

Managing cotton stubble/residues

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Returning cotton stubble to the soil provides a source of energy for the microbial biomass, which in turn helps the breakdown of stubble. This maintains the supply of nutrients to the crop. Organic matter enhances the health of the soil, as higher organic matter drives better water infiltration and internal drainage.

Avoiding soil compaction

Cotton pickers are very heavy, with front axle loads as great as 14 tonnes for conventional pickers and about 40 tonnes for a fully loaded round module picker. However, when the soil profile is dry at harvest, their impact on soil structure is less than when the soil is moist, although wide tyres or dual front wheels will compact loose beds.

It must be remembered, that serious soil compaction may have occurred earlier in the season (due to operations such as fertiliser application and weed control), or remain from previous seasons when the soil has had insufficient time to restore its structure. Soils may take years to

BE AWARE OF

- Pupae control is the first priority after harvest, in Bollgard II® fields. It must be completed by the end of July.
- Preventing cotton ratoons and controlling volunteer cotton after harvest, is the second priority.
- The majority of growers utilise mulching & root cutting to manage cotton residues.
- Ratoon cotton will increase the incidence of Cotton Bunchy Top disease as well as mealy bug, aphid and whitefly infestations for the following crop.
- Poorly destroyed and incorporated crop residues will hamper planting and germination of the following crop.
- Excess stubble that enters irrigation channels creates problems for irrigation pumps.

recover from structural damage and many wetting and drying cycles assist this process.

A big advantage of a dry harvest is that it gives you the widest possible range of options for preparation and improvement of cracking clay soils, provided that heavy rain does not follow soon afterwards. Cultivation, and particularly deep tillage should only be attempted when the soil is dry. On non-swelling silty soil, however, dust production may be a problem if it is tilled when dry. When these soils are re-wetted rapidly, they will have poor structure.

Pupae control

When preparing soil after a dry harvest, the first priority is to deal with the over-wintering pupae of *Helicoverpa armigera*. They are a key risk of increasing resistance to Bt in Bollgard II® cotton and to insecticides. A tillage strategy must be implemented to destroy the pupae by the end of July (as per the Bollard II Resistance Management Plan), while avoiding serious structural damage to the soil and minimising input costs.

Tillage to a depth of at least 10cm is most likely to kill overwintering *Helicoverpa* pupae, if all of the very large clods (more than 50mm wide) in the topsoil have been broken down and rearranged. However, be careful on silty soil where aggressive dry cultivation will create dust and destroy soil structure.

For further information on pupae control refer to the Integrated Insect and Mite Management chapter.

'Volunteer' and 'ratoon' cotton

Due to the advent of herbicide tolerant cotton cultivars in the past decade, cotton residue management has become an extremely important consideration for cotton producers utilising the technologies.

'Volunteer' or 'ratoon' cotton provide an excellent host (green bridge) for exotic pests such as whitefly, aphids, mites and mealy bugs to survive on-farm from one season to the next. Therefore the need to provide a high level of control has never been more pertinent.

There are several factors which will determine the choice of operation to eliminate the current crop residue effectively (see Residue Management Options below). These will include, equipment availability and the moisture status of the soil.

Cotton stalk management

Crop residues can carry disease, clog tail drains, interfere with herbicide incorporation and with planting. However, stubble incorporation may improve the amount and quality of soil organic matter. Burning of cotton stalks should be avoided as nutrients will be lost and soil carbon levels will decline quickly.

Soon after harvest the stalks should be cut finely enough to avoid immediate management problems such as implement blockage. If the trash is broken down too finely, decomposition and nutrient release may occur too quickly

KRONOS SHREDDERS . JUST WHAT THE CONTRACTOR NEEDS!

“The Kronos just keeps on going, which is exactly what a contractor needs from a machine.”

Graham Gowar has been contracting in south-west Queensland for 18 years, 12 of them working with cotton. He discovered the strength of Howard machinery whilst farming in South Africa.

“We had two Howard slashers and they took a lot of punishment from drivers who didn’t know or care about machinery. Those slashers are rugged machines and they held up very well, giving us many years of service,” Graham said.

Graham’s business, GMG Contract Farming, is now a family operation. His son, Bruce, will also mulch cotton this season, and bought their second Kronos 8000C flail shredder. Graham bought his first Kronos 8000C shredder three years ago after the dealers, Vanderfields, demonstrated the machine’s capabilities.

“One of our clients runs a major Queensland cotton station. They saw the Kronos in action and were very happy with the results. So were we. We mulched 5000 acres of sorghum with it in the first season and made enough to pay for the machine. We’ve been mulching cotton since then, and we also did a trial run with pigeon peas,” Graham said.

“This year, a client has asked us to mulch 16,000 acres of cotton in a month. We’re aiming to have 20,000 acres done by end of the season and we wouldn’t have a hope without the Kronos.

“The shredders are so rugged and reliable. The gearbox is fantastic. It takes a tremendous load, mulching eight rows of cotton stalks at once. It’s like feeding wood through it, and to turn it so quickly, it’s just incredible.

“The hard-faced flails are toughened with a special welding technique to give them a long life. Sometimes we work in paddocks with quite a bit of wood lying around and you can’t always avoid it. I’ve had a flail bend slightly but they just keep working. I’ve never broken one yet.”

Graham said before they bought their first Kronos, it took at least four passes to get the work done. “So doing a 10,000-acre mulch was like doing 40,000 acres in work terms. Getting great results with one pass is a 75 percent saving on time and labour for us so we are very happy using the Kronos.”

They use two John Deere 8400 tractors with their Kronos flail shredders and Graham says if he’s getting 10 km/h, he’s happy.

He learned about machinery growing up on the farm and he does his own maintenance. They regularly blow down the machines with a compressor and grease them. “I believe in preventative maintenance for machinery and for the land too,” he said.

“The Kronos design is very practical. Maintenance access is easy and I like the doors at the back. You don’t have to lie in the dirt to take a look at the machine; you just stand there and open the doors.

“The only problem we’ve ever had with the Kronos was due to human error when a driver went too low, cutting into the dirt and overloading the belts. Apart from that we’ve had no bother at all. The Kronos just keeps on going, which is exactly what a contractor needs from a machine.”



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– this can lead to loss of nutrients such as nitrogen. If the cotton disease *Fusarium* wilt is known to be present, it may be necessary to at least partially disinfect the stalks by leaving them exposed to UV light on the soil surface for several weeks – immediate stubble incorporation is likely to aggravate the *Fusarium* problem.

Choosing a tillage and/or rotation option

You may find that the crop you have just harvested has partly or wholly fixed a compaction problem that had caused it to perform poorly. Cycles of wetting and drying during the growing cycle and deep drying by the crop after the last irrigation can crack the soil and improve structure to a point where deep tillage may not be necessary. However, residual compaction may remain; and cracking by rotation crops, and/or deep tillage, may be required to improve yields and profits of subsequent crops.

Full land preparation (ploughing the old hills and forming new ones) gives you the opportunity to ‘tidy up’ a field: removing hollows, straightening crooked rows, adjusting guess row spacing, and controlling weeds.

After examining the soil structure, assess soil moisture to determine to what depth tillage would be beneficial. The soil profile may not be at a uniform moisture content. It may be possible to till the upper, dry part of a compacted layer and leave the deeper, moist soil untouched (and unsmear).

Cotton residue management options

Methods for crop residue control have changed greatly since the late 1990s when ‘pull, rake and burn’ was a common option.

The main processes currently promoted in the industry include:

- Mulching of stalk above the ground and cutting the root.
- Incorporating the residues into the surface soil.

Mulching and root cutting

The Australian cotton industry has now moved away from the practices of stubble removal and burning, and now promotes the practices of slashing and incorporating stubble due to some of the positive impacts this system has on soil fertility.

Some of the positives of the mulch and root cut approach are:

- Speedy operation.
- Root and sub section is cut in half reducing cultivation problems.
- System has been widely proven and is available in a variety of configurations.
- Residue is more easily broken down and incorporated than slashing.
- Weather conditions have less of an impact than on rake and burn operations.

- Depending on depth of root cut, some preliminary pupae control is achieved.
- Residues are mulched back into the soil as opposed to being burnt.

Some of the negatives of the mulch and root cut approach are:

- Unless the machine is set up properly ‘ratoon’ plants can become an issue in guess rows though GPS systems have helped to reduce this.
- With moist conditions trash and soil surface can build up and hamper following fertiliser applications.
- Machines are generally heavy and horsepower intensive.
- There can be more expense with maintaining machinery due to the extra components.
- Generally speaking, the cutting operation requires a much greater speed to achieve maximum efficiency

Standard slashing

This operation focuses on slashing of the crop residue and allowing other operations to take care of the cotton stub and root system below the ground. This practice is no longer common within the industry due to the issues associated with ‘ratoon’ cotton.

Pull, rake and burn

The pull, rake and burn process is rarely used throughout the industry as a mainstay for crop residue control. As mentioned previously this option is only generally used when growers are looking to re-laser fields and due to minimal cuts are seeking to avoid stubble becoming an issue with the laser buckets.

An experiment was conducted at Narrabri over three seasons (1992–1995) to investigate stubble management systems in relation to cotton growth, lint yield and fertiliser N recovery.

The experiment indicated that removing cotton stubble caused a reduction in lint yield and profitability over time. Compared with the lint yield of the stubble-retained treatment, the yield of the stubble-removed treatment was reduced by 3 and 9% respectively, in the second and third years of the experiment.

The experiment also revealed that the N fertiliser recovery was reduced by 10% where the stubble was removed compared to the retained plots, ie more N fertiliser was lost from the soil where stubble was removed.

A number of growers still pull cotton plants after harvest, but the stalks are then mulched using a conventional mulcher. This process allows the stubble to be returned into the soil profile during cultivation operations. Raking and burning stubble is strongly discouraged.

Further information:

SOILpak - <http://www.dpi.nsw.gov.au/agriculture/resources/soils/guides/SOILpak/cotton>

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