Photo 2: This photo shows the stubble effect three days after around 30 mm of rain at Bungunya to the west of Goondiwindi in southern Queensland. A rolled cover crop treatment is in the foreground with the 'control', a low-cover fallow plot behind it. The theory is that stubble reduces evaporation and keeps the soil surface wetter for about 21 days, so if more rain falls in that time, more water will be stored.

The science of stubble and evaporation

How can growing more crops actually increase soil water? We know cover crops will use some of the stored soil water and so make the soil drier. This drier soil can then recharge faster following rain than a moist soil. We also know more crop stubble (e.g. after a cover crop) will protect the soil from rainfall impacts and so improve infiltration to store more water in the soil.

Finally, we know that increased stubble loads can slow down the initial rate of evaporation (Photo 2). Research shows that these evaporation gains are short-lived and lost from accumulated evaporation after three to four weeks. But any further rain within this three to four week period provides opportunity to reduce total evaporation and so accumulate more soil water.

If the increased cover across the whole fallow can store more water than it takes to grow the cover crop initially, there will be more water to grow better and more profitable crops.

Any extra cover will similarly help infiltration under irrigation for better and more efficient crops.

Trials with commercial cover crop treatment

Trials are underway in both dryland and irrigated systems from Goondiwindi in the north, to Parkes and Yanco in the south. Two trials at Goondiwindi are now complete:

- Pivot-irrigated cotton at Yelarbon; winter cover crops planted in June 2017 on a short fallow between back-to-back pivot-irrigated cotton; and,
- Dryland grain at Bungunya; summer cover crops planted in October 2017 after skip-row sorghum harvested in February that year was long-fallowed into wheat in 2018.

These trials included treatments based on the main commercial options used in the district:

- Cereal cover crops (barley or millet/sorghum) sprayed-out at different growth stages (first node, flag leaf, flowering);
- Legumes (vetch or lablab); and,
- Tillage radish alone or in mixtures with the other species.

Longer fallows need later terminated cereal cover crops to maintain ground cover

The dry matter production levels (biomass) of the cover crops were similar at both sites; 1500–2000 kg per hectare for the early cereal spray-out (first node) treatments; 4000–5000 kg per hectare for the late cereal spray-out (flowering) treatments; and, 8000 kg per hectare for the winter cereal that was taken through to harvest.

This extra biomass will help maintain soil organic matter if the following cotton and grain crops are not smaller as a result.

Biomass declines were small (10–20 per cent) in the short fallow prior to planting the subsequent cotton. While cover levels also remained over 80 per cent for all treatments through to the cereal harvest treatment, they declined sharply by cotton planting for the tillage radish (down to 25 per cent) and the early spray-out cereal (down to 50 per cent). The late spray-out cereal with its more resilient stubble, maintained cover levels over 80 per cent up to cotton planting.