Retaining soil water by using a strip & disc system in 2024

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Location
Buckleboo
Buckleboo Farm Improvement Group (BFIG)
Rainfall
Av. Annual: 349 mm
Av. GSR: 247 mm
2024 Total: 128 mm
2024 GSR: 91 mm
Paddock history
2023: Wheat
2024: Lentils (cv. Hallmark)
Soil type
Sandy loam
Plot size
30 m x 18 m x 3 reps
Trial design
Farmer managed demonstration. Replicated treatment in broadacre strips

Key messages

- **Retention of soil moisture in standing stripper stubble was the same as in rolled stripper stubble.**
- **Lentil yields were higher where the stripper stubble was left standing compared to rolled.**

Why do the trials?

Harvesting with stripper fronts improve harvest efficiency but the impacts of leaving long standing stubbles on following crops is not understood. The stubbles may help to conserve soil moisture by lowering soil temperatures with shading, lowering wind speed and evaporation and suppressing weeds. However, long standing stubbles can also present challenges to subsequent seeding operations and for pest management.

The Buckleboo Farm Improvement Group (BFIG), Agricultural Innovation and Research Eyre Peninsula (AIR EP), South Australian Research and Development Institute (SARDI) Minnipa Agricultural Centre (MAC) and SA Drought Hub supported a large-scale farmer-led demonstration project to compare the impact of rolled and standing cereal stubbles harvested with a stripper front on the following lentil crop sown using a disc seeding system.

How was it done?

A wheat paddock harvested using a stripper front in 2023 was selected at Buckleboo to assess the impact of standing and rolled stubbles on lentil performance in 2024.

The demonstration trial was in a grower managed paddock which has a sandy loam soil. Strip width was 18 m, and length was approximately 100 m with 30 m marked as the length for this trial. The strips treatments were randomised and replicated three times.

The site was dry sown on 3 May with Hallmark lentil @ 45 kg/ha using a 60-foot John Deere 1890 pro-series disc seeder with 19 cm row spacing. Granulock Z 15(S) (70% Granulock/30% SoA) containing 15:13:12:0.6 of N:P:S:Zn was applied during sowing. Seed was not inoculated with rhizobia. Rolling of stubbles was performed a week after sowing (9 May 2024) with a 4.5 m "Flatout Roller" with 1000 kg of pressure per meter. The ground surface was almost covered with the rolled stubbles. After the seeding operation, not all stubble was standing in the standing stubble treatments.

Diuron @ 200 g/ha and Brodal @ 50 ml/ha were applied as a pre-emergent herbicide. Intervix @ 500 ml/ha and Clethodim @ 500 ml/ha were applied as post-emergent herbicides. Insecticides and fungicides were also sprayed to protect the lentil crop.

The 2024 season had a very late seasonal break (late May) and very low rainfall year (decile 2 season). Early season soil moisture was measured on 20 May 2024. Four soil cores were taken per plot to a depth of 90 cm and divided into 4 layers (0-10 cm, 10-30 cm, 30-60 cm and 60-90 cm) and the soil from each layer were combined into one composite sample for each plot (Figure 1). Post-harvest soil samples were collected a week following harvest. Three cores were collected from each plot and divided into the following depths; 0-10 cm, 10-20 cm, 20-30 cm, 30-60 cm and 60-90 cm. Soil samples were oven dried at 100°C for 48 hours to calculate gravimetric water contents. Soil moisture percentage was calculated for each depth.

Crop growth was measured with crop establishment on 4 July 2024, early plant biomass (2nd leaf node - V2 on 17 July 2024 and late plant biomass (reproductive seed stage - R6 on 2 October 2024). Normalised Difference Vegetation Index (NDVI) was measured for each plot on 16 August 2024, plant and pod heights on 2 October 2024 and grain yield on 14 November 2024. Soil cover from the preceding wheat stubble was estimated on 17 July 2024.

Weeds, disease and pests were observed during site visits. Scoring was not performed because of minimal presence of weeds and no evidence of mice, snails or other pests.

Soil moisture

There were no differences in soil moisture due to stubble treatments either early in the season or after harvest (Figure 1). Soil moisture was higher in the deeper soil profile regardless of stubble management.

Lentil growth

Lentil density was the same in both standing and rolled cereal stubble, averaging 77 plants/m^2. Early and late dry matter of lentil shoots were also the same in both stubble treatments (Figure 2).

NDVI

NDVI of lentils in standing cereal stubble was higher than the rolled cereal stubble (Figure 3). The difference in NDVI could be due to different dates of NDVI and dry matter measurements. NDVI was measured later stage of crop on 16 August 2024 after measuring early dry matter (17 July 2024).

There was no difference in residue dry matter of previous cereal in standing stubble and rolled stubbles (1.6 t/ha).

Grain yield and crop maturity

Lentil height in standing cereal stubbles was higher than in rolled stubbles. However, height to first pods were similar (Table 1).

Grain yield in standing stubbles was higher than in rolled stubbles (Table 1).

Based on Viterra lentil grading criteria, total defective seeds were more than 4 g (8.8 g) out of 100 g irrespective of stubble treatments, assigning the grain to B grade (NIPTB) lentil.

Weeds, pests and diseases

A few grass weeds (e.g. barley grass) were observed during the plant emergence counts; however, these were controlled following a herbicide spray by the grower. There was no evidence of mice, snails, insects or diseases in the lentil crop during the season.

Frost damage in the paddock was assessed on 2 October 2024 with minimal frost damage observed (<1%).

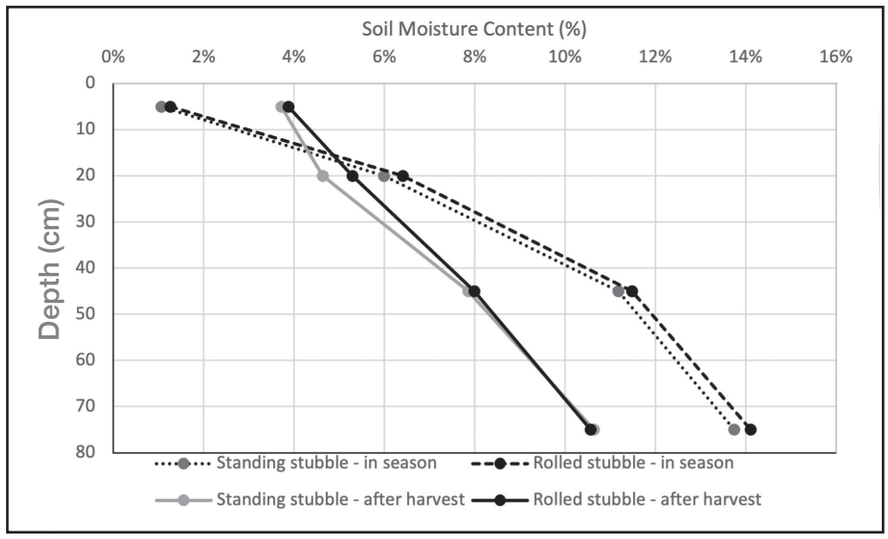

Figure 1. Gravimetric soil moisture (%) early in the season and after lentil harvest under rolled and standing stripper cereal stubble at Buckleboo in 2024.

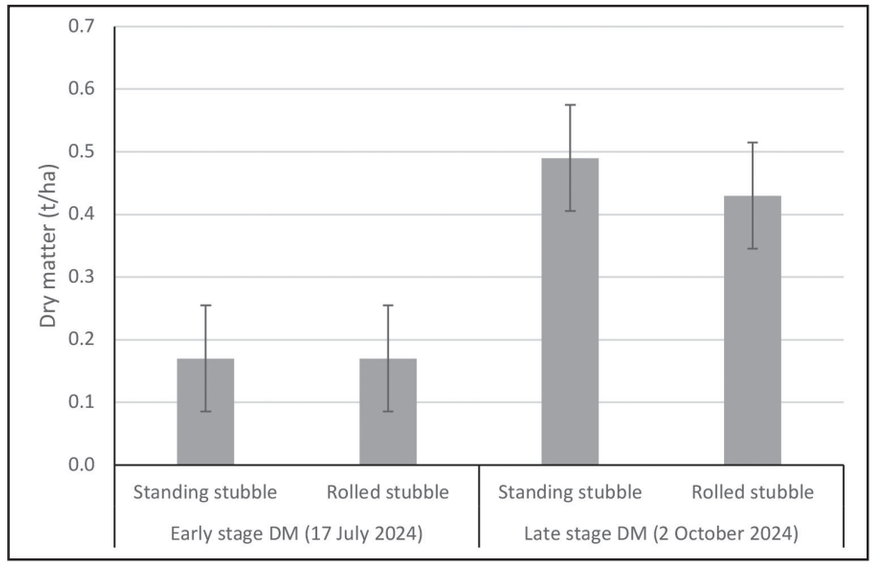

Figure 2. Early and late dry matter of lentil at Buckleboo, 2024.

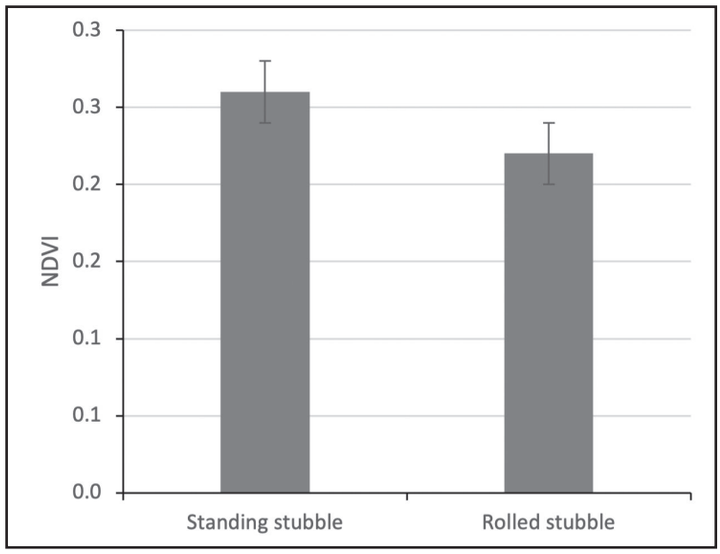

Figure 3. NDVI of lentil with standing and rolled stubbles on 16 August 2024 at Buckleboo.

Table 1. Lentil yield and yield contributing characteristics in standing and rolled stubble treatments at Buckleboo, 2024.

Stubble treatments	Plant height (cm)	Pod height (cm)	Yield (t/ha)
Standing stubble	28	11.2	0.56
Rolled stubble	25	11	0.39
F. pr (5%)	*<0.001*	*ns*	*<0.001*
LSD (P=0.05)	*1*		*0.06*

What does this mean?

In this trial in a dry season, there was no difference in soil moisture under a stripper stubble that was rolled or left standing. However, this may be due to the stubble treatments being implemented later than ideal and due to a very low rainfall season.

Lentil yield with standing cereal stubbles was higher than with rolled stubbles. The increase in lentil plant height in standing stubbles may have contributed to the higher yields.

In terms of infestation of weeds, mice, snails and diseases between the standing and rolled stubble there were no differences observed.

Acknowledgement

We would like to thank Buckleboo Farm Improvement Group (BFIG) and AIR EP for managing the project. We also would like to acknowledge SA Drought Hub for funding the project.