OFFICIAL

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# Multi-species Pasture Integrated Pest Management



Orchard End Farm

Melbourne Water

# Orchard End Farm

Orchard End Farm is a 52 hectare family farm in Bayles, in the Western Port catchment. The farm grows certified organic blueberries, garlic and other vegetables as well as a grass fed herd of Limousin cattle. The farm is undergoing a move to regenerative farming principles and has also set aside 5 hectares for conservation, in particular, habitat for southern brown bandicoot.

## The problem

The farm under previous ownership had traditionally managed pastures, which over time have proven to be unproductive and showing signs of degradation. Invertebrate damage was prolific and with monitoring done by Biological Research Company, proven to be heavily infested with Lucerne flea, above economic threshold. This level of infestation creates problems with pasture renovations and stunts growth of emerging pasture seedlings. On top of this, the paddock of most concern (paddock 7) is waterlogged in winter, followed by drying out in summer. The wet soils also create conditions suitable to many pasture invertebrate pests such as Lucerne flea.

Over time, the paddock has degraded and is in need of a change of management practice to restore good ecological function.

Managing problem pests without fixing the ecosystem in which they thrive, can leave landholders on the input treadmill.

**Project aims**

1. ID key pasture pests through trapping
2. Identify methods of managing invertebrate pests using an IPM approach
3. Identify the level of damage to pastures
4. Determine the cost of damage to pastures
5. Re-evaluate the importance of problem invertebrates in a multi-species pasture
6. Convert to a multi-species pasture with sowing regime based on pest pressures
7. Adopt holistic grazing principals
8. Fix a paddock that has degraded due to wet seasons



# Paddock 6

**Paddock 6 Soilkee**

This paddock was renovated with Soilkee and the difference in success is stark with paddock 7 and over cultivation in a wet year. This paddock was able to grow a multi-species in autumn 2022 and sufficient fodder to carry two grazings over spring 2022 and autumn 2023.



**When thigs go right!**

The success of this paddock has been evident with cattle moved into the salad bowl after spending winter in paddock 7 and hay fed in the sacrifice paddock.

| | | |
|---|---|---|
| 17th April 2022 | Sown with powerharrow | 40 kg/ha ryegrass, saia oats, red and white clover, leafy turnip, tillage radish, vetch, plantain |
| September 2022 | Assessed for dry matter | Approx. 6 t/ha DM |
| October 2022-April 2023 | Strip grazed and mulched | |
| 20th April 2023 | Sown with JD disc seeder | 30kg/ha of tillage radish, leafy turnip, saia oats and purple vetch to complement existing ryegrass, clovers, chicory and plantain |
| October 2023 | Assessed for DM | 5.4 t/ha ME 9.9 and protein 12 |
| Spring/summer 2023 | Strip-grazed with cows/calves | |

# Paddock 7

**Paddock 7 pasture species**

White clover, plantain, ryegrass, flatweed, dock, meadow foxtail, trefoil clover, marshmallow, capeweed, storks bill and other weeds were also present. Weeds are often host to invertebrate pests and this reflects the link between species present and pest presence in large numbers.

## Whoops, what went wrong!

In autumn 2020, Tony decided to test two different cultivation methods for pasture renovations and sowing multi-species crops.

Paddock 6 was renovated using Soilkee and paddock 7 was cultivated with heavy disks and power harrow, then planted with a perennial ryegrass mix 22.5kg/ha. Clover was over sown in April 2021.

Wet seasons followed and the result was paddock 7 became waterlogged and pugged with significant reduction in groundcover (image p 2). Paddock 7 became a winter sacrifice paddock until machinery could get back on the paddock to sow a multi-species. This was not possible until the end of December 2022. The multi-species was sown after power harrow 75-100mm tillage, 10mm cover. Seed @25kg/ha.

## Planting a summer multi-species

A multi-species mix was sown after consultation with Jade Killoran (Healthy Farming Systems):

6 kg millet
3 kg tillage radish
2 kg fodder rape
2 kg buckwheat
3 kg sunflowers
2 kg red clover
2 kg linseed
2 kg chicory
1 kg plantain

The paddock had a soil chemistry and biology test done with the results analysed by Dr Mary Cole (AgPath) and a recommendation to apply biological amendments after sowing the multi-species. March 2023, AGS Bio Active, AGS Bio Catalyst and diluted molasses was sprayed at 400lts water x2. 3m$^3$ <5mm Tynong toppings were spread.



## How did the multi-species perform 2022-2023?

Summer 2022-23 (January-February) was very dry after such a wet winter/spring the previous year. This meant that the germination rate was slow and patchy. Only taking off in autumn with a dominance of sunnies in the paddock.

It was observed that there was an influx of insectivorous birds (Welcome swallows, Wattle birds and Black-shouldered Cuckoo Shrike) which enjoyed the White Cabbage Butterflies visiting the flowering multi-species.

A reduction in Lucerne Flea was observed compared to previous years.

## Grazing management

Paddock 7 was strip grazed with 40 cows and calves in early autumn 2023 in preparation to sow a winter multi-species mix. This was only done in areas dry enough for machinery in late autumn 2023. A Duncan renovator was used and a mix of leafy turnip, vetch, saia oats, tillage radish and leftover ryegrass was sown.

Winter/Spring 2023 was just as wet as the previous year and ongoing drainage problems in paddock 7 saw the return of waterlogging and impacts on maintaining good groundcover through the wetter parts of the paddock.

A summer mix was sown in late spring 2023 @ 22kg.ha (Millet, forage rape, tillage radish, buckwheat, sunflowers, red clover, linseed, chicory, plantain).



Image: Autumn grazing in paddock 7

# Results- An IPM approach

**Paddock 7 recovery**

Converting paddock 7 to a multi-species supported an IPM approach to managing the high population of Lucerne flea. It can take several seasons to see a good result. With diversity of vegetation, comes a diversity of both macro and micro wildlife. Ecosystem function can be restored to a more natural state.

Farms with organic or regenerative farming practices need a range of options to manage invertebrate pests in pastures to ensure numbers don't exceed an economic threshold. It is possible to significantly reduce the need for chemical intervention if an IPM approach is implemented. Our small trials demonstrate that whilst invertebrate pests are still present in the paddock, their impact is much less than it was previously. This is due to changes in the way the problem paddock is managed. Aerial drone footage taken at regular intervals alongside wildlife cameras shows the seasonal changes to the paddock and has enabled better decision making.

A multi-species winter and summer cover crop with up to 8 species from the 4 plant families- grasses, legumes, tall and short broadleaves provides good diversity for both livestock feed and attracting beneficial insects.

In year 1, the cover crop struggled to establish and had patchy success across the paddock. Annual 2022 rainfall was 882mm (BoM) which is higher than average. By the Year 2 winter and summer cover crop, germination and establishment was much more successful even though annual rainfall was still above average.

Table 1: Seasonal rainfall 2022-23 (Source: Bureau Meteorology, Koo Wee Rup

| Season | Rainfall (mm) |
|---|---|
| Winter 2022 | 255.20 |
| Spring 2022 | 293.8 |
| Summer 2022/23 | 117.20 |
| Autumn 2023 | 180.6 |
| Winter 2023 | 138.4 |
| Spring 2023 | 209.60 |
| Summer 2023/24 | 144.80 (Dec-Jan) |

Feed tests were done in Yr 2 in paddock 6 (October) to ensure that multi-species offer suitable feed for livestock and validate the continued use of multi-species as a management practice. Feed test results show that the muti-species mix offered quality feed sufficient for cattle with calves at foot. Increasing the broadleaf species in a mix for finishing cattle should allow cattle to put on 1.5-2kg/ha/day.

# Monitoring



Paddocks at Orchard End Farm have been seasonally monitored for pest pressures such as slugs, crickets, Red-legged earth mites and Lucerne flea. It is important to recognise the different signs and symptoms so appropriate control measures can be taken if pest numbers exceed your economic threshold. We now know that whilst there is evidence of invertebrate pests in the multi-species, the diversity of species means that the pest pressures have significantly reduced, compared to the pressure under the previous traditional pasture.

### Additional monitoring

It is worthwhile conducting a simple bird survey to see what species of insectivorous birds are present as they offer a significant contribution towards invertebrate best control. At Orchard End Farm, Tony and Sue also have a habitat area for Southern Brown Bandicoot. Ground digging mammals, reptiles and amphibians can also support invertebrate pest control.

When supporting a multi-pronged approach to invertebrate pests, a true Integrated Pest Management (IPM) strategy is in place.

Image: Predatory snout mite. K.Thomas

## An IPM Plan

To implement an IPM approach to managing invertebrate pests in pastures, consider the range of options using multiple control tactics:

Biological- biocontrol from predatory and parasitic invertebrates, biological sprays and insect eating mammals, birds, reptiles and amphibians.

Cultural- use a diverse multi-species pasture mix, initially, avoid multi-species that are more palatable to Lucerne flea and Red-legged earth mite, suitable cultivation, strip or rotational grazing, insectaries for beneficial insect habitat and re-vegetation for biodiversity.

Chemical- selection and timing is critical to minimise impacts to beneficial insects. Consider weed control to reduce host plants for many invertebrate pests (ie capeweed). Look at the use of compost tea brews to enhance soil biology, plant health but also reduce plant palatability to sucking insects. Molasses has been shown to support invertebrate pest control as it raises plant sugars and makes them undesirable to eat by sucking insects.





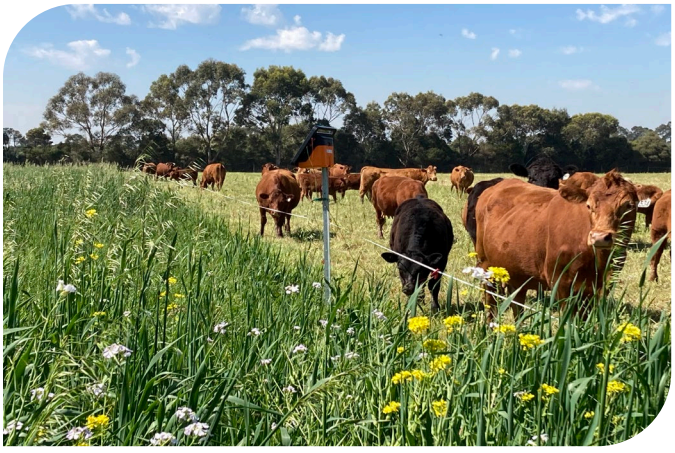


Image: left- strip grazing practices

Top right- Lucerne flea

Bottom right- Lucerne flea damage

# Next steps- Biodiversity Haven

In late 2023, Tony made a decision to work with what this paddock offers rather than continuous investment in trying to change it to suit productivity from a growing good pasture perspective. Another way to improve the paddock, manage the problem area and also boost biodiversity is to convert the persistently waterlogged section to a constructed wetland. Here, everybody wins. The stock can still strip graze the multi-species pasture areas and the constructed wetland will provide additional biodiversity benefits for woodland and wetland birds. Many of which are insectivorous.

Keep an eye out for future activities showcasing the constructed wetland.







Image: Left- persistent waterlogging in paddock 7

Top right- impacts of waterlogging on multi-species growth

Bottom right- drainage lines through the paddock

# Timeline of activities

| Activity | Month | Photo/Comments |
|---|---|---|
| Drone footage- | June 2022 | paddock 7 and paddock 6 comparison. Baseline for P7- degraded<br>P6- multi-species |
| Sacrifice paddock | Winter 2022 | With damage done to P7, the paddock becomes a sacrifice paddock and cattle are feed out over winter |
| Set traps - invertebrate pest monitoring | July 2022 | Huge Lucerne flea population |
| Existing pasture base regenerating | Spring 2022 | Existing pasture species returning but groundcover is well below 100% |
| Soil samples and recommendations from Dr Mary Cole | December 2022 | Biological compost tea application as soil bacterial dominated. A fungal dominated soil will assist with pest and disease management as soil function is restored |
| Paddock renovation & sowing multi-species (species list on p3) | December 2022 | Power harrow 75-100mm tillage, 10mm cover. Summer sown as paddock was too wet in spring. Multi-species 25kg/ha and heavy roller. Followed by less than 20mm rain in |

| | | |
|---|---|---|
| | | January. Germination was hit and miss |
| Drone passes 2 & 3 | Spring & summer 2022 | |
| Biological applications | March 2023 | spread <5mm tynong toppings, 3 cubic meters on 5.8ha for micro mutrient<br>Sprayed AGS BioActive 8lt, AGS Bio catalyst 2lt and diluted molasses 8lt in 400lt water x 4 across the 5.8ha |
| Progress photos | March 2023 | Patchy success with the multi-species, some areas of P7 look great and others have bare spots so 100% groundcover not achieved. More rain in Feb than in Jan |
| Farm walk – Birds on farms | April 2023 | Insectivorous birds observed diving into the multi-species and feasting on moths. Black shouldered cuckoo shrike using sunnies as perches while they feed.<br>P7 coverage looking better after some autumn rain |
| Grazing | April/May 2023 | P7 strip grazed with 40 cows and calves |
| Invertebrate monitoring | May 2023 | Lucerne flea numbers are below economic threshold. CWB and *Heliothis* in brassicas but plenty of parasitic wasps to parasitise these as well as insectivorous birds observed feeding |
| Drone passes 4 & 5 | Autumn/winter 2023 | |

| | | |
|---|---|---|
| Multi-species mix sown | May 2023 | Duncan renovator and light roller. Multi-species mix (leafy turnip, vetch, tillage radish, saia oats and about 10kg of leftover ryes. Persistence of previous multi-species evident (chicory, radish, rape and clover) |
| Rested P7 | Winter 2023 | TBC |
| Drone pass 6 | Spring 2023 | |
| Multi-species feed test | October 2023 | High quality feed for cattle with calves at foot |
| Summer multi-species | November 2023 | Power harrow and air seeder 22kg/ha. Millet, forage rape, tillage raddish, buckwheat, sunflowers, red clover, linseed, chicory, plantain |
| Drone pass 7 | Summer 2023/24 | |
| Grazing | April 2024 | |
| Wetland construction | 2024 | |

# Links to resources

Heytesbury District Landcare Network - Cover crop factsheets and cultivation calculator

Ag-Resilience - find access to information and factsheets on Melbourne Water agriculture projects