

## CASE STUDY

### Patty Barber

Patty Barber farms at Gibson, 30km north of Esperance. Cropping 100% of his program, Patty originally installed chaff decks because he was struggling to gain control of ryegrass on his property, which he said was exacerbated by long seasons, non-wetting soils, and waterlogging.



Using a disc as well as a tine seeder, and a John Deere 9660 and a New Holland 9090, along with a wheat-barley-canola rotation has given him a good handle on how the cropping systems interact with the chaff residue. "We have been tramlining for probably 12 years, 120ft boom, and a 40ft seeder and header. We have widened out our row in the middle, on both seeders to about a 500mm gap. The chaff from the header falls into that gap. We find that a good barley crop will hold the stubble there in the row, but the canola can fall out." The wider gap in the centre row was to make it easier to leave the chaff line undisturbed, as running a tine through it could 'impede trash-flow.'

Deciding to use a single chaff chute instead of a deck, he said it was due to the simplicity of operation and installation, to minimise the weed rows in the paddock, and the ability to use narrow windrow burning to complement the practice. "We can burn the row if we desire, and I would rather have one weedy row than two weedy rows. That's my reckoning - if you went to a chaff deck, it's about \$20,000 and a fair bit of hassle. Whereas this is a few hours in the workshop, and a bit of thought." Further, he said that on his soil types, he would not expect to see great control of weeds from purely driving over them.

"On heavier country I think its because they can drive on it and kill the weeds, but on our soil, here on the sandplain, it just doesn't seem to happen."

This might also be followed by a knockdown application prior to seeding, and then a desiccant spray prior to harvest to increase harvestability and to prevent the formation of ergot. Knowing that he was placing a large selection pressure on glyphosate, he saw using a chaff chute as a way to gain non-chemical control of weeds. As for in season control, he had not had legitimate testing done but felt that it was not as effective at controlling ryegrass as it used to be in canola. However, he was finding great results with Sakura® in the wheat rotation to control ryegrass. "Our canola crops used to be clean, and our cereals dirty, but now it's the other way around."

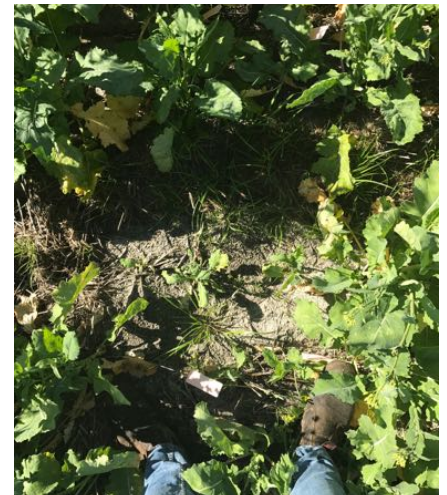


*Given the large weed burden he was dealing with, Patty also had concerns about herbicide resistance in his weed populations. On account of summer rain, Patty said that he will often spray up to three times over summer, with the brews containing glyphosate.*

**IMAGE:** *Patty places the chaff in a narrow band in the middle of the machine using a chute.*

Having been using chaff lining for a number of years, Patty has noticed that in general the chaff lines look weedier than the rest of the paddock and said this is why it would be good to use a narrow windrow burn every three years. However, a demonstration trial set up on his property found that there was not a significant difference of ryegrass panicles between the chaff line and the rest of the crop. As for plans for the future, Patty was excited by the prospect of an integrated mill, saying they would be 'way better than this (chaff lining)'.

Since speaking to Patty during harvest of 2016, he decided to stop chaff lining as he was finding that he was not achieving clean crops.



**IMAGES:** *The chaff lines are left bare at seeding, with the idea being to reduce the germination by not disturbing the chaff.*

## TRIAL

*During harvest of 2016, a small demonstration trial was set up on Patty's farm to estimate the level of control achieved by chaff lining. Method Quadrats were randomly placed to estimate ryegrass plant numbers on an area basis, and to assess the average number of seed bearing spikes per ryegrass plant. Ryegrass spikes were then sampled to be analysed later to estimate the average number of seeds per spike, which could then be used to estimate the average number of seeds per plant, and thus estimate the number of seeds per unit area.*

*Next, a length of marine carpet was placed in the paddock, in front of the harvester, and in line with where the chaff would be deposited in the line. The carpet measured approximately 1m x 0.4m, designed that it could collect chaff without being accurately placed in front of the machine. The location of the carpet was marked with a GPS and the corners of the carpet were marked with pegs. As the harvester moved over the top of the carpet, the chaffline was placed on top of the carpet. Although the chaff was falling in between two rows of stubble with a 60cm gap between them, the chaff itself was deposited into a row approximately 25cm wide. This residue was then collected and later analysed to count the number of ryegrass seeds.*

*The chaff collected in this fraction represented the chaff present in an area the length of the carpet and the width of the harvester's cutter bar. This was then compared to the number of grass seeds present in the crop to estimate how effective the harvester was at depositing weed seeds in the chaff line.*

*As the carpet location was marked, the site was returned to in July of the following year to measure the ryegrass burden in the chaff line, and the ryegrass burden where there was no chaff placed from the 2016 harvest.*

*The ryegrass density in the adjacent crop was not measured. This was compared to the amount of weed seeds present in the crop, based on the ryegrass density and average seed yield per plant.*



**IMAGES:** (1) The materials used in setting up the trial. (2) Excluding chaff shows how much the residue degrades over the course of the year. (3) Flags were placed on the corners of the plot to find them the following winter.

## DATA

| Rep            | RG seeds collected on carpet in 2016 (0.4m <sup>2</sup> ) | RG seeds germinating in chaffline in 2017 | RG seeds germinating in 2017 from where the carpet was held the previous year (no 2016 chaff) |
|----------------|---|---|---|
| 1              | 6821  | 120                                       | 140   |
| 2              | 19225   | 60  | 60  |
| 3              | 20765   | 130                                       | 285   |
| <b>Average</b> | <b>15604</b>  | <b>103</b>                                | <b>162</b>  |

The measurements for the number of ryegrass germinating in the chaff line was adjacent to where the carpet was placed, and taken over an identical area.

## DISCUSSION

The limitations of this trial are that the weed density was only estimated at one stage during the year, in July. This is after the application of pre-emergent (trifluralin) and in crop (clethodim, quizalofop & atrazine) herbicides. However, observations from other farmers indicate that it tended to be more successful to not remove tines, as the crop competition seemed to do a good job at controlling the weeds. As the chaff lines were not seeded, there was essentially no crop competition adjacent to the chaff, and there were many ryegrass plants emerging. By comparison, the crop had a much lower weed burden. Because of these variables, it is not clear if the chaff lines were weedy and the crop clean because there were many weed seeds placed there during harvest of the following year, or because there was ample sunlight and moisture due to the lack of crop.

In the distance the machine moved the length of the carpet, it would have collected approximately 80,000 seeds of ryegrass. However, on average across the 3 replicates, only 15000 were collected in the chaff line. However, these measurements were taken on a cool, humid day so it would have been difficult to adequately thresh the residue, possibly leading to more ryegrass not being threshed and exiting the machine via the straw chopper. Despite these late germinations, it seems that the chaff has a strong tendency to inhibit germination of ryegrass. After all, approximately 15000 seeds were deposited in an area approximately 40cm x 25cm, and only 103 germinated when it was checked in July. This may be considered the mulching effect that many growers have observed.



**IMAGES:** *Following a wet summer, autumn and winter, there was a strong germination of weeds in the chaff line.*

## CONCLUSION

*Although it isn't perfect, it does seem that the chaff line is effective at confining weeds to a narrow row. Using the available data, which is admittedly not extensive, indicates that about 19% of the weed burden was deposited into a narrow band, about 2% of the width of the swath. This represents a significant concentration of weed seeds.*

*Given the attitude of many of the growers was to simply 'play the numbers game,' being able to deal with any proportion of the weed seeds would be an advantage, especially if the mulching effect of having a concentrated band of chaff is as strong as it appears in this data set.*

*John Broster (Charles Sturt University) and Michael Walsh (University of Sydney) concluded that a machine is able to divert as much as 97% of weed seeds into the chaff fraction when working at harvest, if set up properly and working in optimal conditions. Thus, chaff lines may be more effective if being used under better harvesting conditions, as they would be able to concentrate a larger proportion of weed seeds into the chaff line.*

