong background in financial management have given him a strong profit (rather than production) orientation. When Peter and Nicole realised they needed to make significant changes on the farm, they set themselves the task of designing a family-friendly, profitable farm business that would rebuild the condition of their land. Over the last seven years they have created a business that has been profitable through drought, has allowed them free family time and which is steadily regenerating their land base.

Pasture cropping allows them to crop at a lower input cost level, which makes it easier to make a profit, even in poor years. Purchasing trading stock to run on the perennial pasture base after harvest has reduced drought risk. Stock numbers are related to the level of feed available. The trading operation can be scaled up or down according to the feed available at the time.

Peter and Nicole are adamant that they will not feed stock. This means they are able to sell stock with less emotion when conditions are tightening, as they are less attached to short term trading stock.

The pasture cropping approach means the soil is covered with growing plants all year round, improving the soil and making sure rainfall is used when and where it falls. This is important in a non-seasonal/ unpredictable rainfall climate. Pasture cropping and running large mobs of stock in a paddock for a short period of time appears to suit the regeneration of a wide range of native perennial grasses and also benefits tree establishment.

Peter and Nicole still face a number of challenges in the enterprise. In some areas that have been intensively cropped for many years, it is hard to establish perennial grasses. They are working on developing cost effective temporary fencing options to convert larger cropping paddocks to smaller grazing paddocks which are suitable for correct stock density and plant recovery periods. Surface water on the farm has declined as ground cover has increased, so the Days are developing a low cost bore and trough water system for the farm.

'A lot of reading and thought needs to go into the development of a pasture crop program,' says Peter. 'We have had learning experiences and the path forward hasn't always been clear.

'A big risk factor is that this approach to land management is relatively new, there are a lot of unknowns and there is little expertise available to assist. The benefits are apparent and are still evolving, however it may not appeal to everyone.'

Peter and Nicole's changes were the result of investing in learning. Because of the benefits they have achieved from personal education, they have made ongoing learning a high priority.

John and May Rudd and David Rudd

Central West NSW

400mm average rainfall

5000 hectares

Factors for success

- Participating in the Allan Savory Holistic Management® Course, which helped the family to set goals and monitor progress
- Using saltbush as a critical alternative stock feed
- Setting grazing recovery periods for saltbush and other pasture
- Committing to good family communication
- Maintaining 'flexible single-mindedness' to pursue common goals and adjust them when required
- Being prepared to 'sit back on the hay bale' – the importance of reflecting, thinking, talking, planning and monitoring as well as action.

Saltbush saves the day

When the Rudd family first moved into the Trangie district in 1922, they started a sheep enterprise – however, fairly early in the family history they decided to diversify, moving into stud and commercial cattle and dryland and irrigated cropping, and finally moving out of sheep altogether when wool and sheep prices dropped in the 1990s.

'Diversification' has since become something of a motto for the enterprise. John, May and their son David aim to develop greater diversity across the whole business, from the soil life below ground through to the plant species in the pasture – and, just as importantly, in the ideas and approaches of the management team.

Within the family partnership, high importance is placed on maintaining and improving the value of the land base (soil, water and feed quality), improvements (fences, waters and roads) and machinery, as these resources are the basis for sustaining all the farming practices.

In the mid 1990s the family began growing saltbush, initially to help 'drought-proof' the farm and later to supplement forage requirements and to enable natural and established pastures to rest between stockings.

The value of the saltbush was graphically demonstrated in 2004 when other families in the district had to begin feeding stock. The Rudds were able to get by using the saltbush for feed, saving them an estimated $60 – $80,000. The saltbush has become a vital part of their mixed farming operation.

The goal

The Rudd family set itself the following goal:

'The ideal pasture will have lots of native perennials in it, with a range of summer and winter growers. It will have some annuals. There will be increased areas of saltbush and this will benefit the whole farm by allowing better litter to develop over the soil surface. Our grazing management will reduce overgrazing. The cropping operation will be productive and profitable. We will get on well as a family. We will be farmers, graziers and business people.'

The cropping system

The family crops 2000 hectares, including 800 hectares of share farming. Dryland crops include wheat, oats (grazing and grain), chick peas, canola and field peas. A typical rotation sees four years of crop followed by four years of lucerne-based pastures.

In the mid 1990s the family became concerned about rising costs, herbicide resistance issues and soil based problems. 'The crops looked good, but they just weren't yielding as they should,' says John.

The Rudds investigated and adopted conservation farming techniques, including reduced tillage and retained stubble. Around 80% of their country is direct drilled, with 20% minimum till (less than two passes). With the new approach, the land is becoming softer, and they have been able to sow crops in years when, with a conventional approach, it would have been impossible.

The focus on soils continued to grow, with machinery purchases to make better use of moisture and emerging technology. The family has carried out extensive soil testing. With the assistance of a hand held GPS unit, they are able to soil test zones. A yield monitor fitted to their header, plus yield mapping, help identify higher and lower yielding zones within a paddock.

'The yield monitor has shown variations in crop yield from three tonnes per hectare to nine tonnes per hectare in a single run,' says John. 'We are looking at soil differences in these zones to see if we can work out why. The yield mapping also showed that the majority of the wheat from some paddocks could come from just 25% of the area. This gives us enormous opportunities for gains if we can work out the reason through soil testing.'

The grazing system

A commercial cattle herd was introduced around 1970. When David joined the partnership in 1999 he established an Angus cattle stud and increased the commercial cattle herd to 240. The stud enterprise has grown to selling upwards of 50 bulls per year.

In the 1990s a run of dry winters had the family hand-feeding stock. They visited a local farm which was growing saltbush and were impressed with its potential. After further investigation they planted 80 hectares in 1996, 20 hectares in 2001 and a further 20 hectares in 2004.

After completing an Allan Savory's Holistic Management® course, they subdivided saltbush paddocks into 10 blocks, allowing them to graze stock in greater density on the saltbush, which stopped the plants becoming tall and rank and allowed a longer recovery period between grazings. The Rudds observed that stock did better on the saltbush when there was a range of feed between the saltbush rows, so row spacings are now five and seven metres (rather than three metres) to allow a greater production of paddock feed in between rows. The native perennial grasses have responded well, with high-quality feed establishing in these areas.

The saltbush has many advantages in the farm system. Putting stock on the saltbush allows the rest of the property to have a long plant recovery period from grazing, which improves perennial native grass regeneration. With the extra rest from grazing, the quality of the other pastures has improved, allowing the family a greater capacity to 'sell cattle when we want to, not when we have to'.

The saltbush and paddock feed between rows provides great feed for the dry cows after early weaning, and helps ensure a good joining percentage. Moving them around small paddocks provides a constant nutrition source. This evolving grazing approach has allowed the family to ensure cows are in a good condition at joining and maintain a good condition at calving.

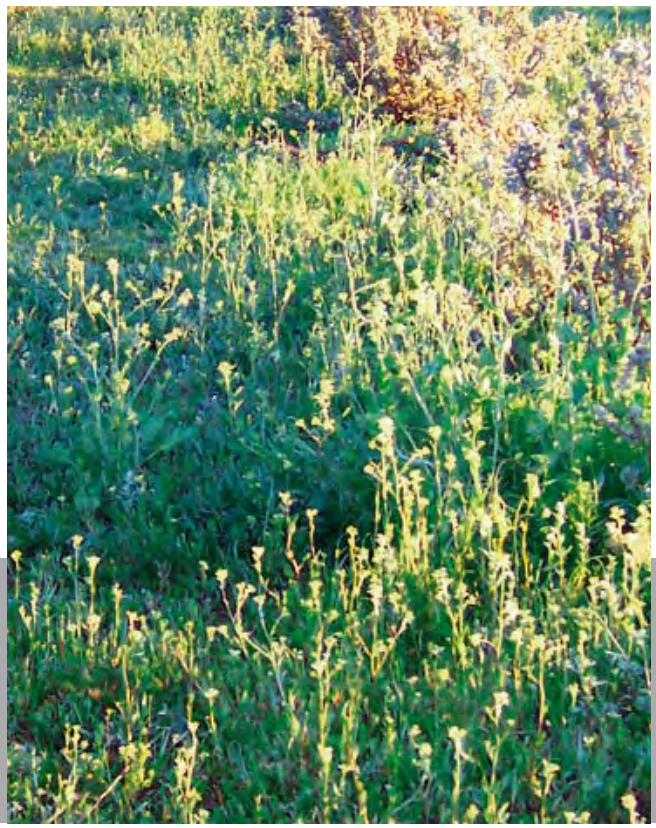
The family calculates that the saltbush can pay for itself in three years, through better cattle performance and having better quality pastures through long recovery periods.

Strengths and weaknesses of the mixed farming system

The Rudds believe they have a good mix of cattle, cropping and saltbush. On cropping country they do not make many compromises to benefit cattle. Cropping is the 'main game' on these areas and the cattle have to fit in.

Cattle can be harder to manage than sheep and can do damage to crop country if not managed well. However, large mobs, short duration grazing and moving them regularly all mean that the family is positive about the value of cattle. Good planning is important and flexibility is the key. 'Thinking about a scenario of what would I do if it got wet, helps me plan ahead for what I will do if it actually does get wet,' says David.

The Rudd family are continuing to evolve their mixed farming approach. Technology shows great potential to assist them to better map their soils into yield zones and to differentially manage these. As the family is aware, a focus on each individual's role in the business and good communication are also important factors for success.



Doug and Lyn Hewitt and Jim, Bob and Bruce Hewitt

South West Slopes NSW

550mm average rainfall

890 hectares at Young,
600 hectares at West Wyalong

Factors for success

- Participating in the Allan Savory Holistic Management® Course
- Having clear objectives
- Keeping it simple
- Documenting activities (stock programs, budgets, grazing planning, cropping program and agronomy) so people know what is happening
- Constantly evaluating enterprises for profitability
- Being willing to try ideas that are well researched
- Being prepared to use outside advisers if they can add value.

Using diversity to achieve stability

With four families making up the Hewitt farm business and living off one modestly sized property, a strong focus on profit has been vital. To achieve this, the family business runs a number of enterprises, based on the idea that business diversity can bring business stability. Instead of buying more land, the family has focused on making its enterprises diverse and intensive.

The Hewitt family has farmed near Canberra for the past five generations. In the seventies they gradually shifted operations to Young and West Wyalong in the South West Slopes of NSW. There are four families involved in the partnership: Doug and Lyn and their sons Jim, Bob and Bruce (plus their families). There is a strong cropping orientation to the enterprise, but family members have also enjoyed the grazing side of the business. As a result of their good grazing management, their stocking rates now range from 10-13 dry sheep equivalents (DSE) per hectare, which is well above district averages.

Following the 1994-95 drought, parts of the farm suffered from wind erosion. After seeing the difference in stability of soils in lucerne/phalaris pastures, the family began to examine their pasture phase more closely. They concluded that under-sowing lucerne on its own was leading to a monoculture, leaving bare soil at risk of erosion.

In 1996 the family did Allan Savory's Holistic Management® course, which helped them to look for new ideas and shape their existing business. While initially drawn to the grazing components, they realised that the program offered a framework for running an integrated farm business.

The farming enterprises

'We are very conscious of the number of enterprises which we run,' says Jim. 'There is a local saying "Enterprises doubled, management squared" so we are very aware of the time and skills needed to run a diverse enterprise mix and develop new enterprises.'

There are currently six enterprises:

1. Merino sheep: joining 3000 ewes of 20 micron, aiming at high weaning percentages.
2. Dairy heifers: contract growing out 80–160 dairy heifers each year and joining them for return to coastal dairy farmers on the point of calving.
3. Cattle feed lotting: finishing around 130 head of cattle.
4. Lamb feed lotting: the family finishes their own lambs, in order to run more ewes and maximise profits from each lamb drop. Up to 2000 lambs can be fed at once.
5. Contracting: in 1999 the family started a windrowing business, which has recently been sold. They still carry out contract harvesting.
6. Cropping: rotations of wheat, lupins, triticale and some barley. The rotation includes a six year cropping phase with a five year pasture break. The family produces some straw bales and operates a lucerne seed enterprise.

The family plans out the sheep enterprise 12 months ahead and the cropping enterprise 10 years ahead, but this is flexible according to season and prices. Each year they examine enterprises in the light of seasonal conditions and prices and the least profitable are removed. The range of enterprises also gives a good risk spread.

The cropping system

The basic crop rotation revolves around canola and wheat, with small areas of lupins and triticale. The final year of the rotation is commonly triticale, which is under-sown to pasture.

Soils are mainly red brown earths with areas of light sand. Closer to drainage lines some alluvial soil is evident. There are a number of soil-based challenges, including surface acidity, low phosphorous levels, poor soil structure and the need for more organic matter. The family has adopted direct drilling, which has made a positive difference to the soil by retaining organic matter and reducing soil damage. Paddocks can now be sown quickly after rain, when with conventional cultivation they would take many days to dry out for sowing.

An outside soil nutritionist helps with fertility management and crop planning. Two years before the pasture phase is to return to crop, the soil is extensively soil tested and a suitable fertiliser program developed. This testing, along with attention to grass weed seed set and the scope of broadleaf weeds present, plus the use of stock grazing management, helps make sure that paddocks enter the crop phase with maximum profit potential.

The grazing system

Once the family decided not to sow lucerne alone, pastures were sown with a range of perennial grasses such as phalaris, fescues, lucerne, chicory and clovers to create a stronger, more diverse pasture base. Soil tests have shown that these pastures have higher levels of soil organic matter and organic nitrogen than the pure lucerne pastures. This is of major benefit to the crop phase, and has also created a more stable feed base for the stock. The family is also trialling saltbush and has planted 3000 trees to improve farm biodiversity.

Strengths and weaknesses of the mixed farming system

The enterprises are complementary. For example the lamb feed lotting capitalises on the low-price feed-grain market and the high-price lamb market to make a good return. A side benefit is that it has allowed the business to cope with drought, by getting stock off the land to maintain soil surface cover wherever possible. Skills in animal nutrition are useful across both feed lotting enterprises and the dairy heifer grazing. A long pasture phase benefits both the cropping enterprise and the livestock enterprises. Stock has become a valuable input into the cropping operation for weed control in the pasture phase and also for stubble management.

The farm is structured so that each family member is responsible for an enterprise, which helps for planning regular holidays during enterprise down time.

However, in such a diverse and integrated farm family business there are ongoing challenges.

Profit from the cropping operation has been low over the last few years, due to an erratic and low rainfall. It is an important enterprise, but its profits are unpredictable.

For the cropping, big paddocks are desirable, while for good grazing management smaller paddocks are desirable. Electric fencing has been used in the past, however in the recent dry conditions its performance was not satisfactory.

Working out the family partnership direction in the long term is becoming important. While the family gets on well and works well together, as children's education, retirement and other individual decisions arise, the structure of the business may need to be reviewed.

'The production stuff is easy, it's the goals and people stuff that is the hardest,' says Jim. 'Having family members who are good "generalists" helps pull the operation together. Good communication and relationships are essential if all the enterprises and people are to work well together.'

David and Julie Langman

Central West Plains NSW

400mm average rainfall

5900 hectares

Factors for success

- Establishing a low-cost, diverse pasture base
- Low reliance on costly inputs
- Using grazing as a vegetation management tool
- Maintaining profitability through land development
- Establishing off-farm investments and assets
- Developing business knowledge and having pro-active advisers
- Employing a full-time farm worker
- Maintaining personal fitness and good health
- Factoring in time for holidays and breaks.

Diverse pastures and new rotations reduce risk

In 1993 David and Julie Langman took over their share of the Langman family farm partnership, operating a mixed grazing property of 5900 hectares near Condobolin, Central West NSW. Although the property had been in the family for more than 50 years, David and Julie faced some challenges. Heavily farmed soils were vulnerable to degradation, and after 2001, the annual average rainfall of 400mm became increasingly unpredictable.

The Langman family join 2000 Merino ewes, typically crop 1800 hectares of wheat and oats and run up to 150 cattle, all seasonally dependent. Their current enterprise mix and conservative approach to management has been shaped by their experiences in the 1979–82 drought.

David and Julie approach the business as a series of complementary operations, where the cropping benefits the stock enterprise, and vice versa. They have developed a flexible approach to their cropping and grazing enterprises, through a low-cost cropping rotation, maintaining a strong native pasture base, cropping oats for storage, using agistment to match feed supply with animal numbers and a strong business management attitude. This approach has been developed over many years of experience in an uncertain and erratic rainfall environment – and as a result the Langman family members are progressing towards their personal and business goals.

The goals

The Langman family set themselves the following goals:

- Increasing weaning percentages in the sheep enterprise
- Making the property more compliant with occupational health and safety regulations
- Setting themselves up for retirement with off farm investments and superannuation
- Establishing windbreaks and not cultivating within 50 metres of fence lines to allow regeneration to occur
- Increasing breeding cow numbers to 200 by using agistment
- Having four weeks holiday every year
- Setting up a farm that is more easily managed when the family is away.

The cropping system

‘I’m not in favour of prolonged monocultures,’ says David. ‘Our ideal rotation is two years wheat, under-sown in the second crop and then six to eight years pasture. During this time the lucerne thins and the native perennials return. A very productive pasture results and hopefully the biodiversity of the pasture gets a chance to recuperate.’

The cropping program remains flexible to suit the often risky seasonal conditions, and creates a low cost diverse pasture base. Coming out of the pasture phase, the country has a chemical fallow commenced in July and is worked once in September/October with the trash worker. The country is left rough to reduce soil movement from wind. Fallows are maintained with a combination of plough or spray, according to conditions at the time.

Crops are sown when moisture conditions allow. Fertiliser rates are adjusted according to yield potential and past history, and soil tests are used to assist decision making. Very few in-crop herbicides are used and mostly these are broadleaf sprays.

The family aims to keep herbicide use to a minimum, both for environmental reasons and to ensure that the perennial grass seed banks are maintained after the crop cycle. This is enhanced by leaving 50 metre barrier strips around fence lines which are not cultivated or sprayed, acting as grass seed banks and habitat.

The grazing system

The Langman family runs a Merino sheep enterprise of 2000 ewes. One of their major goals is to further increase weaning percentages, currently ranging from 83-92% depending on the season. Maiden ewes that do not join are either rejoined to meat breeds, or are sold and replaced with purchased older ewes. 'We are after a ewe with a lamb and are less interested in wool quality,' says David.

The family has adopted pregnancy scanning, which they believe offers great opportunities for gain. Scanning helped them identify that their maiden ewes were reducing their overall weaning percentages and this is now being addressed through supplementary feeding and culling. Scanning has also helped identify multiple birth ewes, which are looked after with better nutrition.

The cattle herd of some 150 breeders has a calving rate of 82-86%. When seasons allow, steers are grown out to two years, otherwise they are sold at 12 months. With the tough seasonal conditions over the past few years, cattle have been agisted during dry times. This is a flexible way of reducing stock pressure and maintaining ground cover.

Strengths and weaknesses of the mixed farming system

The Langman family is achieving some valuable benefits from their production approach. Their cropping program can be conducted at low cost through reducing costly inputs, which also helps to minimise risks. A low-cost, diverse pasture base can be established, also with low risk. Increasing crop fertiliser rates assists the crop, and also appears to improve the quality of the subsequent pasture base. Grazing management can be used to reduce seed set, decrease herbicide use, clean stubbles and fallows, and increase the capacity for machinery to get through trash. Oats can be grown at low cost and stored for dry periods.

However, there are pressures in running a mixed farm, of which the most significant are the potential for overlap in operations between cropping and stock and the difficulty in scheduling holidays. Shearing at the end of June can run into sowing time, heifers can calve at harvest time and a mixed farm means it is difficult to find time for breaks within a constant workload. Even agisting animals during drought can add to the pressure, as the time needed to travel and check agisted stock can be significant.

Getting the right balance between work, health, family and friends is important, but hard to do in practice, particularly in terms of scheduling breaks and holidays. 'With current pressures it's hard to get away for more than a week,' says David. 'A week isn't long enough to wind down.'

Having an employee has been a big help in creating the capacity to take breaks, but David and Julie say that unfavourable seasonal conditions over the last few years have created a lot of pressures and they may need to reassess how the farm is organised in the future to create a better balance.

The Langman family is now thinking longer term. Not only are family members concerned for the long term changes in the land, stock and crops, they are also thinking about themselves and their own needs into the future. Planning for investments in shares (via a self-managed super fund), Farm Management Deposit Bonds, off farm investments and tax are all important aspects of their farming business.

'In this environment there are a lot of unknowns,' says David. 'We also need to be thinking of our income and asset needs in retirement, even though it is a while away.'

Murrumbidgee

New South Wales

The project looked at four properties in the Murrumbidgee region. Three of the four were within 100 kilometres of Wagga Wagga, running dryland cropping and grazing systems. The fourth case study was near Hay with a small area of irrigation and extensive grazing

The dryland farming systems are characterised by cropping rotations based on wheat and canola with minimal cultivation and sowing either directly into stubble or cold burning. They produce both meat and wool from Merino ewes and use lucerne for grazing and some hay or silage. In several cases cattle have been sold due to drought and are considered an opportunity enterprise.

Most farms have a combination of 50-70% of the land in crop and the rest for grazing sheep. Farmers maximise the use of moisture for profit and use labour efficiently throughout the year. In general, soil health is improving on these farms.

The table below shows farm financial performance in 2003/04. All the dryland mixed farms were profitable and farm operating costs were between 50% and 70% of income in a year where crop yields were average due to a difficult season. Limited irrigation water severely affected profitability on the Hay property. Farm operating surplus on land value was low in all cases. This is due in part to an average season but also due to land values being higher than would be expected given recent seasons.

Indicators	Richards	Adlem	Blackburn	Harrison
Area farmed (ha)	650	5388	1440	900
Farm business profit ($)	-10,416	32,000	119, 962	53,276
Return on capital (%)	-0.1	-1.7	0.0	3.7
Farm income ($)	232,778	323,000	368, 376	326,928
Farm operating costs ($)	159,742	273,000	188, 384	176,723
Farm operating surplus ($)	73,036	50,000	179, 992	150,205
Farm income ($/ha)	358	60	256	363
Farm operating costs ($/ha)	246	51	131	196
Farm operating surplus ($/ha)	112	9	125	167
Farm OC as % of farm income (%)	69	85	51	54
Farm OS as % of land value (%)	3.5	2	8.3	8.3
Crop intensity (%)	35	1	47	68
DSE/labour unit (DSE)	3824	1658	1210	6272
Wheat yield/ha/100mm GSR (t)	1.11	0	0.56	1.10
DSE/ha/100mm GSR (DSE)	3.0	NA	1.0	4.0
Meat yield/ha/100mm GSR (kg)	56.59	NA	39.21	NA
Wool yield/ha (kg)	52	11	22	49
Farm income/100mm/ha ($)	67	NA	54	80

Opportunities for improvement

These five farmers put a great deal of thought and effort into water use efficiency (WUE) in crops, however the issue of WUE for livestock was never raised. Lucerne is drying out soils and causing a penalty in crop production in the following year. Pasture, stubble weeds, crop grazing and lucerne are all used inefficiently because the focus is on efficient crop production and not maximum production from the system.

Lucerne has become an established part of the cropping/pasture mix. The level of knowledge of lucerne management is limited. In particular there is potential for improvement in aspects of grazing management such as dry matter production and timing throughout the year, 'fallowing' of lucerne prior to the cropping rotation, establishment techniques and the relationship between plant density and production.

In most cases the farmers have difficulty identifying issues or research priorities for mixed farming. There is generally a focus on enterprise rather than systems. Work is required to model the interactions and synergies in mixed farming systems to help the farming community focus on and understand the whole system.

Improvement in natural resources focuses on improvement in soil structure. Farmers have made significant progress in this area, which has led to gains in water use efficiency. Farmers would be helped by being able to clarify costs and benefits of stubble retention and direct drilling.

Long term sustainability is dependent either on lucerne becoming a better fit in the mixed farming system or finding a legume crop which is more profitable.

Jim and Sally Richards and Neil Richards

Murrumbidgee NSW

620mm average rainfall

650 hectares

Factors for success

- Reducing sheep numbers and removing cattle from the system during drought
- Timing shearing to maximise wool quality and fit in with lambing
- Developing a special sheep breeding program that could be put on hold during drought and re-started afterwards
- Replacing phalaris with lucerne when conditions became dry
- Storing grain for supplementary feeding
- Enjoying working on the farm.

In charge of their own destiny

Jim and Sally Richards and their son Neil manage a 650 hectare property south of Wagga Wagga in the Murrumbidgee region of southern NSW. Despite an average annual rainfall of 620mm, in recent years the district has been gripped by drought. The Richards family runs three enterprises – grain (wheat and canola), wool and lamb production. They used to run cattle, but after a bushfire in 1997 and the 2002 drought, the family gradually removed cattle from the system and converted phalaris pastures to crops or lucerne for sheep grazing.

The property has clay loam soils with a gravel topsoil and red or yellow clays underneath. Usually the underlying clays provide a valuable source of moisture in dry times.

Both Jim and Neil like being their own bosses and think farming is a great lifestyle. They have not applied for drought relief themselves and believe in being prepared for drought.

'I love farming because you are in charge of your own destiny,' says Jim. 'But you have to be prepared to handle the rough spots. Droughts can be handled well by making early decisions. You make a decision and run with it before markets collapse and safeguard your land so it is productive at the end. I don't think it's fair that people who haven't prepared for drought get the first handouts.'

The Richards have been part of the local catchment management strategy, which involves five farms. The group has received money for salinity strategies and erosion control works on their properties and members have matched the funding dollar for dollar to fence off gullies and plant them with native vegetation. Jim and Neil have planted native trees on the western sides of paddocks as windbreaks and as shelter for stock. They have also carried out erosion control works around the dams near the farm's creek and applied lime to acid soils, reducing acidity and making the whole farm capable of growing lucerne.

The intense drought has meant the mixed farming system has needed to evolve over time and has highlighted the importance of the interactions between the different enterprises and how well they work together.

The grazing system

The wool and lamb enterprises vary in size depending on market prices and conditions. During the drought the family sold around 2000 sheep and kept running another 2000 Merino ewes, with lamb and wool production being their main focus. Half of the ewes are joined with Border Leicesters and half with Merinos. Some first cross ewes are also joined to Poll Dorset rams.

Merino weaners and ewes produce 18-20 micron wool, with shearing in May and June. Jim believes this is the best time to shear because it is as near to the season break as he can get. This reduces the chance of a break in the wool and ewes are then clean and ready for lambing.

Lambing starts in August, with lucerne providing feed for stock. Jim decided to change from autumn to spring lambing about eight years ago in the hope of having lambs ready for markets in July. He thinks lambing during this time makes it easier to manage stock.

Jim has done some artificial insemination with Merryville Stud and has semen in storage at Jerilderie. However, the drought meant he had to mix his specially bred sheep with others. He is gradually separating the two groups out again to continue the breeding program.

The cropping enterprise

The family has planted 68 hectares of lucerne for the Merino ewes. The remaining farmed area has been turned to a canola-wheat-canola rotation, producing on average 2.5 tonnes per hectare of canola and 4.5 tonnes per hectare of wheat.

During the drought they sowed lucerne instead of phalaris, which had died in the dry conditions. Pasture areas that were not performing were sown to canola, followed by wheat using direct drilling. Jim uses Goulburn and Riverina clover and winter wheat to fill the winter production gap. Some grain is stored for supplementary feeding.

Jim aims to keep the fertility of his property as high as possible, in both the sheep and the cropping enterprises. ‘If you keep fertility up, you are always in with a chance,’ he says. ‘Cropping is about harvesting the fertility that is there. It’s important to keep doing it, despite the drought.’

Strengths and weaknesses of the mixed farming system

The sheep and cropping enterprises work well together, so that production and management run smoothly. Having sheep grazing crops supplements pastures during the winter gap period when the pasture struggles to supply pregnant ewes. Cropping cleans up the land and makes it available for a more productive enterprise in the short term.

However, some clashes exist in this mixed farming system such as time restrictions in May/June when shearing and crop sowing occur together.

Jim thinks mixed farming is essential because of changing commodity prices. The Richards family has kept its system mixed and members adapt their activities to the markets at the time.

The future

Having recently returned home, Neil provides Jim with a new outlook on farm management. Jim sees himself as a bit conservative, because of his past experiences. However, he listens to his son’s suggestions. ‘He comes up with some good management ideas because he views the farm differently,’ says Jim. ‘I’d like to stay on the farm permanently, but I don’t want to reach the point where I am driving Neil crazy.’ At the moment, Neil likes having his father around because of his experience.

Sheep will continue to be the main focus on the farm in the future, with the family developing the specialised Merino flock it started before the drought, through the artificial insemination program. Jim also intends to put in a lamb feedlot, which will allow him to quickly fatten lambs and sell them so he has money available if opportunities to buy cheap land or stock arise. He has started growing lupins to provide a high protein grain for the project.

Cattle and grain production will not become a major part of the business, as Jim knows what he is doing with sheep and enjoys working with them. ‘If you do what you like and do it well, then you’re in front,’ he says.

Steve and Jane Adlem

Murrumbidgee NSW

350mm average rainfall

5388 hectares

Factors for success

- Adopting a low-risk conservative approach in the face of drought
- Trading livestock profitably
- Changing irrigation from summer crops and pasture to annual pasture
- Working as a team to maintain the farm asset and lifestyle.

Reducing risk in the face of water losses

Steve and Jane Adlem own a mixed irrigation farm, running sheep and cattle on irrigated pastures and rangelands adjoining the Murrumbidgee River at Hay, NSW. The family grows crops for fodder and sells a small amount of grain depending on the season. Land use is a 'patchwork' of irrigation amongst native vegetation and rangelands.

Their advantageous riverside location has turned into a mixed blessing for the family. Historically, the amount of water the Adlems could pump from the river for irrigation was unregulated. In 1982 irrigation licences were converted to a volumetric allocation and 972 megalitres were allocated to each of the irrigation properties. In 2002, irrigation water volumes were restricted. The allocation for the 2004/05 season was 32% of the licence volume. As a result, Steve and Jane changed all irrigation from summer pasture and crops to annual pasture. Low water allocations in recent years have caused challenges and the family has had to manage and reduce risk to minimise potential losses. This has influenced all farm management decisions.

The original family farm of 750 hectares has greatly expanded in the past decade and the property has 400 hectares of fully developed irrigated land and 4988 hectares of dryland grazing. The expansion of the farm was driven by the Adlem's need to make sure the farm could support them and allow their children to come home and run the enterprise if they wished. The land purchases were at good prices and the properties have increased in value by up to 100%. However, the family increased its debt significantly to purchase the properties and their main focus is now on reducing debt.

The family sees the farm as a resource that enables them to live and work. Two of Steve and Jane's sons have spent time managing the farm over the past five years, which has given them valuable experience and allowed Steve and Jane to work and travel overseas. The family hasn't prepared a written retirement or succession plan but Steve knows the children are enthusiastic about agriculture. The family works as a team to maintain the farm asset and their lifestyle.

The farming system

The goal for the livestock system is to maximise profitability but at the same time manage risk and the variability due to season and irrigation allocation. Two main strategies have helped Steve and Jane achieve this: reducing stock numbers early while they hold their value; and buying and selling stock according to the feed that is available.

The property runs sheep for breeding and trading. There are around 4700 Merino ewes and first cross lambs, and around 800 ewe hoggets. The family buys young Merino ewes and wethers for an average of $40 per head and keeps them for 10 months, with one or two shearings, before selling them for an average of $110 per head. They also trade around 2400 sheep each year. Livestock trading has been very profitable in recent years with good lamb prices. The principles that the family operates by are to buy at a low price, to purchase young, small animals which have growth potential and to graze irrigated pasture hard to maximise productivity.

The cattle system, although not as profitable as sheep, requires very little labour and the grazing of cattle is complementary to sheep. The family runs around 135 breeding cows and calves, 125 steers and heifers and 110 calves.

These strategies have not led to maximum income, but they have avoided overgrazing and depreciation in stock capital.

Strengths and weaknesses of the mixed farming system

The combination of rangelands, irrigated pasture, sheep, cattle and fodder crops provide a mixed system which gives flexibility. The family buys and sells cattle and sheep according to pasture availability. They breed stock on the rangelands and put the animals onto irrigated pasture to fatten. High yielding winter crops provide a fodder reserve of silage, hay or grain and cultivation for cropping provides the opportunity for upgrading irrigation layout.

The family runs sheep and cattle on the rangelands from autumn to spring and then moves stock to the irrigation blocks for the summer to allow the plants to seed and to maintain ground cover. However the future management of the rangelands is very challenging for Steve and Jane. Their biggest concern is weed infestation, as boxthorn and galvanised burr are increasing rapidly. 'Weeds could completely overtake the rangelands,' says Steve. Although subdivision and rotational grazing are possible solutions, the Adlems believe this is too expensive at present, given the current poor profitability of the business.

The current market value of the rangeland block is $1 million, but Steve believes this is an inflated value which cannot be maintained in the long term. Historically (the last 20 years), the rangelands had carried around 5000 dry sheep equivalents (DSE), but the current carrying capacity is only around 1400 DSE.

The farm has many important and challenging natural resource management issues and Steve and Jane are concerned about managing them sustainably given poor farm profitability. They believe it is difficult to find a balance between conservation and profitability and that they need financial assistance to manage natural resources.

They have planted many trees but survival rates have been poor. Steve is unsure about the value of the great effort put into tree planting over the past 10 years. They have also fenced off riparian vegetation, but lipia has increased as a result and Steve believes that these areas should be available for intermittent grazing.

The future

The Adlems believe there is a strong need for farmer discussion groups — however they fear that younger people aren't interested in groups and many farms have been purchased by corporations that also don't have the interest.

Steve and Jane are working on the best ways to integrate irrigation and dryland grazing. Although livestock trading has been very profitable, the drought and the other risks they face have led them away from innovation and into a low risk, conservative approach.

Harry and Alisa Blackburn

Murrumbidgee NSW

425mm average rainfall

1440 hectares

Factors for success

- Removing cattle after drought in 2003
- Timing lambing for March/April instead of spring to manage grass seeds and flies
- Shearing after lambs are weaned to prevent grass seed contamination of wool
- Introducing legumes into crop rotations to improve soil structure by increasing nitrogen
- Spreading risk between the different enterprises.

Keeping it in the family

Harry and Alisa Blackburn manage a mixed farming property west of Wagga Wagga in the Murrumbidgee area of southern NSW. The Blackburns previously ran three enterprises – cattle, sheep and cropping – however they removed cattle in 2003 because of the drought. They now produce grain and wool in a family partnership between Harry, Alisa and Harry's parents.

Red clay loams are the predominant soil type and the entire property can be cropped, although soil crusting can be a problem. Weeds are the main problem, particularly rye grass, barley grass, wire weed and silver grass. Harry suspects that there is some resistance to chemicals and he manages the problem through stock rotation and spraying.

The soils have a natural tendency to crust and Harry has avoided soil damage through minimum tillage and stubble retention. He has also used an aerator in the last three years, which breaks any compaction layer and allows oxygen and moisture to enter the soil. This has improved biological activity and soil structure.

'The farm is one big family operation,' says Harry. 'Farming is an ongoing apprenticeship. You just don't stop learning.' Harry's father is a farm 'encyclopaedia', being a source of knowledge, experience and inspiration for Harry. His mother plays a key role in planting and managing native vegetation. All the farm work can be done by family members. The Blackburns would rather scale back their operations than pay others, as they like being independent.

The grazing system

The Blackburns run Merino ewes that are joined to Border Leicesters. They run 940 Merino ewes, 350 young ewes, 620 wethers and 750 lambs, resulting in a stocking pressure of 2588 dry sheep equivalents (DSE).

Harry bases his livestock management on his father's experience and what has worked in the past. He times lambing for March and April instead of spring to help manage grass seeds and flies. During lambing the Blackburns hand feed the stock and in June the lambs are weaned onto crops. Harry sells the Merino wethers 12 months later.

Shearing starts in August and September after lambs have been weaned. Some farmers in the area shear in autumn just before lambing begins, but Harry believes this can result in too many grass seeds contaminating the wool. Harry bases farm management on what has worked in the past rather than on current trends. 'We choose not to be led by the industry standard,' he says.

The cropping system

The Blackburns grow wheat, barley, canola, triticale, lupins and field peas over 1100 hectares, plus 300 hectares of lucerne for sheep grazing.

The family has lengthened cropping rotations over time and now includes more varieties. Legumes such as field peas and lucerne have improved soil structure by increasing nitrogen. According to Harry, the soil is no longer 'one big hard pan' like it once was. However, the Blackburns have noticed that lucerne dries the soil and causes poor triticale and barley yields.

Harry may reduce dryland cropping in the future because labour is restricted to family members and because he prefers to concentrate on livestock. Alisa can be more involved in the stock side of the farm and stock needs less work. Harry says he would love to bring cattle back, but he believes they are too expensive and involve too much capital.

Strengths and weaknesses of the mixed farming system

The Blackburn's grain and sheep enterprises work well together. For example, cropping paddocks provide valuable grazing in winter and crops provide stubble feed for sheep. The cropping enterprise benefits because sheep graze in cropping paddocks and control weeds. The cropping and sheep grazing rotation controls worms because paddocks have breaks from stock.

In some instances the grain and sheep systems can clash. For example, autumn lambing means crops and pastures do not provide enough feed when the stocking pressure is highest.

The future

The Blackburns do not see farm productivity increasing in the future as they have restricted their labour input. Harry thinks he will reduce crops in future, with stock being the major focus for production. However he emphasises that even if cropping is decreased, the family must be percentage operators. 'Never chase rainbows. Never go for the big kill,' he says.

Harry would love to reintroduce cattle and would like to become an organic producer. He would also like to experiment with native grasses to compete with the weeds, rather than relying on sprays. However he is concerned that organic farming is not an option because of the weed problem and the lack of profitable markets. He also worries about the possibility of litigation, in terms of both people visiting the farm and for food products supplied by the farm, and feels it is possible that this will threaten the viability of farming in the future.

The Blackburn family intends to continue as mixed farmers in the future, as they believe the flexibility of the system makes them successful. Harry wants to expand what his father began on the farm – but also plans on seeing more of Australia in the future and does not know how long he will stay on the farm.

Gary and Meg Harrison

Murrumbidgee NSW

480mm average rainfall

900 hectares

Factors for success

- Focusing on improving soil health and maximising soil productivity
- Retaining stubbles and direct drilling crops to conserve moisture and increase organic matter
- Removing lucerne before spring rainfall to restore subsoil moisture
- Fine-tuning rotations to manage weeds.

What happens underground is the issue

Gary and Meg Harrison farm 900 hectares of land over three blocks west of Wagga Wagga in the Murrumbidgee catchment of southern NSW.

'I enjoy what I do and I like doing it well,' says Gary. Since ending a partnership with his brother in 1995, Gary has been managing the property on his own. He plans to farm for another 15 years until his children have left home. He doesn't encourage them to become farmers, but will give them the opportunity to take the farm over if they want to. Meg does not have a major interest in the farm and works in town.

'What happens underneath the ground is 100% of the issue,' says Gary. His soils vary from red loam to red clay loam with grey clays along the creek. The soils are not self mulching, but are fertile and have few soil degradation issues. Such good quality soil means that 820 hectares of the farm are arable, with three quarters of this area cropped with wheat, canola and lupins. Gary also grows around 200 hectares of lucerne pasture for the sheep and wool enterprise. The farm carries 2000 dry sheep equivalents (DSE) including Merino ewes, wethers and weaners.

Gary views soils as extremely important to the success of his farm and has adopted a number of innovations to improve soil health. Surface soil acidity has improved from a pH of 4.7 to 5.5 through liming. Gary has also applied gypsum to the grey clay areas, which has improved legume and crop growth and made phosphorus more available. Environmental management surveys have found subsoil acidity on the farm with a soil pH around 4.7. Gary is aiming to increase the pH to above 5.5.

The property has some unique environmental features that require specific management. It contains a 50 hectare wetland with native floodplain grasses, which is protected under the NSW Environmental Planning and Assessment Act (1979) SEPP 46 guidelines. Gary cannot graze the area between October and December and cannot plough it at any time without consent from the Environment Protection Authority.

As part of Greening Australia and the Murrumbidgee Catchment Management Strategy, Gary has fenced off two kilometres of the creek running through his property. He has also fenced off 15 hectares next to the creek, where river red gums and other native vegetation is naturally regenerating. He plants up to 600 metres of tree line each year to increase the native vegetation on the farm and replace older trees that are dying. The trees improve the aesthetic appeal of the farm and provide shade and shelter for stock.

The cropping system

Gary has designed his cropping system to maximise soil productivity. He has not burnt stubble for 11 years – all stubbles are retained and he direct drills crops to conserve moisture, improve water use efficiency and increase organic matter levels. Developing this system was expensive but Gary believes it has been worth it and that the soil structure has improved.

Gary uses a wheat-canola-pasture rotation, growing Wylah wheat in winter for sheep grazing and Triazine-tolerant canola for combating weeds while still producing a crop. Originally wheat followed canola in the rotation, however Gary reversed this as he found it was better for weed control. Lucerne pastures are sown into wheat stubble during spring. They are sprayed for weeds and grazed heavily before being sown to crops.

The grazing system

Gary puts minimal effort into his sheep enterprise. He runs 1500 Merino ewes, 400 wethers and 500 weaners. Lambing is in mid July so that pasture is available at weaning. Shearing is in late January and early February, as this is when shearers are available and the farm workload is low. The sheep produce 19-20 micron wool and are jetted once in October with a five-month active chemical, meaning that Gary does not need to check for fly blown sheep on a regular basis.

Strengths and weaknesses of the mixed farming system

Gary's wool and grain enterprises interact well together in many ways. Sheep graze and help control summer weeds in cropping paddocks after spraying. Sheep graze crop stubbles, and grain in the stubbles supplements their feed. Shearing in late January/early February fits in with cropping work.

There are some tensions between the enterprises. Sheep pulverise the soil in cropping paddocks, especially in wet periods and there is no way of controlling the growth of wheat when it can't be grazed. Sheep are restricted to pastures when the crops are being sown.

There are several issues arising with the lucerne pastures. Lucerne has a drying effect on the soil and the following crops establish poorly. Gary now removes lucerne for crops before spring rainfall so that subsoil moisture levels can recover.

Another problem is that lucerne pastures raise soil nitrogen levels too high, so the wheat crop following the lucerne is not as productive. Gary direct drills the wheat into the lucerne paddock as a way of reducing the nitrogen effects. 'You have a better chance if you don't work up the soil and lucerne isn't broken down to supply more nitrogen,' he says. If he needs nitrogen for a crop he applies it by top dressing, not drilling when he sows the crop.

The future

Gary takes an active role in the local community. He is part of the local district agricultural group, Farm Link and the local fire brigade. However, he has noticed the community shrinking. 'There are few fire fighters and we struggle to get a tennis team,' he says. He sees the fewer local people as a sign of Wagga Wagga's growth, with many commuting to Wagga Wagga for work.

Gary sees climate and markets as the biggest risks to production on his farm in the future. He doesn't think his crop area will increase without a fallow, because of weeds. He hopes to introduce precision sowing, where the next crop is sown in between the rows of the previous crop, and hopes to see the development of easier and quicker ways of sowing seed.

Corangamite/ Glenelg-Hopkins

Victoria

The project studied five farms in the Corangamite/Glenelg-Hopkins region of South West Victoria, of which four are included here. These farms are an excellent representation of the issues faced by mixed farmers in the region.

The farming systems are characterised by cropping of heavy soils (through either improved drainage or minimum cultivation) and sheep and cattle grazing, with a move away from wool and beef cattle towards prime lamb production due to dry seasons and low wool prices. There are a range of crop types depending on soils, grain, price and rotation. Generally there is a need for a profitable and reliable legume crop. Cropping yields are reliably high (4.5 tonnes per hectare), however cropping inputs are also high due to the need for pest control. Most properties use lucerne for grazing, which is possible through improved soil drainage and an increase in pH from liming.

The following table provides a summary of farm performance in 2003/04. All farms were profitable, but return on capital was low despite productivity being high, due to high land values.

Indicators	Thompson	Baker	Freeman	Watson
Area farmed (ha)	3750	68	670 1	1862
Farm business profit ($)	437,916	2867	187,592	164,990
Return on capital (%)	5.0	2.5	4.5	3.3
Farm income ($)	2,591,157	422,943	528,682	582,176
Farm operating costs ($)	1,953,080	237,124	235,143	383,688
Farm operating surplus ($)	638,077	185,819	293,539	198,488
Farm income ($/ha)	996	621	789	306
Farm operating costs ($/ha)	751	348	351	202
Farm operating surplus ($/ha)	245	273	438	104
Farm OC as % of farm income (%)	75	56	44	66
Farm OS as % of land value (%)	8	9.3	12	6
Crop intensity (%)	63	58	75	0
DSE/labour unit (DSE)	8194	5106	4040	7343
Wheat yield/ha/100mm GSR (t)	1.02	1.07	1.06	0
DSE/ha/100mm GSR (DSE)	3.02	2.9	3.29	2.3
Meat yield/ha/100mm GSR (kg)	46.02	68.08	13.17	58.04
Wool yield/ha (kg)	86.70	NA	49.70	34
Farm income/100mm/ha ($)	193	118	136	51

Opportunities for improvement

Water use

Anecdotal evidence from the case studies suggests water is being used by plants rather than running off the paddocks. The last seven years have been relatively dry and the system of raised bed cropping has not yet been tested with a very wet year. There is an opportunity for better understanding of the water use of crops and pastures, to help farmers maximise water use and the conversion of dry matter into profit.

There is likely to be significant runoff from raised beds in a wet year and managing nutrients in this runoff could be an environmental problem. There may be a need for dams to catch run off for recycling, or filtering run off through wetlands before it enters streams.

Soils

Surface soil structure has improved, however the next limitation to productivity is hostile subsoils, which are sodic and sometimes acidic. A number of techniques are being evaluated to improve subsoils. Farmers reported improved root development due to well drained subsoils. Farmers have an excellent knowledge of soil structure and many decisions are influenced by their desire to improve soil structure.

Reliable legumes

Legume crops have been unreliable in this district and farmers need a legume which is reliable and profitable. Lucerne is taking the place of a legume in the rotation and farmers need ways of better incorporating lucerne into the system. For example, easier establishment, cropping over the top of lucerne or undersowing techniques would help reduce establishment costs.

Lucerne management

The grazing management of lucerne requires further work. Farmers do not know if dense or sparse stands of lucerne are more profitable, or if grazing lucerne should be sprayed for weeds in winter.

Livestock systems

Livestock systems don't have the level of management given to cropping systems. Pastures are often underutilised compared to crops. There is potential to use crop stubble more effectively, however farmers are reluctant due to the risk of damaging soil structure.

Environment and biodiversity

Clearing paddocks and introducing raised bed cropping has led to reduced pasture and native pasture areas throughout South West Victoria. There is a need to preserve native pastures.

George and Lisa Thompson

South West Victoria

520mm average rainfall

3750 hectares

Factors for success

- Including intensive livestock production (pigs) in the mix to spread risk and add nutrients to cropping soils
- Using a detailed business plan with long term goals and strategies
- Adopting raised beds and controlled traffic to improve soil drainage and root growth
- Adopting minimum tillage
- Removing legumes from the crop rotation and replacing them with pig breeding on cropping paddocks.

The courage to keep purchasing land

George and Lisa Thompson manage their mixed farm west of Geelong in the Corangamite Catchment of South West Victoria with their son, Craig, and manager, Bill. They own 3000 hectares and share farm or lease another 750 hectares.

When George and Lisa began managing the farm in 1971, they bought land for around $125 per hectare. Land prices had fallen in the district because wool and sheep markets were poor. 'At the time many people thought there was no future in farming,' says Lisa.

The Thompsons disagreed. Despite several periods of drought and ongoing low land values, they kept purchasing land up until 2002. 'We figured the land had to increase in value eventually to reflect real estate behaviour,' says Lisa. Their prediction proved correct.

A major limitation for cropping on the farm and in the district has been waterlogging. 'At one stage most of the area had given up on cropping,' George says. He and Lisa solved the problem by adopting raised beds and controlled traffic. They started with 90 hectares in 1996 and now have raised beds on 554 hectares. The new practice has improved soil structure and allowed George to crop areas of the farm that were non-arable. Combined with minimum tillage (direct drilling) and spraying of broad-leafed weeds, controlled traffic raised bed cropping has increased yields and profitability.

The property involves four enterprises – grain production (wheat, canola and barley); cattle (including an Angus stud); sheep grazing for lamb production and intensive pig production. 'The property must constantly evolve to achieve a balance among the enterprises,' says George.

As a person who loves farming and has worked the land from an early age, George has an intuition about how to manage the business. 'I sometimes can't explain the decisions I make but I know they are the right ones,' he says. Bill, the manager, takes a high level of responsibility and encourages George to try new things. The team works in an open and harmonious environment, with a high level of trust.

The grazing system

Since the family developed their Angus Stud 10 years ago, cattle numbers have increased from 200 to 500, including 200 stud cows and 80 bulls. The Thompsons manage 200 trading cattle (heifers and steers). They changed from a mixed herd to black cattle because of the strong market for them.

In contrast, sheep numbers have declined from 6500 to 4200, consisting of 1000 Merino wethers and 3200 crossbred ewes. The sheep enterprise has shifted from Merino ewes and wethers for wool production to first cross ewes for lamb production, which are grown out over summer. Stocking rates have varied from 8 to 10.7 dry sheep equivalents (DSE) per hectare. The family has significantly increased stocking rates by lambing in winter (June/July) and finishing lambs over summer. This makes the sheep enterprise productive all year round and maximises water use.

The cropping system

The cropping rotation is canola-wheat-barley-canola, followed by two years of outdoor pig production. There is no legume crop in the system, as field peas and lupins have not done well in the past.

The Thompsons now grow lucerne in raised beds, which has significantly increased the productivity of grazing. With the improved drainage and soil structure, the lucerne root systems can penetrate deep into the subsoil and access a previously unusable water resource, providing reliable summer grazing for cattle and sheep.

The outdoor piggery plays an important part in the crop rotation and has been operating since 1995. Pig breeding takes place on a paddock for two years. This builds up nutrients to very high levels, removing the need for a legume crop in the rotation.

Strengths and weaknesses of the mixed farming system

The enterprises on the property work well together and enhance overall performance. For example, the piggery provides high nutrient levels (including nitrogen) for crop production. Improved soil structure and drainage from raised bed cropping allows the family to grow lucerne for stock grazing and finishing. This in turn improves barley and canola growth by allowing root development following the path made by lucerne taproots. Alternating between sheep and cattle provides a break in the availability of hosts for parasitic worms, therefore helping to control worms. For this reason most of the sheep only need two drenches and most of the cattle only need one.

Despite these positive interactions, there are some instances where enterprises work against each other. Cattle and sheep cannot be left grazing on stubble in crop areas for too long or the preparation for cropping may be compromised. Grazing and piggery operations can cause compaction in cropping soils and can damage the raised beds.

A major focus of the Thompson's management style is that they make a profit off the land while still leaving it in good condition. George and Lisa have carried out revegetation in conjunction with Greening Australia and Green Corps. They have fenced out and planted around 10,000 trees along dry creek gullies and in areas where salinity may be a problem in the future. This reduces salinity and enhances the vegetation communities of Lake Murdeduke, an internationally recognised RAMSAR site located in the centre of the property.

In the past, planting shelterbelts has interfered with management and George has some concerns about these projects. 'There needs to be a strategic plan developed so revegetation doesn't interfere with making a dollar,' he says.

The future

The Thompsons have a detailed business plan which sets out long term goals and strategies. Craig produced the plan and it has helped everyone understand where they are heading and how they can achieve their goals.

While George hopes to stay on the farm, he doesn't want to drain the operation and has worked towards creating a business system that doesn't rely on him. This provides the opportunity for Craig and Bill to take more active roles.

The Thompsons believe the farm business will become increasingly sophisticated, with a balance between all enterprises so that one does not dominate. They believe new technology will become more important in bringing about higher yields.

The family has begun carrying out environmental management surveys on specific paddocks. George has learnt a lot from soil sampling results and wants to learn more about subsoil health and how to tackle problems.

Having come through times of low confidence in farming as an industry, George and Lisa are concerned about the future of agriculture and the reduction in the numbers of young people going back to the family farm. They would like to see the profile of family farm businesses raised and the advantages of living in rural areas promoted so that current communities can survive and thrive in the future.

Simon and Louise Baker

South West Victoria

570mm average rainfall

681 hectares

Factors for success

- Simplifying the system to only include one type of sheep and a basic crop rotation
- Making farm decisions on business principles rather than emotions
- Introducing canola and clover into the crop rotation
- Running a sheep flock with very high lambing percentages and fast growing lambs
- Taking steps to minimise the risk of a wet year
- Tracking budgets against actual spending every month.

Biting the bullet

Simon and Louise Baker reached a turning point in their farming lives eight years ago when the bank started to ask difficult questions and put pressure on them to consider changes. They took the opportunity to have a hard look at what they were doing and 'bite the bullet'.

It was time for the Bakers to ask themselves serious questions about their farming system. How were they going to make a profit? Were they running the right kind of sheep? Should they get out and do something else altogether?

Simon and Louise seriously considered selling, but in the end decided instead to make some major changes. They simplified the enterprise as much as possible, cutting it down to just one type of sheep and a simple crop rotation.

Then they decided to change their own approach and run the farm in a much more businesslike way – basing each decision on its business impacts, rather than just what felt right.

Under their new approach they bought additional land and increased their equity. The farm now produces a healthy operating surplus of $185,000, or $273 per hectare. When the time does come to sell the farm, the Bakers are in a position to walk away with $2.5 million to start their next phase in life.

The business is a 681 hectare mixed farm near Derrinallum in South West Victoria, with the sheep and grain sides of the enterprise being roughly equal in terms of land area used and income earned.

Although Simon makes many day-to-day decisions himself, the couple makes all the big decisions together. Louise manages the finances and keeps a close eye on progress by keeping an up-to-date budget that she tracks by putting in actual income and expenditure figures at the end of each month. The Bakers keep an open mind about the future and regularly review their plans.

The cropping system

The cropping rotation is canola-barley-clover hay-wheat. Although most of the property is arable, the Bakers only crop 58% of the land area. Simon direct sows, doesn't burn stubbles and has been successful in introducing canola into the rotation.

Although Simon and Louise considered introducing raised bed cropping, they decided against it for a number of reasons. Their paddocks run in a range of directions, making it more difficult to manage, and they believe direct sowing minimises the problems with waterlogging, although they admit a very wet year could cause problems. The Bakers believe raised bed farming could have a negative impact on the sheep enterprise, which is very important to the property. Sheep could be lost going down in the furrows because of beds and Simon doesn't want the inconvenience of beds in the grazing paddocks.

Including a clover paddock in the crop rotation is a great benefit to both cropping and sheep. It provides an excellent disease break, is profitable, provides a fodder reserve and valuable clean grazing on regrowth in spring.

The grazing system

The sheep side of the business is a specialist meat production enterprise. The improved pastures and stubbles allow the Bakers to run 1600 Coopworth/East Friesian cross ewes, giving a stocking rate of 12 dry sheep equivalents (DSE) per hectare.

The self-replacing flock of ewes achieves very high lambing percentages (an average of 132%) and produces fast growing lambs. Ewe lambs are joined for the first time at seven months of age and around 60% of lambs are dropped at 12 months. This reduces the cost of replacing ewes and allows fast genetic improvement. Simon previously carried some lambs over summer on fodder crop, but he found that after all costs were included, the profit from doing so was small and it was more convenient to have the lambs off the farm at harvest. He now sells all lambs around Christmas.

Strengths and weaknesses of the mixed farming system

Simon and Louise are very happy with their farming system and believe it is successful because the enterprises work so well together. Grazing sheep on crop stubble gives the pastures a three-month spell in autumn and stubbles aren't burnt because they are grazed hard. Growing barley after canola is very low cost because the ground is clean and growing spring barley gives more room for sheep in winter. Ewes lamb in spring onto growing fresh pastures and selling lambs in late spring/summer means they are off the farm before the harvest and so don't interfere with it.

The Bakers have made several decisions which spread their workload through the year. They have moved shearing from late autumn to January (after harvest) to fit in better with cropping.

This also fits well with joining, as the ewes are bare shorn at joining in February/March. They have also moved lambing to spring to increase fertility, because the sheep have access to plenty of feed at that time.

The Bakers' greatest risk is a wet year, when crop yields can drop by as much as 40%. However the couple believes that minimum tillage minimises that risk and income from livestock and hay would make up for some of the loss.

The future

Simon and Louise believe they can improve their business even further. Some strategies they are considering include improving pastures and then running more stock, cropping more of the farm, improving lamb growth rates so they are heavier for sale in December and managing the system to allow for a holiday during the year.

The Bakers have turned around their fortunes. They have made a success of the farm and increased their wealth significantly in the last five years by lifting productivity, running an efficient mixed farming system and expanding. They may consider selling and starting a new life in the next five years – and they have the freedom to make that choice.

Alex and Maree Freeman

South West Victoria

550mm average rainfall

670 hectares

Factors for success

- Establishing underground drainage to improve soil structure and aeration
- Establishing controlled traffic raised beds to deal with waterlogging
- Improving rye grass management
- Reducing the sheep enterprise to improve crop profitability
- Developing a Whole Farm Management Plan to run the enterprise better
- Using the available land to its maximum benefit rather than expanding.

Making the most of what you've got

Alex and Maree Freeman own a mixed farm north of Wickliffe in the Glenelg-Hopkins catchment. Their average annual rainfall is 550mm – though this can vary a great deal. In 1993 the farm received 838mm and the Freemans produced their worst crops on record.

Soils on the property include clay loam, sandy loam and clay. Like many soils in the area, they are fertile and high in organic matter, but a heavy layer of blue-grey clay occurs in the subsoil over most of the farm, leading to poor drainage, one of the major restrictions to cropping on the property. 'When it started raining, Alex would always be out in the rain digging drains to divert surface water,' says Maree.

Alex hated losing water so he constructed underground drainage on 40 hectares. Despite the expense (it cost $1000 per hectare) and many around him 'thinking he was mad', the soil structure improved dramatically and became aerated. The first canola crop following the engineering work produced 2.5 tonnes per hectare and almost paid for the cost of the project in a single year.

Soil structure and drainage has improved so much since that time that the drains have almost become redundant. Following the initial drainage work, the Freemans established controlled traffic raised beds on parts of their property in 1996. These have further improved production, with Alex believing that lower yields have risen and higher yields have stabilised since he started using raised beds. The farm is now very productive and profitable.

'Farming is our life, it is who we are,' says Alex. After being on the property for over 20 years, the Freemans have focused on using their available land to the maximum in order to have a comfortable lifestyle, while still looking after their resources. This has involved being flexible and trying new things such as developing a Whole Farm Management Plan in 1993. This allowed them to analyse their property based on land capability classes so that Alex could improve farm planning and operation.

As part of the plan and in conjunction with Landcare, the couple planted native trees along the Hopkins River, which runs through the property. The aim of the revegetation project is to reduce salinity in saline soak areas, decrease nutrient runoff, increase biodiversity and improve the aesthetic value of the property. They have re-fenced the waterway above the flood line to prevent stock access and reduce subsequent erosion.

Alex and Maree believe there is substantial merit in planting native vegetation along the river. 'We are trying to find a balance between getting an income off the land and not making the land go backwards. We are planting trees for the people downstream and hope those upstream will be doing the same for us,' says Alex.

The cropping system

Alex crops 500 hectares of the property and the remaining 150 hectares consist of unimproved pasture for sheep grazing. Cropping follows a wheat-barley-canola-wheat rotation. Some areas have been continuously cropped for 30 years.

The couple has tackled rye grass control through using a naturally bred Triazine-tolerant canola in the crop rotation so that a crop can be grown while rye grass is sprayed with Triazine. The combination of soil structure improvements and management of rye grass has seen crop yields increase from three tonnes per hectare to 4.5 tonnes per hectare.

The grazing system

Originally Alex grazed the property intensively at 25 dry sheep equivalents (DSE) per hectare. However, sheep production has declined dramatically from 4000 to 1200 in the last two years. This has happened for two main reasons: firstly poor returns from sheep and secondly, greater investment in crop machinery has meant larger areas need to be cropped to make the purchases financially worthwhile.

The farm currently carries 1200 Merino sheep, comprising 800 Merino ewes and 400 wethers. The combination of sheep and crops has allowed the majority of the property to be productive. However, Alex can see sheep numbers declining even more than they have as cropping expands in the future. 'Having less livestock gives us more time and flexibility,' he says.

Strengths and weaknesses of the mixed farming system

The Freemans have gradually segregated the grain and wool enterprises because of clashes between them. For example, having sheep grazing in cropping paddocks compacts the soil. 'I use six litres per hour more fuel to sow paddocks that have been grazed by sheep for two weeks,' says Alex. Sheep grazing in cropping paddocks also leads to rye grass seed being trampled into the soil, increasing weed problems.

Despite a limited number of interactions between these production areas, Alex and Maree believe the systems work well together by providing risk management. The enterprises use different areas, thus allowing the whole farm to contribute to production and some synergy does occur. Stubble grazing by sheep allows pastures to grow during autumn and provide more dry matter in winter and stubble provides feed for sheep.

The future

Alex and Maree feel strongly about their local community. They aim to expand their business by making maximum profit from the area they own rather than buying more land. They believe if everyone continued purchasing land then the number of farming families would decline, as would the local community.

Alex thinks the area has sufficient rainfall to produce 10 tonnes per hectare of wheat. He believes this will be achieved partly through seed breeding developments, especially the development of breeds that can use the limited light in South West Victoria more efficiently. Eventually he can see the property running no stock at all.

Alex believes that to be successful in the region, farmers need to be true professionals and use their skills to increase returns, rather than just relying on the climate and soils.

Tim and Margaret Watson

South West Victoria

600mm average rainfall

1862 hectares

Factors for success

- Treating the environment as one of the farm enterprises
- Aiming to improve productivity in all enterprises
- Excluding cropping from the enterprise and introducing agroforestry
- Using crash grazing and rotational grazing to improve pasture diversity
- Supplying European Union accredited beef independently
- Developing an Environmental Management System.

Treating the environment as an enterprise

Tim and Margaret Watson represent an exciting new era in mixed farming. They are working to reduce the ecological footprint of their 1862 hectare property near Mortlake in western Victoria. 'Farmers are natural resource managers,' Tim says. 'Like it or not, we are in charge of the resource.'

The property is located in the Hopkins River Catchment and Salt Creek flows through its centre. Thirty years ago the creek had a low level of salinity – a measure of around 60 for electrical conductivity (EC). Today this has risen to 6000 EC, a graphic illustration of the risk of not valuing the environment. Luckily for the family, the land near the creek is steep and rocky and the high elevation of grazing paddocks compared to the saline waterway mean that salinity hasn't been a problem on the property.

Four business enterprises make up this mixed farming system. The first three – sheep, cattle and agroforestry – are traditional farm enterprises. The fourth enterprise is the environment, which is managed so that its productivity – including biodiversity, water quality and soil health – is improved. Tim's management techniques have stemmed from the realisation that the environmental resources on the farm are very important to the success of the business and future productivity.

Tim decided against cropping for three main reasons: the high cost of capital for machinery for grain production; a dislike of the cropping process including the high levels of chemicals involved; and his view that cropping is a monoculture that does not fit into his mixed farming system, which aims to increase biodiversity.

Tim has taken an active role in managing the natural resources on his property through the development of an Environmental Management System (EMS). The long-term objective of the EMS is to identify issues and rectify them so that Tim can leave the property in a better condition than when he took it on.

This has involved planting trees along the creek to increase biodiversity and to improve the health of the aquatic system. Farm activities have also been altered to reduce environmental impacts. Tim manages native pasture areas with the help of a local botanist so that native grasses can regenerate while still being intermittently grazed. He has developed an artificial wetland along a drainage line that reduces the amount of silt being discharged into Salt Creek.

The goals

Several years ago the family created a set of property goals. They include:

- People goals: to develop a safe, happy and progressive workplace for family and staff, to continue our education, to cater for our parents and to ensure everyone has a holiday.
- Natural resource management goals: to have shade and shelter in every paddock, to understand nutrient and water cycles, to ensure plenty of ground cover and to introduce more earth worms and dung beetles.
- Productivity and profitability goals: to reduce costs of production for beef and wool, to increase dry sheep equivalents (DSE) carried, to maintain natural and man-made assets, to aim for a 10% return on assets and to develop off farm assets equal to the value of the livestock.

The grazing system

Beef cattle are the dominant enterprise. Around one fifth of the property is native pasture and the rest is improved pasture. The family runs Herefords, Angus cross, and Murray Grey cross cattle, including 400 cows, 180 heifers and 500 steers, giving a stocking rate of 10.2 DSE per hectare. They graze cattle intensively on a 30-day rotation on 60 hectares. This gives stock high quality feed every day. Other areas of the farm have a lower grazing intensity, with feed being supplemented by silage and grain.

Tim's beef cattle produce is European Union (EU) accredited. After the Portland Meatworks closed in 1996, he joined other beef producers in an alliance to market their own meat. He learnt the demands of hotels and restaurants and how to prepare cattle for sale in winter months, so that production could occur all year round. After leaving the alliance, Tim began supplying the EU independently. This means a high standard of management is critical to ensure that the produce meets strict EU standards.

Tim sells 400-500 steers each year. He aims to double that number in the future by increasing the productivity of pastures rather than reducing sheep numbers. However there are several constraints to future development, including capital costs and access to watering points in other areas of the farm.

Wool production is an important part of this mixed farming system and the farm currently carries 2500 Merino ewes, 2500 Merino weaners, 3000 Merino wethers and 200 Merino stud sheep. Tim breeds his own rams using artificial insemination and has altered the timing of shearing to May for wethers and June for ewes. Not only does this mean workers are available, but shearing earlier has had a dramatic effect on the quality of wool by reducing tenderness.

The agroforestry system

Agroforestry represents a smaller part of the mixed farming system. The enterprise includes alternate plantings of 1000 softwood trees (sugar gum, Eucalyptus cladocalyx) and 1000 hardwood trees (blackwood, Acacia melanoxylon). The plantations are a relatively recent addition to the property and are yet to contribute greatly to farm profitability. However, as the stands develop they will become more important to farm productivity and biodiversity.

Strengths and weaknesses of the mixed farming system

Production from the beef, wool and agroforestry enterprises provides profit for natural resource conservation on the property, and improving natural resources helps the other enterprises. For example, crash grazing of native pasture by sheep promotes biodiversity by creating disturbance and then letting the grasses set seed and re-establish over a six month resting period. Agroforestry plots provide shelter for stock and native pasture provides feed and forage paddocks in August and September. Rotating between sheep and cattle grazing reduces worm burden in pastures and timing of some livestock operations are complementary – for example, spring calving doesn't clash with autumn/winter shearing.

Despite these positive interactions, there are some areas where the enterprises do not work well together. Artificial insemination and calving in autumn clash with shearing, while sheep and cattle grazing can cause soil compaction in areas where native pasture regenerates.

The future

With the possibility of three generations being on the property in the future and the Watson family having farmed in the region for 99 years, the property is a true family farm. Tim's father still provides assistance with farm activities and his son will be returning to work on the property in the future. Tim believes he will stay on the farm for life and help with production, but is planning to pass on management to his son.

Tim hopes to double the number of steers in the future and continue his EU accreditation. He believes climatic variation will increase over time and he hopes to become more prepared through planting trees and developing more watering points for stock.

The Watson's commitment to the environment as one of their key enterprises provides a valuable example of how mixed farming can be ecologically sustainable.

Mallee

South Australia, Victoria, New South Wales

The project studied five properties in the Mallee region, from South Australia, NSW and Victoria, of which three are included here. All farms are mixed systems comprising dryland cropping and sheep. They involve a cropping and pasture phase rather than continuous cropping. The cropping systems are based around wheat. Sheep are used for both wool and meat production, and are a key risk management strategy. Landholders use only low amounts of chemicals on their cropped areas, preferring to seek alternative forms of weed control. Labour is used efficiently throughout the year, and farmers rely little on labour from outside of their families.

The table below summarises farm performance in 2003/04. Although all the farms returned a profit, there were vast differences in the level of profit depending on location. The cropping intensity of two of the three farms was around 60% and all properties had similar water use efficiency. Overall, the size of the property had no influence on profitability. The profitability of two farms (Dixon and Riley) significantly improved due to sowing an increased cropping area after the 2002 drought.

Indicators	Dixon	Riley	Malone
Area farmed (ha)	3176	3540	6084
Farm business profit ($)	496,935	596,404	28,875
Return on capital (%)	20.4	18.4	1.1
Annual rainfall (mm)	251	343	289
Farm income ($)	910,018	942,591	282,412
Farm operating costs ($)	307,314	275,571	169,910
Farm operating surplus ($)	602,704	666,020	112,502
Farm income ($/ha)	287	266	46
Farm operating costs ($/ha)	97	78	28
Farm operating surplus ($/ha)	190	188	18
Farm OC as a % of income (%)	66.23	70.66	39.36
Farm OS as a % of land value (%)	39	30	16
Crop intensity (%)	69	63	13
DSE/labour unit (DSE)	3648	5354	3801
Wheat yield/ha/100mm GSR (t)	1.19	1.04	1.07
DSE/ha/100mm GSR (DSE)	1.4	2.0	1.2
Meat yield/ha/100mm GSR (kg)	43.30	35.54	8.02
Wool yield/ha (kg)	5.9	10.24	8
Farm income/100mm/ha ($)	114	78	16

Opportunities for improvement

Cropping improvements

Farmers in this region are looking for development of a reliable malting barley for the low rainfall areas and higher yielding wheat varieties. A grain legume or oilseed that could perform well in the region is also a high priority for them. Some are interested in exploring value-adding straw by baling or turning it into a fodder source with additives to improve nutritive value for use in feedlots.

Grazing improvements

Case study participants believe there is potential to gain more feed value out of the weed species that are already present and well adapted – for example, potato and skeleton weed could be bred to become more palatable and make use of their suitability to the region. They are very interested in the development of a dual purpose cereal that can be grazed during the season and harvested in a good year. Similarly, farmers are interested in achieving even grazing with sown feed and exploring cell grazing principles in the Mallee environment.

Livestock improvements

Case study participants would like to make the fastest genetic progress towards feed conversion efficiency and lamb turnoff in the Mallee environment. They would benefit from independent evaluation of the performance of exotic breeds in terms of the trade off between wool and meat production.

The future

The participants in the project are looking to the future and are interested in further independent validation of technologies and techniques such as no-till, AutoSteer GPS steering system, yield mapping, and variable rate technology. They would like to see better predictive models for soil moisture, likelihood of season, and soil nitrogen to enable clearer decision making.

Bill and Stella Dixon
Richard and Maggie Dixon

Mallee VIC

312mm average rainfall

3176 hectares

Factors for success

- Using a whole property plan done in the 90s, which identifies different land types and gives an overview of the property
- Previously being involved in the TopCrop program and an FM500 benchmarking group
- Attending Victorian Farmers Federation grains conferences and functions with guest speakers
- Attending grain marketing workshops and seminars
- Taking advice from a chemical reseller agronomist who provides herbicide information and recommendations
- Becoming involved in lucerne trials through the Victorian Department of Primary Industries to assess what works best on their property.

Trials, conferences and programs to improve progress

Bill and Stella Dixon farm 3176 hectares in the Victorian Mallee with their son Richard and his wife Maggie. Around 2940 hectares are arable, with the rest being remnant Mallee vegetation.

The farming system is a mix of prime lamb production and cropping wheat, barley, and triticale. They grow some lucerne to complement the cropping and sheep enterprises. The emphasis is evenly divided between livestock and cropping, and the family recognises that one could not be profitable without the other.

Bill and Richard share most of the farm duties and many of the management decisions, while Stella and Maggie look after bookkeeping and some farm duties. They employ casual labour at shearing time. Constant discussions between Richard and Bill ensure they both know what is happening and can support each other accordingly.

Wind erosion is the major environmental issue facing the Dixons. They manage it by using herbicides rather than cultivation for weed control and by carefully monitoring grazing to stop paddocks becoming bare. They have planted trees and saltbush on the property and plan to establish more saltbush on rougher ground to help to stabilise it and allow grazing.

The property is running very successfully. Yields have been consistently improving over the past 30 years and lambing percentages are always in excess of 100% (reaching as high as 140%). The system is flexible enough to capitalise on opportunities, such as buying in lambs for feedlot.

The cropping system

The cropping system was previously based on a three-year rotation, although most paddocks are now on two-year rotations, involving a year of crop, (usually wheat, sometimes barley or triticale), followed by fallow. The ratio of wheat to barley is generally around 80:20. The Dixons originally grew barley for malt, however the protein specifications were too difficult to achieve regularly and now they grow the feed variety barque to maximise yields. The family grows triticale as an alternative to barley if the paddock has had less preparation. They have tried canola and lupins in the past but found them too unreliable in the variable seasons.

Prior to seeding each paddock is worked two or three times (depending on rainfall) for weed control and seed bed preparation. The main weed problem in the cropping phase is brome grass, and they manage this by controlling seed set in the fallow phase. Silver grass is the main grass weed problem during the fallow, and this is becoming more difficult to kill, possibly due to a herbicide resistant population developing. The main summer weeds are melon, skeleton weed, turnip, and some caltrop, which are controlled by a combination of herbicide, grazing and tillage.

The grazing system

The sheep flock consists of 1200 first cross Border Leicester/Merino ewes. The Dixons prefer these over pure Merinos for their better milking and higher lambing percentages. They mate the ewes to terminal sires to produce prime lambs, which are sold as suckers if possible. The rams are selected to produce offspring with low fat, high weaning rates, and low birth weights to aid with lambing. Bill and Richard use the sheep industry genetic improvement program 'Lambplan' to help them choose rams. They have brought lambing forward to early March so that lambs are ready for earlier markets, allowing the family to capitalise on undersupply and reduce labour pressure during the peak time of seeding.

Ewes are hand fed prior to lambing with a mix of hay, barley, or triticale depending on what is available from the previous year. The Dixons grow all their feed on the farm. They have a feedlot to fatten lambs that have been carried over and lambs are sometimes purchased to finish when the price opportunity arises. Shearing takes place in August for the ewes and March and November for the lambs. The Dixons sell the wool unclassed to a private buyer, and see it as a by-product from the meat sheep.

During the fallow year, the Dixons direct drill a mix of oats and medic for sheep feed. They use a grass selective herbicide in July/August to control the grass weeds and take the oats out. The medics remain to provide feed for the rest of the year, until stubbles become available for the sheep later on in the year. They also grow lucerne by under-sowing it into the crop and then keeping it for three to four years, or sometimes longer if it is going well and the lamb price is high. Grass selective herbicides and glyphosate are used on the lucerne to remove grasses and the risk of seed problems with lambs. When moving from lucerne to cropping, the paddock is simply worked up an extra time prior to sowing the next crop.

Strengths and weaknesses of the mixed farming system

The cropping system is now predominantly a year-in year-out rotation, compared to the previous three-year rotation (although this is still in place in some paddocks). Continuous cropping is not an option, as the Dixons prefer not to have all their eggs in one basket, given the unreliability of rainfall in the district.

The two systems have some synergies. Because sheep have less variance in income compared with cropping, they provide a steady source of income even during drier cropping seasons. They help with weed management and provide income from the land during the fallow period. The sheep enterprise value adds grain and hay produced by the cropping enterprise. Challenges include compromising cropping activities to take care of sheep – for example by sacrificing cropping areas for sheep feed.

The Dixons deal with their production challenges by spreading the risk over several enterprises (meat, wool and cropping) to reduce reliance on one commodity. They use Farm Management Deposits in good years to manage tax and protect against reduced income in drought years. In dry years they hold on to stock rather than selling when prices are low. They use contracts for selling sheep to allow them to forward plan and budget more accurately over the year.

Bill and Richard no longer grow risky crops such as legumes and malt barley. They store grain in pits when there is a good year, and then retrieve it to use as sheep feed in dry years. Their integrated approach to weed management means that they rotate chemical groups and use grazing and cultivation to help protect against herbicide resistance.

The Dixons are continually developing their farming system. Their future vision sees global positioning system (GPS) and variable rate technology playing a larger role as the technology becomes cheaper. They intend to plant more saltbush and improve sheep nutrition to bring up production levels in the livestock enterprise.

Les and Beth Riley

Mallee VIC

300mm average rainfall

3540 hectares

Factors for success

- Expanding farm in size and enterprises over time
- Keeping a positive attitude
- Cropping a large area per labour unit
- Being involved in the Mallee Sustainable Farming program as a forum for ideas
- Seeking grain marketing advice
- Using 'Cropfacts' computer program for record keeping and farm management
- Interacting with other like-minded farmers.

'Addicted' to mixed farming

Les and Beth Riley say they are 'addicted' to farming. They farm 3540 hectares in the Victorian Mallee, of which 3136 hectares are arable. The Rileys grow wheat, barley and triticale, adding canola, peas and vetch if the season allows. They run a flock of 1500 Merino ewes mated to Poll Dorset rams.

The Rileys have refined the system over the years, drawing on ideas from outside and their own innovations. The Mallee Sustainable Farming program has been a source of ideas and a forum for discussion, critical in helping the couple keep up with changing times. Les and Beth also value their interaction with other like-minded farmers and they draw on expert opinions, such as grain marketing advice, to help with market predictions and decisions.

The property has increased in both size and productivity over the years. The cropping system has changed from a two-in-five rotation to a year-in year-out approach, which has seen the cropped area of the property increase, with less area left in pasture/fallow.

Remnant Mallee vegetation covers 40 hectares of the farm. The Rileys have planted tube stock trees for many years and plan to do more in the future. Rabbits have previously been a problem and foxes remain an active pest, particularly around lambing. Salinity and wind erosion are the two major natural resource management issues. Les and Beth are managing salinity by direct seeding saltbush into low lying saline areas and improving summer cover to minimise drainage from summer rainfall events.

The cropping system

The cropping system revolves around wheat, with some barley sown onto selected paddocks as a second crop. The two-year rotation consists of a year of wheat (frame or yitpi) followed by a year of pasture, which serves as fallow for the next wheat crop. The Rileys grow tahara triticale for sheep feed on paddocks that have had limited preparation and plant canola opportunistically when the season looks promising (although this is minor). They sometimes grow peas and vetch as a break crop, extending the rotation to three years, but these are generally unreliable and will only perform well in good seasons.

The grazing system

The sheep flock consists of 1500 Merino ewes, joined to Poll Dorset rams to produce first cross lambs, which are sold. The Rileys bring in replacement ewes as required to maintain the flock.

Lambing is in mid March and April and there is occasionally a later mob that lambs in July. The Rileys aim to sell the majority of lambs as suckers before the end of the season. This is not always achievable and some lambs are kept for 12 months and then shorn before sale. Most sheep are sold in the yards, with a proportion sold over the hooks. The later lambing mob spreads risk by providing lambs for sale in June/July. This also reduces feed pressure during the autumn feed gap.

The Rileys time their shearing for late August to help guard against grass seeds with the lambs. The ewes average about six kilograms of 22.5 micron wool per head and need supplementary feeding (mainly grain with some hay) in most years, due to the relatively early lambing. They sometimes feed lambs that need help to get to market size. The grain is either barley or triticale, which is grown on the property.

The Rileys believe strongly in soil conservation. 'We have always worked against wind erosion and modified practices to reduce it,' says Les. For this reason they have increased their reliance on herbicides for weed control during the pasture phase, preferring to avoid cultivation until the autumn prior to seeding. They apply two knockdowns within a month during spring to prevent grass seed set and reduce weed seed banks.

Areas of the property that are saline affected have been planted to old man saltbush to reduce the water table and provide a feed source for sheep. This is a relatively new venture. Once established, the saltbush will provide further options for sheep feed and cover during lambing.

Strengths and weaknesses of the mixed farming system

There are a number of strengths in the farming system. The property is centrally located to lamb markets and silos. The soils are sandy enough to have a very low wilting point, yet there is enough clay underneath to maintain good water holding capacity and the soils give a quick response to rainfall for early feed. The water table under the property has been lowered by improving the water use efficiency of crops and pastures. The glyphosate knockdown program for pastures fits in well with sheep feeding requirements, and urea is often applied in two stages, meaning the later application can be aborted if the season is dry, saving input costs.

There are synergies between the cropping and grazing enterprises. Livestock benefit from grazing stubble, and will eventually provide some productivity from the saline areas where saltbush is being established. Livestock graze fallow paddocks and provide income from those paddocks when they are not in crop. Importantly, although cropping has greater potential for high income in a good year, wool and meat income continues in years when crops fail. Sheep provide weed control and cycle nutrients.

On the challenging side, there are ongoing tensions between stocking rates and the areas used for cropping. The Rileys would like to have somewhere to put the sheep in winter, and then bring them back over summer to graze on stubbles, thereby increasing stocking rates. Labour can become an issue when spraying coincides with shearing.

The Rileys use a number of risk management strategies to deal with these challenges. Les and Beth research prospective financial situations thoroughly. They use farm management deposits after good seasons to manage tax and provide a buffer for poorer seasons. They seek independent grain marketing advice to achieve the highest possible prices.

The Rileys choose crops and varieties that are suited to the area and rainfall. Lambing during the autumn feed gap can be risky, however supplementary feeding during this period minimises the risk. The family's use of grazing, the double-knock herbicide strategy and some cultivation as part of integrated weed control, all help avoid the risk of herbicide resistance.

There are many challenges facing Les and Beth as they continue to refine their farming system. The future will include yield monitoring on the header and possibly more extensive soil testing to build more accurate predictions of required inputs. They are concerned that most farmers in the district are middle aged and there is little 'young blood' coming through. 'For the future of the industry and the district we need to be attracting more young ones back to the farms,' says Les.

Greg and Patricia Malone

Mallee VIC

285mm average rainfall

6084 hectares

Factors for success

- Being prepared to change and adapt
- Taking the time to assess and research all available options and preparing budgets to determine viability
- Sharing ideas with other farmers and observing their activities and successes
- Attending MLA field days and conferences for information and ideas
- Experimenting and implementing changes on a trial basis before applying over the whole system
- Keeping good records to track the value of changes.

Farmers make great researchers

'Farmers are generally great researchers,' says Greg Malone, a producer who is not afraid to research different strategies and experiment with alternatives.

Greg and Patricia Malone farm an area of 6084 hectares in the Mallee region of Victoria. Around 2600 hectares is arable, with the rest being thick virgin scrub or grazing country. Rainfall predominantly comes in winter, however summer rainfall events and the stored soil moisture from them are critical to growing a successful crop.

The cropping system is based mainly on wheat, with some oats being sown for sheep feed. The Malones run a self-replacing Merino flock of around 1300 breeding ewes, which have always been an integral part of the property.

Greg is responsible for the decision making and for most of the daily operation of the property. He does the bookwork in conjunction with Patricia. Two of their children help out, especially at shearing and preparation for seeding. They use some contract labour for harvest and shearing.

The cropping system

The cropping program is based on a three-year rotation, with a wheat crop followed by two years of fallow/pasture. Seeding is done after four or five cultivations to kill weeds and prepare the seedbed. A stable medic pasture seed bank exists on much of the arable land and this regenerates well after the year in crop. Greg often spreads oats and discs them in dry without fertiliser on the wheat stubble, which gives him some control over the establishment of onion and potato weed. The oats take the grazing pressure off the medic early in the season by providing sheep feed.

The main summer weeds are skeleton weed, melon, potato weed and onion weed, although the skeleton weed and melon are valuable as grazing species for the sheep and skeleton weed plays a role in preventing salinity. Greg manages these through grazing and cultivation. The oats also play a role in weed control, with oat paddocks having reduced weeds because of increased competition.

'I'm not green, but I try to minimise chemical use wherever possible,' says Greg. This approach helps contain the costs for cropping.

The grazing system

The Merino sheep flock is around 1300 breeding ewes, although numbers can rise as high as 1700 in a good season. It is a wool-based enterprise and the only meat sales are wethers and cast-for-age ewes. Greg agists lambs off the property when feed is low and keeps the ewes on the best feed available, which helps them average above 95% lambing every year. He only feeds grain or hay to keep ewes in condition for lambing if there is a late break to the season. The ewes cut an average of 8.5 kilograms per head, with weaners cutting five kilograms. The average micron is around 21.5 to 22 in most years.

Shearing has been in June, although Greg is trialling shearing some sheep in January and March, with a view to converting the whole flock to an earlier shearing. 'The change in shearing time will hopefully improve clean wool yield by keeping dust out with the shorter fleece,' he says. 'It should also help the ewes stay healthy when lambing.' There have been problems in the past losing ewes from cold stress when lambing off shears and Greg hopes that earlier shearing will alleviate this.

Greg selects sheep using 'Soft Rolling Skins' (SRS) principles, developed by Dr Jim Watts. This means they have loose, pliable skins and produce high quality wool. Greg is happy with the SRS approach, and believes that wool has improved and the incidence of fly strike has fallen since he started using it. The Malones use a regular stud for ram purchase. The stud principal also embraces the SRS concept and the Malones have developed a good business relationship with him over time.

Greg is considering running White Dorper sheep as a prime lamb flock on a part of the farm that is only suitable for grazing. The area is segregated by large patches of scrub, which will prevent any contamination of Merino wool by the medullated fibre of the White Dorpers. He plans to regularly feed the White Dorpers with hay and grain, developing an enterprise that will help balance risk and get more productivity out of this part of the farm.

Strengths and weaknesses of the mixed farming system

There are a number of strengths in Greg and Patricia's farming system. The soil type is well suited to the district's low rainfall and there are no salinity problems. Ryegrass is kept under control with grazing and medic pastures regenerate strongly in the fallow/pasture phase. The Malones keep their costs low because they do not own a header or spreader and they minimise their use of herbicides. Good stands of native vegetation on the property provide shelter for stock and crops.

There are synergies between the two enterprises. Sheep provide a more steady income source than the cropping, and help to balance out dry years. They provide weed control for the crops by reducing seed set of weeds prior to cropping, saving on herbicides, fuel and cultivation.

Challenges include a highly variable rainfall, and the lack of a summer crop that can turn summer rainfall into fodder and thereby make use of every millimetre of rain that falls. Half of the property is unproductive scrub, which forces Greg to put sheep on agistment at times. There is often a low yield due to dust in the wool from sheep grazing next to cultivated paddocks. A fallow is often not kept bare enough to conserve moisture due to the need to prevent wind erosion, which can reduce the yield on the following crop.

The Malones have a number of risk management strategies. They use farm management deposits after a good year to manage taxation and buffer income against drought years. They sell wool through the auction system and grain through cash sales. Ewes are sold privately, whilst wethers are sold via the saleyards. They manage wind erosion risk by agisting sheep rather than overgrazing. Greg uses higher fertilizer rates than the district average, which helps the crops to establish quickly and cover the ground early.

The Malones manage the risk of overcapitalisation by researching new technologies and implements before adopting them. They avoid burnout by making sure there are small breaks away from the farm and that Greg spends time with the family.

The farming system has evolved over the years. Greg can see the enterprise moving away from wheat and growing more oats to improve productivity and carrying capacity in the sheep flock. Running White Dorper sheep could help balance risk and get more productivity out of certain areas of the farm which are not otherwise usable. One of Greg and Patricia's children is showing a keen interest in wool classing and will be able to step into this role in the future.

Eyre Peninsula

South Australia

The Grain & Graze project looked at five farms in the Eyre Peninsula region of South Australia. All farms were dryland cropping with a mixed farming system comprising cropping and sheep.

The dryland farming systems are characterised by adoption of direct drilling, minimum-till or no-till management practices, cropping rotations that involve cropping and pasture phases rather than continuous cropping, sheep being used for both wool and meat production as an important part of risk management and little reliance on labour from outside the family.

Wheat and barley are the dominant crops grown, supplemented by lupins and canola, and there are low inputs of chemicals on cropped areas. Farmers use alternative forms of weed control.

The table below provides a summary of farm performance in 2003/04 for four of the five farms.

Indicators	de Marco	Halas	Pryce	Chalker
Area farmed (ha)	5200	3316	4531	3995
Farm business profit ($)	640,160	351,752	34,352	84,689
Return on capital (%)	15.2	7.1	0.2	0.6
Annual rainfall (mm)	330	342	236	308
Farm income ($)	1,159,700	898,321	304,378	481,866
Farm operating costs ($)	415,440	384,236	180,527	212,468
Farm operating surplus ($)	744,260	514,085	123,851	269,398
Farm income ($/ha)	223	271	63	121
Farm operating costs ($/ha)	80	116	37	53
Farm operating surplus ($/ha)	143	155	26	67
Farm OC as a % of income (%)	64.18	57.23	41	55.91
Farm OS as a % of land value (%)	25	14	14	14
Crop intensity (%)	54	61	21	34
DSE/labour unit (DSE)	3354	1066	1239	913
Wheat yield/ha/100mm GSR (t)	0.96	0.87	0.48	0.52
DSE/ha/100mm GSR (DSE)	1.0	1.6	0.3	0.5
Meat yield/ha/100mm GSR (kg)	43.45	160.7	8.29	31.15
Wool yield/ha (kg)	13	33	3	12
Farm income/100mm/ha ($)	73	75	27	38

Opportunities for improvement

Farmers in this region are looking at a number of areas where they can improve productivity. Overall farmers wish to maintain and improve soil health in their cropping and grazing practices. They are very interested in improved wheat varieties that are adapted to the local environment and conditions. Managing herbicide resistant weeds is an area of high concern and they are interested in more information on ways to measure and understand the value of fodder and how to improve pasture in low rainfall areas to maximise grazing benefits.

The future

Farmers in this region are looking towards developing ‘paddock to plate’ management (supply chain management) techniques to ensure that their agricultural commodities are value-added successfully.

James de Marco and his sons Carlo and Gabriel de Marco

Central Eyre Peninsula SA

330mm average rainfall

5200 hectares

Factors for success

- Working as a team – the family works well together and would struggle without one another
- Using outside advice to improve their knowledge
- Taking time to wait and see before adopting new practices
- Modifying machinery to suit local conditions
- Staying flexible about crop rotations depending on paddock needs and seasonal conditions.

Doing it properly

James de Marco and his sons, Carlo and Gabriel farm seven blocks in a 15 kilometre radius around their home farm on the central Eyre Peninsula. The farm is 65% crop and 35% stock, with 200 hectares of native vegetation on sand hills and fence lines. The properties produce wheat, barley and a robust medic-based pasture, which is able to carry 4790 Merino ewes and lambs.

The family has been gradually buying land since 2000 and is keen to grow the business to full capacity.

'Our motto is – if we are going to do something, then we try to do it properly,' says James.

James, Carlo and Gabriel make their business decisions jointly and many activities are team focused, although each family member brings different skills and interests to the team. James is the general hand and does some sheep work and the bookkeeping. Carlo is interested in machinery and does most of the maintenance himself. Gabriel is keen on the sheep enterprise and does a lot of the driving work. They employ shearers.

The team has recently decided to value-add their sheep mob by moving into South African Merinos and capitalising on the strengthening meat market.

The cropping system

The family grows wheat and barley on some 3380 hectares. James, Carlo and Gabriel are moving towards minimum tillage and some paddocks are no-till. They use grass herbicides to maximise pasture quality. Although the de Marcos use Roundup widely, they believe they have kept herbicide resistance to a minimum through careful management.

The grazing system

The family runs a flock of almost 5000 Merino ewes and rams. Lambing is in mid-June and shearing is in September, though this will move to April in the future. Late lambing was chosen due to better feed being available. Grass herbicides have also improved the pastures. The move to later lambing has taken some of the pressure off the system during peak seeding times and has improved lambing percentages.

The de Marcos expect that the move to South African Merinos will further increase lambing percentages to 90-100%. Feed will be the major determinant of the age at which the South African Merino lambs will be sold and introducing a new variety will change shearing and selling times.

Strengths and weaknesses of the mixed farming system

The strength of the farming system comes from its flexibility, which allows risks to be spread across the enterprises. The biggest risk is climate variability and the chance of poor seasons and the family deals with this by having a mixed enterprise. There is also a commodity price risk and as a result the family is moving completely into the meat market, which has better prices.

The family finds that sheep increase the chance of soils blowing, but at the same time reduce the need for chemicals. James uses the sheep to protect the fragile soils, because they provide a return on land that is not suitable for cropping. The sheep are good at pasture cleaning and weed control. They also remove the need to burn stubble and waste. On the negative side, they reduce organic carbon in the soils and can leave sand dunes bare after grazing, creating an erosion risk. Wool prices have dropped and the sheep work can seem never ending.

There are 200 hectares of native vegetation on the properties, none of which is fenced because sheep graze in those areas to keep the understorey tidy.

The family has carried out erosion control on top of the sand hills by planting saltbush, which has established successfully and is holding the soil together. Instead of planting all of the sandy areas to saltbush, James is trialling spreading clay over sandy areas to reduce erosion.

The people risk is well managed because of the family's team approach – everyone can fill another role if needed. If a job comes up that no one can do, a contractor is employed to carry it out. The family is happy to draw on outside knowledge and advice, and has found the most useful sources to be the Agricultural Bureau of South Australia, field days and published research.

Although family members are confident about jumping in to modify machinery to suit local conditions, the de Marcos have consciously taken a conservative approach to minimise risk in their system. 'We are happy to be second or third to adopt new practices,' says James. 'We are successfully implementing 1990s technology now without any problems.'

Peter and Jill Halas
Ray and Stevie Halas
Sam Halas

Eyre Peninsula SA

342mm average rainfall

3316 hectares

Factors for success

- Changing to later lambing to better match the feed demands of the sheep to pasture supply
- Adopting minimum-till and no-till, which have improved yields and profitability while reducing the risk of wind and water erosion
- Introducing short-term vetch pasture
- Having a strong emphasis on good plant and equipment, with a strong preventative maintenance program
- Making strategic and tactical decisions as a team
- Making strategic use of outside expertise such as consultants and agronomists
- Participating in ongoing training to improve knowledge of best management practices.

Making farming an inspiring industry

Three generations of the Halas family work together to farm three separate blocks of land on the Eyre Peninsula and they aim to make farming an inspiring industry in which to live and work. The family owns 2853 hectares and leases 463 hectares. The farm produces wheat, barley, canola, lupins, peas, wool and sheep meat. The arable land is intensively (and in some cases, continuously) cropped, with sown vetch used as short-term pasture. The sheep enterprise consists of 840 breeding Merinos, which run on two of the three blocks. Around 13% of the farm is native mallee scrub, mostly in creek lines and along fences.

Peter, his son Ray and his grandson Sam run the farm. Bill and Ray's wives (Jill and Stevie) take an active role in farm issues and do some bookwork. Natural resource management is a key focus for the family, and protection of the soils and vegetation underlies many of the practices they adopt.

The farming system is very successful and has responded well to changes and innovations. Changing to a late lambing has raised lambing percentages from 90% to around 119%, while the wool cut has improved from 6.6 kilograms per head to 8.2 kilograms per head. The water use efficiency of wheat on the property has increased from 37% in the late 1970s to 72% in 2003.

The main natural resource management issues on the property include water erosion and traffic in the heavier soils of the home block. The family has used contour banks and gypsum applications to address problem areas and their adoption of no-till farming methods has also helped. Wind erosion on the lighter soils of the farm and their susceptibility to overgrazing is also an important issue, and weeds such as herbicide resistant ryegrass and wild oats are an increasing concern. There is also minor salinity and some acid soils.

The cropping system

Most of the farm is intensively or continuously cropped using no-till techniques. The rotation consists of one or two years of wheat, one year of barley (malt and feed varieties) and then a break crop or pasture (lupins, canola, peas or vetch pasture). All crop residues are either retained or grazed, as the family has not burnt stubbles since 1986. Arable land that isn't cropped is sown (usually dry) with morava vetch to provide a short term (one year) pasture for sheep. The Halas family keeps the rotation flexible, depending on circumstances such as soil type, weeds, the market outlook for break crops and requirements for pasture area.

The grazing system

The sheep enterprise is based on a flock of 840 self-replacing Merino ewes. Since 1992, ewes have lambed in July rather than during the traditional March-May period. The later lambing means a better match between pasture feed availability and the high feed demand periods of late pregnant and lactating ewes. It also minimises the need for supplementary feeding. Shearing occurs in January/February. The Halases used to breed rams on the farm, but they now bring rams in.

With the move into more intensive cropping, the legume content in pastures (provided by medics and sub-clovers) deteriorated substantially. The Halases now use dry sown vetch pastures to provide reliable, high feed-value, short term pastures, which also provide a root disease break for subsequent cereal crops. The sheep graze on the vetch pastures during winter and spring and on crop stubbles during summer and autumn.

Strengths and weaknesses of the mixed farming system

Peter, Ray and Sam have improved their risk management through building a diverse enterprise that has achieved excellent profitability and productivity.

Their move to more intensive cropping evolved from a desire to make the system more viable. Peter believes their adoption of minimum-till, stubble retention, and more recently, no-till, is a major breakthrough in terms of improving productivity and sustainability.

When the family adopted later lambing in 1992, it improved the system by efficiently matching livestock demands with pasture feed supplies. This also allowed the family to move shearing to January/February, which means fewer days are lost because of wet sheep during shearing time. The late lambing also solved the problem of time conflicts between the different enterprises.

Changing to no-till and retaining stubbles has reduced the need for contour banks. The stubbles also provide summer and autumn grazing and the sheep tidy up summer weeds. Using short term pastures helps in delaying and managing herbicide resistance. It also provides an alternative to less reliable break crops.

A key feature of the enterprise is the strong team approach. Strategic and tactical decisions are made as a team. The family is dedicated to improving its understanding of best management practices and spends considerable time and money on training. The farming system ensures that peak times generally do not overlap and the only labour hired throughout the year is at shearing time. The high level of mechanisation of the cropping program aids labour efficiency enormously and removes the need to hire casual labour.

The family manages commodity price fluctuations by investigating basis contracts to manage the risk. Low levels of debt in the business keep the finance risk low.

Peter takes pride in the fact that native animals, including echidnas and eagles, have returned to the area because of the regeneration of their habitat.

'We aim to maintain a viable and sustainable farming system by "bringing together the green and the brown",' says Peter. 'It's not all about planting trees. It's about looking after what you've got.'

The family is currently in the first stages of succession, with Peter and Jill looking to retire to town in the next few years. Peter's aim is to reduce his role on the property, handing over increased responsibility to Ray. Peter is very confident in Ray's ability as a farm manager and worker. Ray is the farm's main decision maker although most things are discussed with all team members. Sam takes an active role in the day-to-day running of the property and Peter feels he too, could capably manage the property if needed.

'We are farming so that we can stay farming,' says Peter. 'As long as we all enjoy farming, we will keep doing it.'

Melville and Joan Pryce

Eyre Peninsula SA

280mm average rainfall

4531 hectares

Factors for success

- Taking pride in the family's work and achievements
- Aiming to leave the property better than when they started
- Setting goals and planning ahead
- Attending field days at Minnipa Agricultural Centre
- Being involved in the local Agricultural Bureau, which gives access to independent trial results
- Subscribing to a climate information service to help manage climate risk
- Being involved during the 90s in Topcrop, which provided good information on soil and plant nutrition
- Attending local GRDC updates and taking on information from agents and agronomists
- Enjoying the farming lifestyle and the flexibility of being their own bosses.

No residue burning in 15 years

Third generation farmers Melville and Joan Pryce farm 4531 hectares on the Eyre Peninsula of South Australia. Their farming system is a mix of cropping and livestock, with a self replacing Merino flock of 800 ewes. A large percentage of the property is arable and well laid out, with race access to most paddocks. There are no bores on the farm and all water for stock comes from the Port Lincoln pipeline.

The major environmental issue facing the Pryces is wind erosion. In the early nineties, Melville and Joan changed their farming system to minimum tillage to conserve their soil. It was a challenge, as burning crop residues had been an effective way of managing snails and herbicide resistant weeds. But they needed to build up ground cover to resist wind erosion, plus increase organic matter levels in the soil.

The change has paid off – minimum tillage has improved soil cover over the summer months and reduced wind erosion. Now days the second crop in the rotation is often direct drilled, further preserving the soil structure. The Pryces have not burnt residues for the last 15 years.

They are still facing some challenges on the farm, including dryland salinity in the form of magnesia patches. The family carefully monitors grazing in paddocks with magnesia patches and takes sheep out if there is a threat of bare ground.

Melville makes most of the decisions and carries out most of the farm work. He also does most of the bookwork and GST-related paperwork. Joan helps with some tractor driving and cooking at shearing time. Melville's father Gerald also helps at shearing and busier times of the cropping year. Melville and Joan's children are not yet old enough to be actively involved. There is a good supply of casual labour in the district and Melville uses this during seeding, shearing and harvest.

The cropping system

The Pryces use a flexible rotation for their cropping enterprise. 'It's difficult to have a fixed rotation due to the variable rainfall,' says Melville. They generally have two or three years in crop, followed by two or three years in pasture. The rotation varies according to the outlook for the season and what occurred the previous season. There is a nominal target of 1600 hectares of crop in an average year.

The main crop is wheat, with oats grown occasionally to manage disease and provide sheep feed. The main quality issue comes from shot grain and the Pryces would like to find varieties that are more resistant to sprouting prior to harvest in seasons with wet summers. All of the wheat grown goes through the pools system because Melville believes production is too unpredictable for him to forward sell.

If there is significant summer rainfall there is a summer working, otherwise seeding takes place after one autumn working. Dry workings are avoided if at all possible, due to root disease and wind erosion threats.

Melville has trialled canola and peas as break crops without success. Currently oats and triticale are the only break crop options. However, he is moving away from triticale as it is not helping to control diseases and is therefore of no advantage in the rotation.

The grazing system

The sheep flock consists of 1200-1400 Merinos, with 800 being breeding ewes. Lambing begins in April and there is some supplementary feeding of hay and oats to the lambing ewes. While the target is 100% lambing, the actual percentage is usually 80-85%. The lower rates are due to predation, a higher mortality rate for twin lambs and early lambing while the temperatures are still high and there is only dry feed. Despite the impact on lambing rates, the family has continued the April lambing as it suits target markets.

There are three shearing times. The ewes and older wethers are shorn in February, so that the ewes have less wool at lambing. The weaners are shorn in March, with six months of wool and lambs are shorn in August to avoid grass seed contamination. The older sheep cut around eight kilograms of greasy wool per head. The fibre diameter is consistently at 22 micron, and the wool is sold by auction.

Pastures are a mix of medics that were sown 10 years ago and have been regenerating ever since. The initial mix consisted of parabinga and harbinger. The pasture is either spray topped in August/September with glyphosate or sprayed with Targa early in the season to remove the grass weeds.

Strengths and weaknesses of the mixed farming system

Melville and Joan find that there are good synergies between the two farming systems. The pasture phase provides organic carbon for the soil, which benefits both phases of the rotation. Stubbles provide sheep feed over summer. Hay and oats produced by the cropping enterprise are value added in the sheep enterprise. Sheep always grow wool and therefore provide income even when crops fail. Sheep provide weed control for the crops. Controlling grass weeds in pastures (to manage crop disease) also protects lambs from grass seeds.

On the negative side, having high numbers of sheep can reduce income in good years, as sheep have lower profit margins than crops. Sheep contribute to soil compaction, which can hinder the emergence of first crop. The sheep can exacerbate magnesia patches by grazing them out and setting up camps on them.

Melville and Joan manage their risk levels carefully. They keep enough flexibility in the cropping program to vary the area cropped according to the year. They sometimes carry wool over to offset income in a good year and manage their tax better. They use farm management deposits in good years to manage tax and buffer against drought. The farm has high equity and the family has locked in debts at low interest rates. They store up to two years supply of hay and oats to guard against lack of sheep feed in a sustained drought.

Autumn rainfall gives a good indication of the outlook for the rest of the year and the flexible system helps the family cope with the variable climate. The family refers to 40 years of rainfall and cropping data when assessing climate outlooks, as well as subscribing to a climate information service.

The Pryces are looking forward to adopting Autosteer GPS (global positioning system) technology in the near future. They have already fitted the technology to the tractor and plan to start using it soon.

Mike and Jan Chalker
Bill and Ruth Chalker

Eyre Peninsula SA

284mm average rainfall

3995 hectares

Factors for success

- Supporting each other and discussing decisions
- Using 'Lambplan' to improve the prime lamb enterprise
- Using a department agronomist for advice
- Sourcing information from neighbours and their own trial and error
- Attending local trials and field days
- Working away from the farm to gain fresh ideas and insights.

It's not good to see paddocks blowing

Mike and Jan Chalker farm 3995 hectares with their son Bill and his wife Ruth on the Eyre Peninsula of South Australia. Around 2000 hectares of the property is cropped each season and the remainder is left for running the sheep flock, which comprises Merinos and prime lambs. The family has set up a feedlot on the property to help finish the lambs. The emphasis of the farm is clearly on cropping rather than the sheep. 'Sheep suffer for the crop if any compromise is needed,' says Mike.

In past years there were dust storms on the farm every March and April prior to the autumn break – and the dust was sometimes still blowing as late as June in late breaking seasons. The Chalker family traced this back to their cultivation practices. They were carrying out at least one working before seeding and then a harrowing after crops were sown.

'It's not good to see paddocks blowing,' says Mike. The family moved to direct drilling and now they never leave ground bare before seeding time. They have also stopped burning stubble. Grazing management has also been a key to reducing wind erosion and the family keeps stocking rates on the property relatively low.

Around 15% of the property is native vegetation, which is important for stock shelter and windbreaks. The feedlot is particularly well sheltered, and the trees are protected from the sheep by wire guards.

Bill is a keen cropper and is in charge of the cropping operations, while Mike is more enthusiastic about the stock and looks after the sheep work. They help each other at busy times. Jan and Ruth also help out with tractor work and everyone is required to help with shearing, crutching and lamb marking. Jan does all of the farm books. The family uses contractors for shearing, hay operations and mulesing. The Chalkers have their own truck and do all of their own grain carting, which is a considerable saving.

The cropping system

The Chalkers sow 1200 hectares of wheat each season, using several varieties to give a good spread of risk. They also grow 200 hectares of barque barley and a similar area of potaroo or swan oats for feed. Both the barley and oats are sown direct into the wheat stubble. The cropping rotation is moving to a year-in year-out system. The Chalkers first tried direct drilling in 2003 and they now direct drill all crops.

The remainder of the property is pasture. Bill and Mike sowed a medic pasture mix of parabinga and harbinger some years ago and the medic regenerates well in most years.

Weed control begins in the pasture phase. The pasture is spray-topped with glyphosate in August/September to control seed set of barley grass and wild oats and reduce root disease problems for the following crop. Heavy grazing following this spray controls any escapes and if there is enough summer rain there may be another spray to control summer weeds.

The grazing system

The Chalkers' sheep flock has both a wool and prime lamb focus. Half the 1100 Merino ewes are joined to Merino rams to maintain the Merino flock numbers, while the other half are crossed with White Suffolk rams to produce prime lambs. The rams are fed before joining to increase fertility. The Chalkers use 'Lambplan', the Australian system for describing genetic worth of animals used in the sheep meat industry. They see particular benefits from using it in their prime lamb enterprise.

Lambing begins in July and lambing percentages are 80-100%. Mike weans the lambs in November, and shears in April, with wether lambs then going into the feedlot. The ewe lambs run with the ewes once shorn. All ewe lambs are micron tested at shearing. Those with finer wool are mated to Merino rams, while those with broader wool are mated to the White Suffolks.

Wethers and cross bred lambs are finished in the feedlot on a mix of barley, oats and hay, all of which is grown on the farm. The family brings in hay if needed in poor years. There is also a vitamin and mineral additive in the feed mix, along with some lime and salt to ensure a good balance of nutrients. They do most selling over the hooks.

In the grazing enterprise the focus is on the meat production rather than wool because of wool's poorer price. However the Chalkers keep the flock structure flexible enough to increase the focus on wool in the future. Mike can see the meat flock completely replacing the wool enterprise in the next five years if there is not a turnaround in wool prices.

Strengths and weaknesses of the mixed farming system

The combination of meat, wool and grain gives a good spread of risk and helps buffer against a poor season. The sheep provide cash flow throughout the year while the crop is growing and the sheep enterprise doesn't need the capital outlay that is necessary for cropping. Sheep give good weed control and help to prevent herbicide resistant weeds. July lambing fits in well with cropping activities and areas of native vegetation on the farm provide excellent shelter for the sheep when it's hot or cold. The family keeps a low stocking rate which means there is less pressure to bring in supplementary feed, and the option of buying in stock during good years. The prime lamb flock has been an excellent extension of the sheep flock, capitalising on strong meat prices and helping cushion the low wool prices.

Pastures benefit from the organic matter and fertiliser provided by the cropping enterprise. The cropping provides stubble for the ewes and feed for the feedlot to finish lambs.

Now that the family does no burning or working of the soil, there is a better return of nutrients to the soil and the risk of wind erosion is much lower.

Challenges in the system include the time needed to look after stock (making it difficult to take holidays), and the need for conservative stocking rates to protect the soil.

The family manages some of the risks they face in the enterprise by using a bank harvest loan facility to manage cash flow throughout the year and farm management deposits in good seasons to manage tax and mitigate risk in drought years. They use hire purchase deals with fixed interest rates for machinery upgrades and stick to their annual cash flow budgets. They always keep some cash on hand for immediate needs.

The family has put a succession plan in place which allows Mike and Jan to become self funded retirees and Bill and Ruth to take over the farm. Mike and Jan's vision is to 'Leave the property in a good state for Bill,' and they are farming with this goal in mind.

Avon

Western Australia

The Grain & Graze project looked at four farms in the Avon region, of which one is included here. The return on capital ranged from 4% to 7.8% and farm operating costs were between 52% and 65% of farm income.

The farming systems are characterised by cropping rotations with wheat as the primary grain, supported by smaller areas of barley, canola and occasionally lupins. None of the case studies consider continuous cropping to be a sustainable system. Minimum or no-till crop establishment is the norm for most properties, with stubble and residue retention. Sheep are the dominant livestock enterprise, with most flocks run extensively for wool and meat production. Pastures are sub clover based and spraying is used for weed control.

The families identify diversification of risk and income as the main benefit of a mixed system. They believe that pasture gives a boost to the following crop and that pastures which follow crops have fewer cropping weeds and less weed resistance. Many of the operators believe their livestock enterprises have a higher potential for improvement than their cropping enterprises.

Opportunities for improvement

Cropping improvements

Producers are concerned that wheat/lupin rotations are not maintaining soil structure. They are introducing alternatives such as canola and barley into the rotations, meaning that pastures are being used to provide the nitrogen boost to following wheat crops.

The introduction of minimum tillage has resulted in a significant improvement in soil structure, a reduction in wind and surface water erosion and increases in production due to improved water use. However, it has also exacerbated the lack of dam stored stock water due to reduced run-off.

Grazing improvements

All the producers are establishing improved pastures for their sheep enterprises using strategies such as re-seeding sub clovers, establishing yellow serradellas and introducing ryegrass varieties. Lucerne has been trialled as an option for perennial pastures but there are few reports of persistence under dryland conditions. Rotational grazing, cell grazing or other variations are generating excitement amongst producers as ways to significantly improve stocking rates.

Livestock improvements

Producers are establishing lamb feedlots to grow out lambs and confined feeding systems as a strategy to fill the autumn feed gap. They are also adopting dual purpose meat and wool sheep and improved genetics for prime lamb production.

The future

Salinity continues to be a threat in the region, but improved landscape understanding, changed practices and remedial actions appear to be having a positive effect. Surface soil and sub soil acidity are emerging as a serious threat on a number of properties, with the focus on liming increasing.

The threat to crops posed by frost has increased, possibly as a result of seasons of lower rainfall. Producers are using strategies such as staggering seeding dates and crop types and spreading seeded areas across different elevations.

Many producers are using strategies to diversify their production risk. In one case financial risk management tools resulted in a 15% increase in total farm income.

Producers in the Avon region identified animal welfare, the need for quality assurance, best practice systems and environmental management systems as their major future challenges.

Ray and Justine Crosby and their children

Central wheatbelt region of Western Australia

350mm rainfall area (330 mm for the past 10 years)

4049 hectares

Factors for success

- Sustainability of the resource base is a priority
- Mutual support of family units
- Cropping as the core business with other enterprises built around it
- Replacement of lupins with serradella to combat soil degradation
- Below average stocking rates to ensure sustainability.

Background

The Crosbys have owned eight properties in Western Australia's central wheatbelt for 90 years. They have gradually amalgamated them into a single business. Cropping is their mainstay, supplemented by fine wool and ram breeding.

In the 1990s the family faced a crisis when problems with their wheat-lupin rotation emerged. Capeweed had been flourishing and competing aggressively with sub clovers. They were trying tighter crop rotations, but a series of seasons false breaks meant that early germinations died. More lupins in the rotation further thinned the sub clover stands. The family believed that the continuous wheat/lupin rotations had rendered good sand plain soils more unwettable and reduced the organic matter content. The system was close to collapse.

In response, the Crosbys instituted a complete pasture system change. They sowed up to 150 hectares of Cadiz serradella pastures each year over eight years. In the last two years, the advent of hard seeded serradellas allowed the family to take more lupins out of the system and re-sow 500 hectares to new pastures. The re-sowing of serradellas will reduce as the hard seeded varieties are left to regenerate.

Introducing serradella pastures has improved soil health by increasing the root matter and structure in the soil, increasing microbial activity and reducing reliance on artificial fertilisers. The family is hoping to change to a wheat/wheat rotation after a good serradella stand because of the nitrogen available. Aside from improving the soil, the serradella allows an extra two to five weeks of green grazing in spring, benefiting weaning lambs and allowing wether lambs to be sold much sooner. It also provides much-needed feed for the ram breeding stock in autumn.

There are a number of family units and each one has a clearly defined role in the business. Strong family ties, centred around Ray Crosby, mean that advice and support is always available. Ray and Justine knew that when they made the major decision to switch to sowing serradella in their pastures, they could depend on the support of their sons. Without that support, they would not have gone ahead with a move they saw as part of ensuring sustainability of their farm for the next generation.

The goals

In the next 10 years the Crosbys aim to:

- Increase lambing by 20%
- Increase wool yield by five per cent
- Increase staple strength by 10 Newtons per kilotex in spring shorn sheep.

The family is also considering confinement feeding in small yards, especially of hoggets and pregnant ewes. Sustainability is a high priority with the family, and so is maintaining profit margins in the face of rising costs and consumer and welfare issues that threaten current practices.

The cropping system

Each year the Crosbys sow 1760 hectares of wheat, with smaller amounts of lupins and barley. For three decades the family used a wheat-lupin rotation but this degraded the soils. They tried using canola, field peas and barley instead of wheat, with barley being the most successful. Wheat will remain the primary crop but wheat/wheat rotations are not a viable option at present due to the associated overuse of chemicals.

Soil acidity and low organic matter content are major problems. The Crosbys have dealt with soil acidity by applying lime sands and have tackled the low levels of organic matter by focusing on pasture improvement. Instead of ploughing and scarifying, they have introduced a one-pass direct drilling operation.

Testing has shown that organic matter content is now sufficient in most areas. Family members have noticed increases in earthworms, ant nests and soil activity.

The grazing system

The Crosbys have a 1200 Merino ram-breeding flock and a commercial flock of 700 Merinos. Improved pastures have raised the quality of the 100 rams sold each year. The ram breeding flock is part of an Australia-wide sire evaluation/progeny testing program. Since entering the program four years ago, the Crosbys have improved the genetic gain of their flock.

Due to the improved pastures, the commercial flock is achieving 106% lambing compared to the state average of 75%. The farm has five per cent lower fleece weight per head than the district average, mainly because of its high lambing and weaning percentages.

The family has successfully introduced lucerne to 10% of the property. They ran an initial trial of 60 hectares in a low lying saline area, which failed due to insects and lack of expertise. The second attempt, in conjunction with a research body, has been more successful. In the first year of drought, the lucerne persisted and even survived a locust plague. In the second year of drought, the lucerne died in some parts but persisted well in other areas, which are about to go into a cropping phase with the lucerne being left in the system. The Crosbys are interested to see if the presence of lucerne will lower crop yields and whether the lucerne persists after harvest.

Strengths and weaknesses of the mixed farming system

The Crosbys believe the biggest benefit of mixed farming is sustainability. By rotating crops with sheep, the family controls weeds. Establishing serradella pastures has improved soil health and decreased the reliance on artificial fertilisers. The family hopes that a wheat-wheat rotation will be possible once the serradella increases the nitrogen in the soil.

Cropping is the core of the business, with other components built around it. The family makes very few compromises in the cropping enterprise to benefit the livestock. The compromises made by the livestock enterprises are more significant. One of the main ones is that lambing is in June/July rather than July/August, so that shearing and weaning finish well before crop harvest begins. This reduces lambing rates by five per cent. Having stubble in the system compromises wool style, yield and stock numbers. At the break of season, which is a critical time for lamb development and survival, the family cannot always give enough attention to their ewes.

Protecting the sustainability of their resource base is a high priority for the family. Over the past five years, the Crosbys have fenced off 100 hectares of native vegetation and replanted creek lines, especially in saline areas. The Crosbys run less stock than is usual in the district because they believe that high stocking rates do not necessarily mean higher profits and can lead to increased wind erosion, decreasing crop yields and more parasite problems in the sheep.

The constant push for excellence in fibre has led the family to experiment with direct marketing farmer lots to Chinese processing mills, and they have brought Chinese mill operators to visit the farm.

The Crosbys believe a major challenge is to build greater persistence into the use of serradella and lucerne. The family believes there is still much to trial in terms of chemicals, insects and grazing strategies.

Northern Agricultural Region

Western Australia

The Grain & Graze project studied five farms in the Northern Agricultural Region of Western Australia, of which three are included here.

Farmers in the region appear to be characterised by flexible thinking and proactive approaches to the farming system challenges. There is a real sense of breakthrough with a number of the case studies.

The farming systems generally have cropping rotations with wheat as the dominant grain and minimum or no-till crop establishment with stubble retention on all properties. Drier areas focus on sheep in the grazing component with sub clover based pastures and fine wool production systems, while higher rainfall areas run both cattle and sheep.

The table below provides a summary of farm performance in 2003/04 for two of the three farms (the data from the Clarke case study was unavailable).

Indicators	Hamilton	Morrissey
Area farmed (ha)	2476	3361
Return on capital (%)	5.0	3.8
Farm OC as % of farm income (%)	51	58
Farm OS as % of land value (%)	11.9	7.4
Crop intensity (%)	67	42
DSE/labour unit (DSE)	8878	9653
Wheat yield/ha/100mm GSR (t)	0.8	0.63
Farm income/100mm/ha ($)	111	65

Opportunities for improvement

Cropping

There is some concern that current cropping rotations are not performing adequately. Asochyta disease has knocked chick peas and field peas out of the cropping rotations for heavy land and faba beans have not performed as an alternative. In wheat/lupin rotations, lupin yields are decreasing and profit margins are being eroded by disease build up and significant increases in herbicide costs.

Pasture

After continuous cropping in some areas, organic carbon content and soil fertility have dropped. As a consequence there has been renewed interest in pasture phases and hence, livestock production. As part of extensive grazing systems, perennial species such as yellow serradella, lucerne and rhodes grass have been established to increase stocking rates.

Rotational grazing

There is significant interest and implementation of rotational grazing systems. In one case, cattle are being rotationally grazed on bluebush country to cover the summer and autumn feed gaps. In a second case, the rotational grazing has been introduced as a strip grazing system for standing crops to boost winter production and achieve faster growth and turn-off rates.

Fodder plantations

Fodder species such as tagasaste and saltbush are being introduced to carry stock through the autumn feed gap and to incorporate an insurance factor into the system.

Livestock feedlotting

Farmers are incorporating cattle and sheep feedlotting operations into farming systems to boost production and value of turn-off. Some enterprises are based on backgrounding stock and finishing animals in a feedlot, while other systems are based on trading or turn-off mobs that are bought in, finished and sold.

Labour

Producers identified accessing and retaining farm labour as an issue with the potential to seriously impact on farm operations and profitability.

Separate systems

With the development of specialised standing crop, strip grazing systems, the next step is to run separate grazing and grain systems where the only point of crossover is stock access to stubbles in summer.

The future

Supply chain alliances and vertical integration of production appear to be strong factors in the Northern Agricultural Region. In the future, producers have identified animal welfare, the necessity for quality assurance, best practice systems and environmental management systems as major challenges.

John and Kerry Clarke
Mathew and Kim Clarke

Northern Agricultural Region WA

350mm average rainfall

5760 hectares

Factors for success

- Running a high quality merino flock, part of a nucleus flock allied to a major stud
- Shifting the balance of the business between cropping and grazing depending on conditions
- Taking a whole farming systems approach to natural resource management to improve the resource base
- Treating soil acidity with lime and gypsum
- Measuring water holding capacity and plant/water capacities when deciding to sow
- Managing financial risk through hedging and forward selling in the grain and wool enterprises.

Looking for a dry pasture option

The Clarke family has been squeezed by gradually falling rainfall averages for the past 50 years, with a dramatic decrease in the last 10 years. Their property is in the low rainfall zone of the Northern Agricultural Region of Western Australia. The long term average for the district is 350mm. By the late 1960s the average was 320mm and in the last 10 years it has been 280mm.

The major limitation on the farm business is climate, because of the critical role that rainfall plays in a marginal area. In 1999 and 2000, major summer deluges caused significant erosion damage and in 2002 the season was a disaster, with less than 100mm of rain.

Two family units run the farming enterprise on a home property of 5340 hectares plus a leased block of 420 hectares. Over the long term, the balance has been 50% between sheep and cropping but in recent years, the balance has shifted to 75% cropping. The families divide tasks and responsibilities according to interest and expertise and employ casuals for seeding and harvest.

Soil acidity is a significant issue. Surface soil acidity has been addressed by applying 1000 tonnes of lime per year and substantial amounts of gypsum. Although there has been an increase in production, subsoil acidity remains a major concern. Salinity is a relatively minor threat and the families have planted thousands of oil mallee seedlings for environmental and aesthetic reasons. They also expect that the oil mallees will provide a return on carbon credits in the future.

A key issue in the northern wheatbelt is the increasing pressure on cropping rotations. In wheat-lupin rotations, lupin yields are decreasing rapidly and the area being planted is decreasing. Declining rainfall has had an impact, but the major factors are disease build-up and significant cost increases for herbicide control. On the heavier country that favours wheat and chick peas, asochyta disease has knocked chick peas from the rotation.

As a result, the Clarkes are increasing their pasture phases and have a renewed interest in livestock. Their key challenge is to increase the stocking rate, which in turn depends on establishing decent pastures to keep the profitability up.

The cropping system

Cropping is the dominant enterprise, consisting mainly of wheat, with lupins and chick peas. However, despite a run of years with high grain prices, the Clarkes do not see continuous cropping as being sustainable. Weed resistance to chemical control is firmly established with ryegrass and radish and the spectre of multi-resistance is looming. Organic carbon content in the soil has dropped under continuous cropping.

Under a mixed farming regime, a percentage of the property is out of the cropping rotation and weeds can be managed with livestock and spray topping. A switch to no-till cropping has slowed the decline of organic carbon content. Soil testing showed the Clarkes that organic carbon content climbed quickly under two or three years of livestock.

The grazing system

In earlier years the family ran cattle on the property but the cost of controlling radish began to exceed the income from the cattle enterprise. They examined prime lambs but decided these were not profitable enough. The Clarkes have now chosen a wool flock as the livestock enterprise best able to succeed alongside radish and weed problems.

The livestock enterprise is a self-replacing Merino flock, which is part of a nucleus flock allied to a major stud. The family is passionate about improving the sheep enterprise. Because the flock is based on central sire testing and the handling facilities are good, improvements are easy to monitor.

There has been an increase in wool quality with a drop from 22 micron to 20 micron. Wool cuts improved from 8.6 kilograms per head to nine kilograms per head. Lambing rates have increased to an average of 90% over the past 10 years.

The family does its own wool classing, mulesing and crutching, keeping wool production costs to a minimum.

After the availability of shearers became a major issue in the past decade, the family used a bioclip system (consisting of nets to catch the wool and a protein injection to break the wool) for the first time in 2003, testing it out on ram lambs. On current prices, the cost was comparable to conventional shearing. The biggest advantage was that it evened up fleece testing and micron testing by establishing a baseline, given that wool growth stopped on all animals on the same day. This made it easier to assess genetic improvements in wool production. The family believes bioclip will have a role to play in the future.

Strengths and weaknesses of the mixed farming system

Running a mixed enterprise allows land to be taken out of cropping production, which dramatically increases the success of weed control methods. Meanwhile, livestock use crop residues as a low cost feed supply during the autumn feed gap.

The major compromise to the livestock enterprise is that it must fit in around the dominant cropping enterprise. Paddock use is chosen on the basis of the cropping rotation and livestock are kept off paddocks in a grain rotation in the winter to decrease compaction.

The sheep enterprise is considered to be a major risk management tool for the Clarkes, given the likelihood of crop failure in a low rainfall region. In the cropping enterprise, the family is aware that by taking more risks and winning in low rainfall years, they may be overextending their system for the next drought. This understanding has resulted in the family starting to measure soil water-holding capacity and plant/water capacities and using the information when deciding whether to sow.

The Clarkes address financial risk through hedging grain prices and currency movements. These measures have lifted total grain returns over the past few years. The family is using a futures broker/risk management consultant for advice and applying the same approach to the wool enterprise, using futures and forward selling to lock in the highest prices.

The future

The biggest challenge facing mixed production systems in low rainfall areas is the need for increased chemical use, coupled with an increase in weed resistance to chemicals. A major worry for the Clarkes is that input costs will keep rising as grain prices drop, creating a crisis. Livestock play a vital role in risk management by providing some income in those years when the crops fail or grain prices crash.

The farming operation is running close to the rainfall potential at present. The biggest area of potential gain for the Clarkes is the establishment of better pastures that will enable them to lift their stocking rate.

Bill and Edwina Hamilton

Northern Agricultural Region WA

300mm average rainfall

2476 hectares

Factors for success

- Practising a meticulous cropping program to protect soil structure and prevent erosion
- Developing strip grazed paddocks that have a continuous oats/lupin rotation with undersown pastures
- Establishing fodder plantations of tagasaste, saltbush and mallee on poorer land for risk management
- Treating fodder crops as professionally as grain crops.

Getting excited about grazing

Bill and Edwina Hamilton take an innovative approach to their mixed farm in a drier district of the Northern Agricultural Region of Western Australia.

After a number of years of pasture renovation and improvement, the family was still frustrated by the slowness of the farming system. In order to generate good pastures to carry sheep through the summer, paddocks were locked up from sheep until pasture plants were well established.

To speed up the production of feed, the family moved to planting grazing oats on two paddocks and strip grazing 15 hectare strips in a rotational sequence for six weeks in June/July, before moving to open grazing until November. This system generated the rapid response and performance figures that they had been looking for.

The first year was a trial to develop and test the system. In a dry year with only 185mm of growing season rainfall, the system worked well. The family reduced risk by undersowing grazing paddocks with serradellas and sub clovers, which ensured a good seedbank was present and provided seasonal insurance. In the second year of the new system, the family increased the rotational grazing from 186 hectares to 340 hectares.

In future wet years with long growing seasons, the oats can be sprayed out. If the season is dry, the sub clovers and serradellas can be taken out and if the season is strong, both can be left. Similarly, if diseases develop in the second year of cereals, the standing crop can be sprayed out.

The break of season looms as a critical point for the system and it currently requires holding a substantial amount of grain that could be sold for cash flow. The family deals with this risk by developing fodder plantations that can be used at this time, with weeping tagasaste and normal tagasaste established from seed, saltbush established from tubestock and an area of mallee and river gums.

The family aims to establish three fodder plantations on poorer country, plus any other pockets of land that are non productive for cropping. The plantations will help drought-proof the property, ease the autumn break pressure and free up cash flow from the cropping enterprise.

Like most mixed farm systems, the enterprise uses stubbles for livestock grazing. The difference in this system is that the grain cropping enterprise and the grazing enterprise operate as separate systems.

The grain enterprise will continue to focus on wheat, reducing the area sown with lupins. The strip grazed paddocks will go into a continuous oats/lupin rotation with undersown pastures. These areas will not go back into a wheat rotation. Instead, fodder crops will be treated as professionally as the grain crops. Although not highly profitable, lupins will be used as a cleaning crop for disease and weeds.

The cropping system

The cropping enterprise includes 850 hectares of wheat, 625 hectares of lupins and 186 hectares of grazing oats. The Hamiltons are meticulous in their cropping program, using a one pass minimum tillage operation, triple shooting for fertiliser and seed placement and pushing all trash into the inter row. They do not see continuous grain cropping as an option and they don't burn stubbles. Their care protects the soil structure and reduces the risk of erosion.

The grazing system

The livestock enterprise consists of a flock of 2856 Merinos, including mated ewes, weaners, rams and killers. The wool business is based on modern management and sound breeding principles. The family uses laser scanning to monitor wool quality and comfort factors. The wool quality has averaged around 22.5 to 23 microns, a 58% yield and 7.5 kilograms fleece weight per head. The sheep are run as a self replacing flock with wether lambs shorn at five months, kept a year and sold as export animals.

Over the past five years the family has carried out a comprehensive program to undersow paddocks with serradellas (charano, yelbini and santorini) and sub clovers (nungarin, dalkeith and geraldton) to boost the sheep enterprise.

Strengths and weaknesses of the mixed farming system

The Hamilton's farming system has synergies which come from their use of stubble for livestock. All trash falls in the inter row which means that weed seeds germinate and are cleaned up by the sheep. Dry seeding of oats and lupins takes the pressure off the wheat program, which depends on being sown into soil moisture.

The first year under the new strip grazing system has shown the advantage of delaying the lambing drop by two weeks. If the ewes can be set up to drop their lambs in the standing oat strips in mid June, it will dramatically cut the work involved in shifting ewes and newborn lambs and will provide a better lambing environment. This change is in line with district benchmarks, which indicate lambing percentages of 80% in April, 90% in May and around 100% in June.

The family has found that the size of the grazing strips is best standardised to provide six or seven days grazing. Labour is not the issue that they expected – the sheep learn very fast to shift through the opened section.

The future

Currently the farming system is performing profitably. At $300 per hectare net return, the grazing enterprise is achieving equality with the wheat enterprise net income. This allows the family to adjust the relative sizes of the enterprises each year.

The family aims to use strip grazing to raise the wool yield from 57% to 60%, to consolidate the wool micron count at 20 microns, to maintain a 99% comfort factor and to establish a drought-proofed property. They want to crop the same amount of land but double the number of mated ewes carried, without affecting the viability of the cropping program.

Simon and Jane Morrissey

Northern Agricultural Region WA

500mm average rainfall

3361 hectares

Factors for success

- Willingness to work hard to keep all of the enterprises on the boil
- Openness to change and an attitude of flexibility, especially for markets and prices
- Diversity of production systems and environments
- Reliability of production, due to location.

Building flexibility through getting bigger

Members of the Morrissey family are perpetually busy, as they own three farms and lease a fourth, across which they run five enterprises. The family has expanded the mixed farm dramatically over the past few years, giving them a total of 3361 hectares in the central midlands zone of the Northern Agricultural Region in Western Australia.

The overall farming system is based on flexibility of enterprise mix. Commodity price variation is the key criterion for adjustments to the enterprise balances. As grain prices increase, cropping is increased. As grain prices decrease, pasture area and livestock are increased to benefit from reduced grain cost inputs. The enterprises contribute to total farm income in the following proportions: 40% cattle, 32% grain, 20% sheep and 8% hay for export.

A period of rapid expansion has enabled the business to attain the scale which the family believes is necessary to allow sufficient flexibility in the enterprise mix. This flexibility, the Morrisseys believe, is the most important requirement for the sustainability of their business.

The mixed farm system – farm one

Farm one is the original property and the family has run this enterprise since 1969, consisting of grain and hay production, a cattle feedlotting enterprise, a cattle stud and a sheep feedlotting enterprise.

The cattle finishing feedlot is based on grain feeding plus hay produced from the properties. With the current low grain prices, the target turn-off is 450 – 500 kg liveweight for a 250 kg carcass. Throughput is 550 head per year with 200 head bought in and 350 head coming from their own production system.

The cattle stud is run as a separate enterprise, consisting of 250 breeders and four bulls, with AI used as appropriate and 50 bulls sold each year.

The sheep feedlot enterprise is based on a throughput of 750 head per year and aims to turn off lambs for the 23 kg and above carcass weight market. Production is based on Merino ewes mated to Poll Dorset or Texel rams.

The wool enterprise delivers 19–21 micron wool in adult sheep. The Morrisseys view wool production as a by-product of the prime lamb feedlotting operation.

The mixed farm system – farm two

The family purchased farm two because it significantly increased the potential of the overall business. In 1974 the property was cleared and run as a mixed farming system before being continuously cropped for 15 years. In 2000, a city-based farmer bought the block and invested significantly in infrastructure and pasture. He established frontier, balansa and arrowleaf clovers, rhodes grass, lucerne and dalkeith sub clover before selling to the family in 2004.

The pasture establishment and seed bank is significant, aided by the high input/high production operations of the previous cropping regime and the relative understocking of the recent sheep regime. Rhodes grass has persisted, even under current heavy grazing pressure. Balansa has shown terrific establishment and versatility and sub clovers are growing across most of the area, though arrowleaf is only persisting in certain soil types. Lucerne is patchy and rated as a failure.

The family chose this farm because it was close to the home farm, had a lighter soil type, had a climate that reduced the risk of cold snaps and frosts and complemented the overall farming system.

The cropping program is based on wheat, canola and oats. The cattle enterprise is based on 250 cows, 225 calves at foot and five bulls. The sheep enterprise is based on Merino ewe hoggets, wether hoggets and rams, with just over 1000 head on the property.

The mixed farm system – farm three

Farm three is situated in a drier district and is focused on sheep and grain production. It provides further diversity in terms of soil type, climatic conditions and rainfall patterns.

The cropping system – farm four

The cropping lease on farm four evolved from an initial two-year lease into ongoing long term management. Based on a year-in year-out rotation, the lease produces canola, wheat and hay. The family see the arrangement as a good way to generate income using their existing machinery and equipment.

Strengths and weaknesses of the mixed farming system

The Morrissey family has integrated the different enterprises across the properties. For example, grain and hay are used as inputs to the feedlotting and stubbles are used as backgrounding for feedlot animals. The establishment of quality pastures provides a nitrogen boost to following crops, which in turn act as a weed break for the pasture phase. Increased canola rotations provide a break mechanism for silver grass and ryegrass problems.

In terms of compromises, retaining the flexibility for fine wool incurs a penalty for prime lamb production. The Merino ewes are not framed to provide maximum meat production. The spread of enterprises means that less time is spent on the sheep enterprises. Cropping has seasonal imperatives that demand attention, often at the expense of sheep husbandry and management.

The family's risk management approach has been to diversify the production base and build flexibility into the enterprise mix. They actively pursue contracts with price premiums. They use the export hay enterprise as a risk management tool, varying the size of the enterprise from 50 hectares to 300 hectares depending on conditions. The family doesn't use hedging for financial risk management, although they do use forward selling of grain, prime lambs and hay through price contracts.

Simon believes that continuous cropping is not an option. 'You can never replace what you're taking out,' he says. According to the family, the system works because it maintains nitrogen levels, improves wheat yields after pasture, traps more moisture in wheat stubble residue which produces feed and uses stubble for the feedlot enterprises.

The future

The major area of improvement for the farming system is to look at mating first cross ewes for the sheep feedlotting enterprise. Currently, the Merino ewes are providing 82% lambing performance, compared to a potential performance of 100% from crossbred ewes plus the increased lamb growth rates to be achieved from hybrid vigour. The possibilities are to bring in Border Leicester ewes or to mate Poll Dorset/Merino cross ewes to Texel rams.

A second area of improvement is to upgrade the water and fencing facilities to be able to run more cattle. Sheep and cattle grazing are currently run separately, with sheep controlling weeds and cattle clearing up the capeweed that is left by the sheep.

The challenges facing the business include rising land prices that threaten to price agriculture out of the area, labour shortages, rising production costs and end price variability, as adjustments can only be made in the range of 10–20% rather than completely shifting in and out of enterprises.

The family believes that diversification and flexibility are the most effective counters to these threats.

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