

#### 4. What do the results mean for how we manage mixed farms?

##### **From monocultures to multicultures: Building greater resilience and stability in mixed farming in South West Victoria.**

*'Adoption of the Grain and Graze practices means greater resilience of farming in South West Victoria' (Regional steering committee member).*

Before Grain and Graze, cropping and grazing enterprises were seen as largely independent activities. Cropping was conducted on part of the farm and animals were excluded from this enterprise, except possibly for grazing of some stubble. As pastures were replaced by cropping, the remaining animals were relegated to a smaller and in some cases less diverse feed base.

Vegetation and waterways on farms were seen as separate entity, often as a boundary surrounding the other productive enterprises. The environment fitted around independent cropping and grazing activities, rather than being seen as an integral part of them.

Cropping, pasture and natural resource management specialists re-enforced these beliefs. Many programs were (and still are) run in a way that re-inforces the monoculture approach eg raised bed cropping, no till or controlled traffic farming, vegetation protection schemes etc.

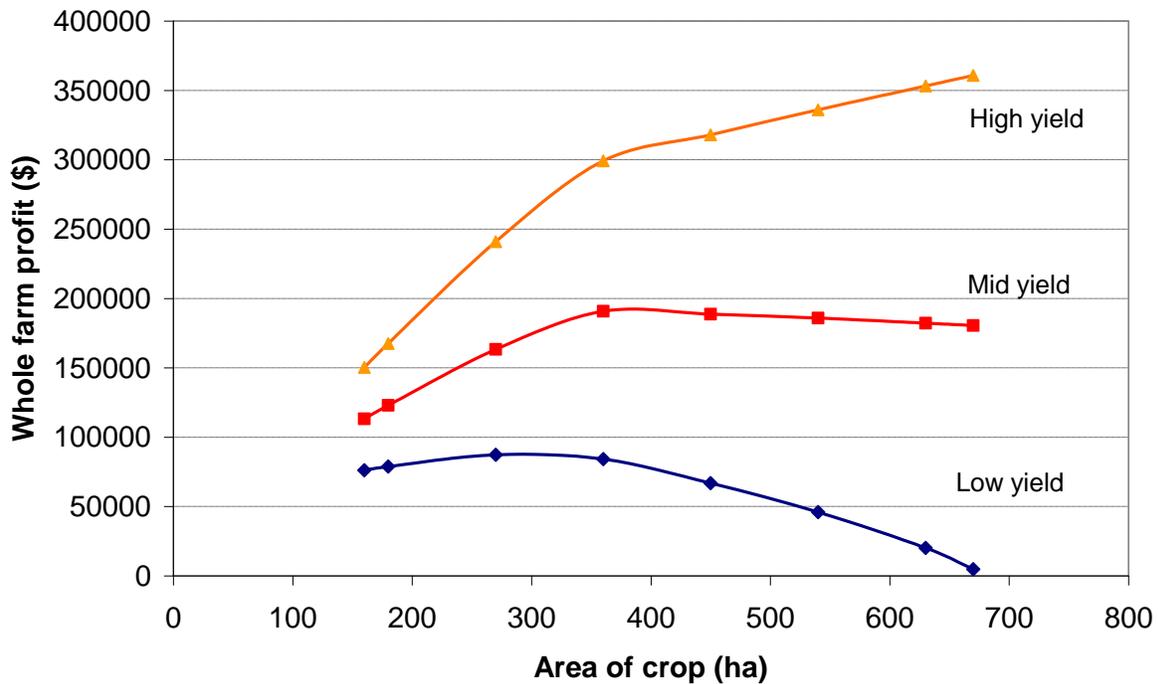
This meant that many enterprises on the same farm, (with different proportions based on individual farmer preferences), operate as independent monoculture systems. Conducting each of these enterprises independently left the farm operation more exposed to commodity and climatic variations.

Grain and Graze in South West Victoria identified, researched and encouraged adoption of practices that bridge the enterprise monocultures, creating opportunities for farmers to value add or gain synergies in their farming system. These increased opportunities have brought increased flexibility, which if used appropriately creates greater stability in the farming operation. It has meant the use of existing resources, working together in additional ways.

*'Farmers adopting Grain and Graze practices have become better at grazing' (Regional steering committee member).* They can graze crops and stubbles in a way that maximise the potential gains but do so in a way that minimises damage to soil structure. They know of ways to enhance the grazing value of lucerne that increases productivity and maintains the environmental benefits lucerne provides. Remnant native grasses can be grazed in a way that increases their diversity and persistence, achieving an important natural resource outcome but also aiding pest management. These new grazing opportunities allow existing pastures to be spelled, allowing greater production and the likelihood of greater pasture persistence.

A consequence of breaking down the divide between cropping, grazing and the natural resources is an improved environment, both within the individual farm boundary as well as across farm boundaries and at the catchment scale. The off farm implications of the practices are simply an amalgamation of on farm impacts. *'The result of these improvements is a healthier environment from a happier, healthier system, with greater diversity' (Regional steering committee member).*

The regional steering committee believe these Grain and Graze activities are the start of a generational change, where there is greater recognition of the robustness of a mixed farming system. The result is a farming system that has increased capacity to withstand price, climatic and regulatory changes. Examples from the national modelling project highlight this robustness of a mixed farming system (figure 9).



**Figure 9: Whole farm profit for farms with different proportions of crop, for three yield scenarios (representing different climatic conditions)**

Mixed farms that have a high proportion of livestock generally have lower profits compared to farms with more crop. As the area of crop increases, potential whole farm profit becomes more sensitive to seasonal conditions, represented here as high, mid (average) and low yield cereal crops. In a very favourable year, a higher proportion of crop will significantly increase profit. In a poor year, farms that have a high proportion of crop may have no profit, whereas farms with a higher proportion of livestock will still make a profit. Increasing the area cropped increases risk.

This illustrates the benefits of the mixed farming system. At approximately 360 ha of crop (40% of the farm area), profit will be maximised in all years except those with favourable climatic conditions. In an 'average year', more than 40% crop does not provide any increase in profit. In a dry year, more crop results in less profit. With the uncertainty surrounding climate change, the profitability of the farm system will be better served and more resilient with a mix of cropping and livestock.

#### 4.1 Taking complicated technologies to help farmers make complex decisions

Capturing the synergies of mixed farming requires systems thinking. The social research conducted by Nigel McGuckian recognises complex, mixed enterprise decision making is made by farming families based on a combination of personal preference, uncertainty and information. Often the information is very complicated, with many technical aspects needing to be considered and implemented correctly to realise the potential benefits and minimise or avoid any downsides.

*'Grain and Graze does not manage mixed farms in South west Victoria. Farmers do. Neither does Grain and Graze make the decision for the farmer. But Grain and Graze has contributed three very important components to assist farmers make these complex decisions (Regional steering committee member).*

The first is the development of approaches to provide opportunity to bridge the enterprise monocultures. It was achieved through researching new technologies and by overcoming impediments to the adoption of existing technologies. These investigations created practices that require some key technical aspects to be considered (table 7).

**Table 7: Key technical components for each activity area**

<b>Activity</b>	<b>Key technical aspects requiring consideration</b>
IPM	<ul style="list-style-type: none"><li>• Ability to accurately identify pest and beneficial predators, including maturity, patterns and trends over time.</li><li>• Skill to determine appropriate response to the results from pest collections in relation to the economic losses to the crop or pasture</li></ul>
Native grasslands	<ul style="list-style-type: none"><li>• Ability to determine appropriate grazing regime to increase vegetative diversity</li></ul>
Grazing stubbles	<ul style="list-style-type: none"><li>• Accurate identification of minimum quantities of grain and green material to determine liveweight gain or loss</li></ul>
Grazing winter cereals	<ul style="list-style-type: none"><li>• Quantification of grazing benefits compared to potential silage, hay or grain losses.</li><li>• Skill to determine critical growth stages in the crop and treatments to maximise animal performance</li></ul>
Cereals in lucerne	<ul style="list-style-type: none"><li>• Agronomic requirements for successful establishment and removal of cereal</li></ul>
Pellet supplementation on lucerne	<ul style="list-style-type: none"><li>• Decision on when pellet supplementation will provide an economic response</li></ul>
Removed waterlogging on pasture	<ul style="list-style-type: none"><li>• Appreciation of production and off site implications (nutrient and runoff) from pasture on raised beds.</li></ul>

The second is ensuring the technical information is presented in a way that informs farmers and helps develop skills and confidence. We have provided better information in terms of presenting the triple bottom line benefits (not just production or financial), shown the potential downsides of the technologies and framed the information which endeavours to answer the questions farmers have (rather than what we know). An example is the grazing winter crops workshop notes that was structured around farmer questions and presents case studies and handy hints.

Additional tools, such as the crop ready reckoner were included to assist with drymatter estimation, identifying crop growth stages and feed budgeting. The IPM course structure of notes and paired paddock comparisons is another example of delivery being designed to help develop skills and confidence. These types of products assist in alleviating the uncertainty associated with the decision making.

Finally Grain and Graze in this region has created opportunities for complicated decision to be synthesised by individual farmers. Significant resources were invested in monitoring farmer trials where the technologies were being put to the test. We provided opportunity for farmers to tell their stories at events and in the media using the monitored results to help inform the examples.

#### **4.2 The impact on available resources**

The Grain and Graze activities promoted in South West Victoria has implications for the way the natural, financial and intellectual resources are used.

Some activities have changed the attractiveness of an existing practice, which makes it more (or less) desirable to adopt. In some circumstances there is no significant natural resource implications beyond what already existed before the activity was adopted. For example two regional activities involved increasing the productivity of lucerne. These activities are the direct drilling of a cereal into existing lucerne and then grazing this over winter and the use of a pellet supplement to increase growth rates of lambs grazing the lush crop. Both treatments will not alter the environmental benefits from existing lucerne such as drying the soil profile, improving soil water holding capacity, maintaining summer groundcover and reducing the future requirements for manufactured nitrogen input.

Implementing these actions will change the profitability of lucerne as a crop, which in turn increases the adoption of the practice. More lucerne will be sown leading to positive natural resource implications. However *'it is improvements to the system profitability, rather than because of changes to the properties of the lucerne that has led to the natural resource gains'* (Regional steering committee member).

Other Grain and Graze activities conducted have direct implications on the natural environment. The grazing of cereals in winter can add directly to the profitability of the farming system but it has the effect of reducing the amount of stubble remaining after harvest. High stubble loads are cited by many farmers as the reason for burning, a practice that exposes soils to wind and water erosion and creates air quality problems, especially around large urban centres. The practice of grazing a crop in winter will reduce the amount of stubble burnt by approximately 65,000 ha, but the environmental benefits occur as a direct result of the change in activity on the crop. No additional grazing is required to capture the benefits and the extra physical resources needed to adopt the practice are minimal, because the costs have been incurred in sowing the crop.

Then some activities have both direct and indirect benefits. Integrated pest management activities have a significant direct impact on the environment, by reducing the use of insecticides and increasing the diversity of beneficial species in the farming system. The practice goes from

having a monoculture, usually showing as a pest outbreak, to a multiculture, where sufficient populations of beneficial species maintain equilibrium with various pests, minimising the economic damage to crops and pastures.

But IPM also provides a bridge between the crop and pasture enterprises and the vegetation on farms. Work in Grain and Graze has established the importance of adjacent native vegetation, especially native grasslands in providing a diverse pool of beneficial species that can repopulate areas where beneficial species have been lost. Crops and pastures contain a less diverse range of beneficial species in them (because they are largely a monoculture), and the adjacent grasslands provide a reservoir to repopulate areas which are either changed due to an enterprise rotation or where the beneficial species have been lost through insecticide use of other farm practices.

Indications are the more diverse the native grassland is, the greater the range of beneficial species present. Such links create a tangible link between protecting and enhancing native grasslands and the resilience of the production system. There is a strong environmental benefit, through vegetation protection and enhancement and a reduction in pesticide use, but this requires a significant investment in intellectual resources by learning new skills and perseverance to gain confidence in the practice.

*‘The regional Grain and Graze program has created tools and products to enable farmers to be more socially responsible’ (Regional steering committee member).* A product such as the stubble assessment tool enables farmers who are thinking of grazing their stubbles to value the grazing benefits and balance these against the negative effects of increased weeds, possible deterioration in soil structure and reduction in groundcover. The grazing winter crops feed budget calculator assists farmers and advisors make important tactical decision on grazing winter crops.

### 4.3 Obtaining a net positive gain

It is important to acknowledge that we rarely get benefits without some associated costs. The benefits are not realised in all circumstances. Neither are the potential costs. Benefits and costs will vary from season to season and from year to year. For example in a dry year, grazing a crop in winter will cause no damage to the soil structure however in a wet year, grazing which creates pugging and compaction could have long term negative consequences.

Predicting these situations is impossible as they can change rapidly through forces outside a farmer’s control. What is important is clearly articulating the potential benefits and costs associated with each of the activity and under what circumstances they may be encountered. This is provided for each activity area in the form of a balance sheet (appendix 6), with each comment assigned a level of confidence, based on the analysis of research and farmer evidence. It presents information that informs a farmer to make these improved tactical and strategic decisions. From these activities, overarching statements which have major implication to a mixed farming system have been identified (table 8).

**Table 8: Overarching statement from Grain and Graze activities**

Activity	Statement
IPM	<ul style="list-style-type: none"> <li>• Consider the long term picture, not short term gain.</li> </ul>

	<ul style="list-style-type: none"> <li>• Give time for the beneficial species to do their job.</li> <li>• IPM requires a new level of skill and confidence, so use the experts.</li> </ul>
Native grasslands	<ul style="list-style-type: none"> <li>• Provides important support for IPM and on farm diversity.</li> </ul>
Grazing stubbles	<ul style="list-style-type: none"> <li>• Simple benchmarks are now available to decide to graze or not.</li> <li>• Careful observation is required to get it right .</li> </ul>
Grazing winter cereals	<ul style="list-style-type: none"> <li>• Can graze wheat or barley without losing grain yield if you do it right.</li> <li>• Need to be flexible, as climatic conditions may change what grazing you intended.</li> <li>• Think of winter crops both for dedicated grazing and an opportunity.</li> <li>• Use the experts out there.</li> </ul>
Cereals in lucerne	<ul style="list-style-type: none"> <li>• It fits well with the whole farm system.</li> <li>• A lucerne stand damaged by sowing will compensate for the decrease in plants.</li> </ul>
Pellet supplementation on lucerne	<ul style="list-style-type: none"> <li>• We are on the edge of developing a feeding system that will greatly increase feed conversion.</li> </ul>
Removed waterlogging on pasture	<ul style="list-style-type: none"> <li>• Significant production and environmental downsides make it unattractive to adopt.</li> </ul>

#### 4.4 Making a decision

*'Farmers will make the decision 'on balance' (Regional steering committee member). This balance will take into account the financial, social and environmental implications. But every decision will be different.*

Above all, being informed and having the capacity to make decisions appropriate for the situation a farming business finds itself in creates resilience.

*'A mixed farming system is not about optimisation in the short term, but building a farming system over the long term that reduces the financial and environmental peaks and troughs' Such a system also reduces emotional stress'(Regional steering committee member).*

The activities undertaken in South West Victoria make mixed farming more attractive and provide farmers with the tools to evaluate and adopt various practices. The analysis by Bathgate (appendix 8) shows the synergy of these components when he states *'An important issue too is that the sum of individual benefits is less than the total benefit if everything is included'*