

# STUBBLE RETENTION CASE STUDIES

## INTRODUCTION

**Stubble retention in the cropping systems of Riverine Plains** was made possible with funding from Grains Research and Development Centre (GRDC) and thanks to the Sustainable Agriculture Victoria – Fast Tracking Innovation Initiative. In addition, we are thankful to the Foundation for Rural and Regional Renewal (FRRR), and the William Buckland Foundation, for providing the opportunity to better understand key drivers in stubble retention systems through the publication of the research and farmer case studies to showcase the outcomes from the project.

The Stubble project was a five-year program initiated in 2013. GRDC commissioned 10 projects involving Riverine Plains and 15 other farming systems groups/research organisations. It was dubbed 'The Stubble Initiative'. Each of the 10 projects focused on a locally relevant issue that impacted on the profitability of retained-stubble systems across a range of environments in southern Australia. The project's aim was to develop regional guidelines and recommendations to assist local growers.

## KEY LEARNINGS

- Stubble management is not a key driver of yield – stubble management approaches should be considered strategic and flexible not a fixed element that has to be managed around. It is recommended to retain stubble where possible but use tools such as mulching or incorporation to optimise the efficiency of the farming system. Only use burning as a strategic tool when necessary.
- Long stubble shades the emerging crop, resulting in a delay in flowering and maturity. Growers can use this to their advantage by sowing crops earlier into a longer stubble and still have them flower in the correct window, allowing the spread of sowing operations.
- Long stubble did not significantly increase the risk of frost damage in the Riverine Plains region. The likelihood of frost damage is directly connected to the date of flowering and is dependent on whether the date of the frost event coincides with flowering. Managing risk of frost damage by employing a range of sowing dates or stubble heights across a variety/paddock helps spread the risk.

- If full stubble retention is not feasible due to machinery, weeds or disease constraints, there are other options such as shallow incorporation, slashing straw or cutting short at harvest which can reduce the frequency of burning and address timeliness issues.

## SUMMARY

- Strategic burning is a useful tool to have, especially when stubble loads are high.
- Accurate GPS systems are vital for inter-row sowing operations which allow the farmers to sow through their stubbles from the previous year.
- Different methods of sowing/seeder bars result in different thresholds for change in terms of maximum stubble load that can be retained.
- There are some drawbacks associated with stubble retention that may be the reason why some farmers are slow to adopt.
- Poor weed control from pre-emergent herbicide application.

- Still the perception that retaining stubble increases your risk of frost damage.
- Higher risk of pests e.g. slugs, slaters, mice, earwigs.
- Nitrogen tie-up – it is expensive to apply extra fertiliser required and payback is slow.
- Poor establishment due to early shading, particularly for canola sown into cereal stubble.
- It is much easier to retain stubbles in lower rainfall years and the major benefits of doing this are to conserve moisture and prevent soil erosion.
- Stubble management practices to help with high stubble loads include harvesting cereal crops at a lower height or slashing straw post-harvest.

## KNOWLEDGE OPPORTUNITIES

- To what extent does stubble retention help improve soil carbon levels?
- Wet summers lead to higher pest populations on retained stubbles – how can we manage these higher pest populations efficiently to ensure productivity levels can be maintained?

## STEVE LUDEMAN

### BACKGROUND

With the help of funding through FRRR we are updating the outcomes from the Stubble Initiative. Back in 2018 we did a case study with Steve Ludeman, who farms at Dookie with his brothers Tony and Chris. Their farm has variable soil types, ranging from light sandy loams to clays to self mulching clays and red volcanic soils. In this case study we reviewed how Steve's stubble management practices have changed in his farming system over the past five years.

#### Location:

Dookie, Victoria

#### Describe your farming enterprise?

100% cropping.

#### What is your usual cropping sequence/rotation? Is there a pasture phase?

Four-year rotation: faba beans and/or vetch, wheat, canola, wheat. Adding pulses in our rotation has helped us to increase nitrogen in our soils as well as providing a good chemical and disease break. The vetch seems to be the standout performer for fixing nitrogen from our deep nitrogen test results.

#### What value do you place on retaining stubbles in your cropping system?

We place a high value on stubble retention in our system. The main reasons include improving soil structure, raising the moisture holding capacity of the soil and from a management perspective it means less hours in the paddock either on the tractor or burning.

#### What percentage of cereal stubble do you retain?

We aim to retain 100% of our stubbles. Strategically we may choose one or two paddocks a year to burn to help with pre-emergent chemical application. However, last year due to the high stubble loads we had to burn a few more paddocks. This also helped the soil profile in a few of our paddocks dry out and we have more nitrogen freely available.

#### How do you manage your stubbles within your cropping system?

Our main issue when planting canola into a cereal stubble five years ago, was the lack of nitrogen available to the plants. To mitigate the nitrogen tie-up, we are now applying 100kg/ha of urea on crops early post-emergence to help break down cereal stubbles.

#### How do you change your management style based on the weather conditions?

If we have a good year with big stubbles we will burn a few more paddocks, this also helps the paddock dry out faster if we have had high summer rainfall like last year. This is vital to allow us to sow the following season's crops on time.

#### What is your threshold for any change in management?

We haven't got one at the moment. If we did have one, last year's wheat crops averaging 8t/ha, would have exceeded it. I would say 6.5-7t/ha would be where we would have to look at changing our management. Last year we slashed the stubbles but ended up burning the trash in more paddocks than we would have if we didn't have so much summer rainfall.

#### What height do you harvest your cereals at?

We harvest at a maximum height of 300mm in our cereal crops. If we need to lift up due to high stubble loads, we harvest at 500mm and then slash down to 250mm later, before sowing.

#### How do you manage your stubbles over summer and before sowing?

Slash, burn if required, or they are sown straight into.

#### What is your set up for sowing?

We have a positive parallelogram system which has depth gauge wheels and coulters at the front, followed by a fertiliser tyne and a seed placement closing tool, then coil press wheels at the back.

The seeder has 330mm spacings. We also have a steerable John Deere hitch. In the past we sowed inter-row however we found this was only 75% successful when sowing through stubble and led to a few establishment issues. We now sow wheat on a 7-degree angle to alleviate these issues.

#### Have you had to invest in new equipment to help manage your stubble or are you planning to in the future?

Currently we are hiring a slasher to mulch our stubbles down after harvest. If we decide that it is the right direction for our farming system, we will purchase one.

#### Has your approach to stubble management changed over the past 10 years?

Yes, we now retain much more stubble than we did 10 years ago.

#### If you have moved to no-till full stubble retention, what benefits have you seen?

Soil structure on most soil types has improved. Another benefit is the higher soil moisture conservation under the retained stubbles, which provide cover over the soil in the normally, hot, and dry summer months.

#### What are the drawbacks to stubble retention?

Spending more on fertiliser to break down the stubbles, we find it takes a few years before we get the payback from this. We still have major concerns about frost events.

Pests were a major issue last year, exacerbated by the wetter summer months. We had slugs, slaters, earwigs and mice to a lesser degree. Slugs did the most damage in canola following wheat however we also had damage in wheat following faba beans.

In some paddocks we had to bait up to three times which is an expensive exercise. We find weeds manageable as we are starting from a low weed threshold.

#### Have you observed any changes in infiltration, soil structure or soil carbon levels as a result of retaining stubbles over time?

Soil structure has improved through retaining our stubbles. With regards to soil carbon, it is, in my opinion, too early to say. There is a lot of work that needs to be done and the goal posts seem to be shifted regularly.

#### What do you feel has been one of the greatest learnings to come out of the Stubble project work for the Riverine Plains region?

The greatest learnings that we have taken from the stubble project is the improvement of soil structure through the addition of organic matter from stubble retention. This helps improve the water holding capacity of the soil, allowing greater establishment and plant available water if there is very little rainfall over summer prior to sowing.

**Authors:** Lynn Macaulay and Kate Coffey, Riverine Plains.



## DENIS TOMLINSON

### BACKGROUND

With the help of funding through FRRR we are updating the outcomes from the Stubble Initiative. Back in 2018 we did a case study with Denis Tomlinson (Riverine Plains Inc, Stubble retention in cropping systems of the Riverine Plains 2018), who farms at Coreen on variable soil types, ranging from heavy clays to clay loam to loams over clay. In this case study we reviewed how Denis' stubble management practices have changed in his farming system over the past five years.

**Location:** Coreen, NSW

#### **Describe your farming enterprise?**

We are dryland continuous cropping enterprise growing wheat, barley, and canola. All our land that can be cropped is. We also run a couple of hundred first cross ewes on areas that cannot be cropped.

#### **What is your usual cropping sequence / rotation? Is there a pasture phase?**

We have a four-year rotation of canola, wheat, wheat, barley but an increasing area of vetch and sub-clover. This helps to reset our paddocks, put some nitrogen back into the soil and clean up some annual ryegrass problem areas.

#### **What value do you place on retaining stubbles in your cropping system?**

We place a high value on stubble retention. We prefer to retain stubbles where we can where the positives of stubble retention are not outweighed by the negative impacts. We are pragmatic with our approach.

#### **What percentage of cereal stubble do you retain? Does this vary from year to year with stubble load, or do you have a standard approach across years?**

The percentage of stubble that we retain varies year to year, mainly depending on seasonal conditions. In a dry year, low-yielding year we will retain as much as possible, up to 100% of cereal stubble, because it helps keep moisture in the soil. In a year where the stubble load is high, retention may be as low as 30%.

#### **How do you manage your stubbles within your cropping system?**

We manage stubble height at harvest time by cutting at around 200mm. In addition, since the project ended, we have upgraded our header to a New Holland CR990 which provides us with a much more even spread of chaff and straw, preventing block ups when sowing.

#### **How do you change your management style based on the weather conditions?**

If the conditions in summer are wet then summer weed control is vital to ensure weeds are controlled before they get too large, as then they become a problem at sowing time. If there is a wet autumn forecast, we will have to burn the paddocks early in preparation. Paddocks with retained stubble take longer to dry out compared to paddocks that have had the straw baled or burnt.

#### **What is your threshold for any change in stubble management?**

There are a number of factors that we consider but I would say a wheat crop that has yielded over 4t/ha is a paddock that we will have to look at and assess the stubble load.

#### **What height do you harvest your cereals at?**

200mm.

#### **How do you manage your stubbles over summer and before sowing?**

Our system is no-till. We do lightly graze the stubbles to clean up any grain left over after harvest, and this helps reduce the likelihood of any major mice or slug problems.

#### **What is your set up for sowing?**

We have a DBS bar with knife points and press wheels on 300mm spacings. The RTK guidance system on our John Deere 8370RT tractor is vital to interrow sow accurately, allowing us to sow through our retained stubbles.

#### **What are the drawbacks to stubble retention?**

Drawbacks include the reduction in effectiveness of pre-emergent herbicides, the potential for seeder blockages, nitrogen tie-up and reduced crop establishment, particularly due to early shading of canola in a cereal stubble. Other issues may include the buildup of mice and slugs. These potential drawbacks can be alleviated using legumes in the crop rotation, and with strategic burning of heavy stubbles.

#### **As a host farmer for the Riverine Plains GRDC stubble project since 2014, have you changed your farming practice based on the results obtained?**

From the project we have realised that we needed more nitrogen in our cropping system. We are doing this by using higher rates of urea and incorporating legumes in our crop rotation. At the moment, we are incorporating lime at high rates with the aim of increasing our soil pH at a depth of 125- 150mm.

Hopefully correcting our soil acidity problems will open up a greater potential to grow more pulses in the future.

#### **What do you feel has been one of the greatest learnings to come out of the Stubble project work for the Riverine Plains region?**

The project looked at different stubble management strategies and we now understand what effect each strategy has on our farming system. If a strategy has a negative effect, we can apply practices that ameliorates that effect.

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