

Stubble Management

An update of
Stubble Management
*practices and research
in southern NSW*

The Cereal Stubble Management project was funded by the Woolworths Sustainable Farms Drought Program (through Landcare Australia) and FarmLink Research. The project was managed by Murrumbidgee Landcare Inc, Industry & Investment NSW and FarmLink Research. Technical management and extension was carried out by Tony Pratt, Industry & Investment NSW.



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Background...

Stubble retention in one form or another has become a priority for many farmers across southern NSW. The primary motivation has been the desire to conserve moisture, although reducing the risk of erosion, the potential to increase soil carbon levels and avoiding health risks from burning have also been significant factors.

The range of stubble management techniques has increased in recent years, with advances in seeding technology, stubble mulchers, straw spreaders and guidance for inter-row sowing. Although these have facilitated the adoption of full stubble retention in continuous cropping, no-till systems, a more flexible approach is often taken in mixed farming systems or when seasonal conditions dictate the need to reduce heavy, weed-infested stubble loads.

It is important to understand that stubble retention alone will not lead to increases in yield and water use efficiency. A review of wheat yields in medium and long term trials across Australia (Kirkegaard 1995) revealed that stubble retention reduced yields compared to stubble burnt treatments in all trials, partly due

to the allelopathic effects of stubble on crop growth. However new research is now showing that stubble has no detrimental impact on yields with the adoption of new technology such as inter-row sowing and straw spreaders.

Stubble retention does form an important component of conservation farming practices that have led to significant yield increases over time. Kirkegaard and Hunt (2010) demonstrated through crop modelling how a combination of stubble retention/direct drilling, fallow weed control, crop rotation and early sowing have increased average wheat yields by 2.4 t/ha (250%) since the conservative farming practices of the 1980s, a result that could not be achieved if each practice was adopted in isolation.

The study also showed that over the last 30 years fallow weed control has had the greatest individual impact on conserving moisture for improved wheat yields (49% yield increase), followed by early sowing (30%), stubble retention/direct drilling (15%) and crop rotation (10%).



Photo: G. Condon

Of the 15 case study farms, six practised light stubble grazing to take pressure off pasture paddocks and reduce feeding requirements.



Photo: T. Pratt

Moderate to heavy grazing was practised on an additional six of the 15 case study farms, while still aiming to maintain 70% ground cover.

Background cont.

The **Cereal Stubble Management project** carried out by Murrumbidgee Landcare, Industry & Investment NSW and Farmlink Research from 2008 to 2011, used paddock demonstrations to compare stubble management techniques across farming systems and seasons. The 15 demonstration sites, which were centred around Harden, Junee Reefs, Ariah Park and Henty/Holbrook, were managed by local farmer groups.

Stubble loads measured after harvest at each demonstration site showed the significant variation that can occur between rainfall zones and seasons, with stubble loads generally doubling between the 2009/10 and 2010/11 harvests. The 2011/12 harvest saw an even greater residue problem, with many growers, including those committed to a no-till stubble retention program, having to burn at least some paddocks to reduce blockages at sowing.

The project's **On-farm Demonstrations and Case Studies 2009** publication (see link next page) clearly indicates a 'one size fits all' approach does not apply to stubble management. Although 12 of the 15 case studies focused on mixed farming operations, the role livestock played in stubble management varied greatly.

While six of the case study farms only lightly grazed stubbles to take pressure off pasture paddocks and reduce feeding requirements, the other six farms used moderate to heavy grazing pressure as the primary means of stubble management, while also providing an important feed source. However the need to maintain at least 70% ground cover and remove stock after significant rainfall events were important management considerations.

Stock were excluded from stubbles on the three remaining case study farms, with stubble either left standing, cut low at harvest, or mulched.



Photo: T. Pratt



Photo: M. Lattimore

Stock was excluded from stubbles on three of the 15 case study farms, with stubble either left standing, cut low at harvest or mulched.

In some situations, strategic burning may be required for heavy stubble loads or where summer weeds have not been controlled.

Since the stubble management project commenced in 2008, many of the farmers involved in the case studies have changed their systems to allow greater stubble retention. This highlights that stubble management is an evolving process and more importantly, that it should remain flexible to suit seasonal variability and changes to farming systems.

Of even greater importance is the need to understand that stubble retention alone will not lead to increases in yield and water use efficiency. A combination of good agronomic management practices, particularly fallow weed control and early (timely) sowing, along with optimum variety choice, nutrition and crop rotation, will help ensure stubble retention is used to maximum effect.



On-farm Demonstrations and Case Studies 2009

www.landcareonline.com.au/wp-content/uploads/2011/12/Murrumbidgee-Stubble-Publication.pdf



Photo: G. Condon



Photo: G. Condon

New technology, such as inter-row sowing and improved straw spreaders, has removed some of the negative impacts of stubble on crop yields.

Good agronomic management, including fallow weed control and early sowing, will help ensure stubble retention is used to maximum effect.

About stubble and...

Disc seeding

The adoption of zero till systems using disc seeders is rapidly increasing, allowing minimal soil disturbance and greater stubble retention, particularly at narrow row spacings. Although improvements in soil structure and infiltration rates have been clearly demonstrated, these benefits take time and growers need to be aware of limitations during the transition from a tyne system.

Disc seeders work best in standing stubble (inter-row sowing) or where residue has been spread evenly across the header width using straw choppers or spreaders to minimise hair-pinning. Hair-pinning occurs when straw is bent into the furrow instead of cut through by the discs, affecting seed/soil contact and seeding depth.

Residue managers such as Aricks wheels can improve crop establishment by clearing stubble ahead of the disc openers. However care needs to be taken to avoid crop damage from herbicide concentrated in the cleared stubble. Due to the potential for crop damage, it should be noted that many pre-emergent herbicide labels do not currently support use with disc seeders, although research and development is continuing.

Further reading: Ashworth et al 2010. *Disc Seeding in zero-till farming systems - A review of technology and paddock issues*. WANTFA 2010.

Haskins and Condon 2012. *My client has purchased a disc seeder - what does this mean for my advice?* GRDC Adviser Update, Narrandera 2012.



Photo: G. Condon

Disc seeders work best in standing stubble (inter-row sowing) or where residue has been spread evenly across the header width to minimise hair-pinning.

Herbicide efficacy

Stubble retention can reduce the efficacy of pre-emergent herbicides through tie-up of the herbicide active or by physically preventing contact with the soil.

In general, many pre-emergent herbicides are still effective with up to 50% stubble cover, decreasing in efficacy with heavier stubble loads.

Despite these limitations, herbicide efficacy can be improved by ensuring chaff is spread evenly across the header width at harvest, avoiding bundles of high residue which can bind with the herbicide and result in patchy weed control. Stripper fronts or windrow burning may be required if header trails are too dense.

Retaining standing stubble is also an effective means of improving weed control by increasing the amount of pre-emergent herbicide reaching the soil. Controlled traffic farming allows further improvement by minimising the amount of stubble laid over on wheel tracks, preventing herbicide penetration.

Selection of herbicides suited to application in stubbles, herbicide rates, water rates and nozzle types can also be managed to improve pre-emergent herbicide efficacy.

Further reading: Haskins 2012. *Using pre-emergent herbicides in conservation farming systems*. NSW DPI 2012.



Photo: G. Condon

Herbicide efficacy can be improved by ensuring residue is spread evenly without forming clumps, or left standing to allow maximum herbicide contact with the ground.

Grazing

Stubble grazing has been commonly thought to jeopardise conservation farming practices due to soil structural damage and removal of crop residues. However, a recent literature review (Bell et al. 2011) shows that shallow compaction caused by grazing tends to be transient and rarely impacts on subsequent crop yields.

These findings have been supported by data from a five-year project currently being undertaken near Temora in southern NSW by CSIRO and FarmLink Research. The research has shown no impact of soil compaction through grazing on crop yields, although it has shown the impact of over-grazing. In this instance, where only 30-40% stubble cover (0.8t/ha) remained post grazing, low ground cover resulted in reduced infiltration rates due to damage from rain impact.

The research demonstrates that provided at least 70% ground cover or 2 t/ha cereal stubble is maintained, sheep can provide an effective means of stubble management in mixed farming systems.

Further reading: Hunt et al 2011. *Do livestock reduce crop yields in conservation farming systems?* In 5th World Congress on Conservation Agriculture, Brisbane 2011.



Photo: G. Condon

Grazing can provide an effective means of stubble management provided at least 70% ground cover or 2t/ha cereal stubble is retained.

Carbon

While stubble retention is well recognised for protecting soils against wind and water erosion, its ability to increase soil organic carbon levels has generally been very slow or even negligible in Australian no-till cropping systems.

Recent research by CSIRO has shown the slow increases in carbon levels may be due to low availability of nitrogen (N), phosphorus (P) and sulfur (S), which are required in relatively constant ratios to stabilise soil organic carbon. In no-till farming systems, efficient fertiliser inputs mean stubbles are generally low in N, P and S and are concentrated at the soil surface. This unstable form of organic matter is unable to provide the nutrients required to increase soil carbon levels.

However research has also shown that this may be overcome by incorporating stubbles and applying sufficient fertiliser (particularly P and S) to increase the levels of stable organic carbon in the soil. As with lime incorporation, however, this approach requires a level of soil disturbance which may not be acceptable to no-till farmers.

Further reading: Kirkby et al 2011. *Nutrients - the real constraint to sequestering carbon in soil organic matter.* In 5th World Congress on Conservation Agriculture, Brisbane 2011.

Kirkegaard et al 2011. *Sense and nonsense in conservation agriculture: principles, pragmatism and productivity in Australian mixed farming systems.* In 5th World Congress on Conservation Agriculture, Brisbane 2011.



Photo: G. Condon

Recent research suggests the slow increase in carbon levels in stubble retained systems may be due to low availability of nitrogen, phosphorus and sulfur.

Stubble Management... action plan

1. At harvest

Stubble management needs to start at harvest. In no-till systems, uniform distribution of residue across the full header width is important to minimise blockages and hairpinning at sowing, achieve even crop establishment and improve pre-emergent herbicide efficacy.

- **Determine a suitable cutting height** - Generally stubble needs to be cut short for tyne seeding to improve trash flow or cut high/left standing for disc seeding to minimise hair pinning. In higher rainfall areas or under irrigation, cutting stubble low can allow the soil to dry out for better sowing conditions, particularly on clay soils.
- **Improve the chopping and spreading capability of your header** - Ensuring uniform straw distribution through the use of appropriate spreaders or choppers, or even stripper fronts, is a critical step in the stubble management process, particularly when using disc seeders. Many standard straw choppers and spreaders tend to concentrate chaff and straw directly behind the header, reducing crop establishment and herbicide efficacy. Although this has been improved on many of the newer model headers, several units can also be retro-fitted to older models (eg. MAV™ Straw Chopper or PowerCast™ tailboard).

Despite these improvements, it should be noted that straw spreaders are currently only able to spread residue evenly in all conditions across the width of a 9m or 10.5m front (30-35 ft). Spreading across wider fronts (12m or 13.5m) may be improved by increasing the straw cutting height to reduce the amount of residue to be moved, and by adjusting rotor speed and vane settings in the paddock to suit windy conditions or sloping paddocks.



Photo: T. Pratt

at harvest:
consider stubble height
to suit seeding system



Photo: J. Coleman

at harvest:
improve straw spreading
by modifying existing straw
choppers and spreaders



Photo: G. Condon

at harvest:
adjust rotor speed/vane settings
to suit windy conditions or
sloping paddocks

2 Post-harvest

Stubble management post harvest is usually dictated by the farming system, ie. mixed farming versus continuous cropping; disc versus tyne seeding. Although many stubble retention advocates maintain that maximum benefit is achieved through ungrazed standing stubble, the ability to remain flexible is important, particularly in mixed farming and/or high rainfall operations where feed requirements and/or very heavy stubble loads come into play. **Some of the post harvest stubble management options include:**

- **Leave standing** - for inter-row sowing using 2cm RTK (Real Time Kinetic) guidance between the previous year's crop rows. Standing stubble also improves pre-emergent herbicide efficacy, allowing more herbicide to reach the soil.
- **Mulch** - to improve trash flow at sowing where inter-row sowing is not used, generally designed to break the straw into smaller lengths and improve the rate of stubble breakdown. Mulchers can be broadly separated into two types, including slasher types (eg. Gason Cropper Topper, flail mulcher), which are useful when using tyne seeders, or harrow types (eg. prickle chain, disc chain, Coolamon Harrows, Stubble Cruncher) which are ideal for heavy canola stubbles but can have limited capacity in heavier cereal stubbles.
- **Graze lightly** - to improve trash flow at sowing in mixed farming systems and provide an alternative feed source over summer. Recent research has shown light grazing to a minimum of 70% ground cover or approximately 2t/ha stubble has only a transient effect on soil structure and rarely impacts on subsequent crop yields.
- **Bale** - to remove the bulk of stubble for improved trash flow at sowing, although rarely used due to limited markets for baled straw.



Photo: G. Condon



Photo: T. Pratt



Photo: G. Condon

Stubble Management... action plan

3. Summer fallow

- **Keep summer weeds under control** - Trash flow through stubbles can be significantly reduced by the presence of weeds as they become caught up in the tynes and create a 'rake' effect. Controlling summer weeds not only removes these obstacles but also saves valuable soil moisture and nitrogen.

4. Pre-sowing

- **Consider a late, cool burn** - In high rainfall areas, a late burn may be the only option to allow sowing through very high stubble loads and/or heavy weed burdens. However the adoption of wider row spacing, inter-row sowing and disc seeding has allowed many growers to successfully sow through heavy stubbles. Many farmers agree that stubble burning should now only be used strategically, citing public health issues and the time and potential danger involved with burning as reasons to limit its practice.
- **Consider burning windrows** - Funnelling chaff into windrows and burning can provide an effective weed and disease management tool, while still maintaining some residue cover in the paddock.

5. At sowing

- **Determine a suitable row width** - Wider row spacings (250mm or 10" and above) have been adopted to accommodate inter-row sowing using 2cm RTK guidance for improved stubble handling. Although research shows that wider rows can reduce crop yields, particularly above 300mm (12") in higher yielding situations, many growers claim the advantages (stubble retention, improved crop safety with pre-emergent herbicides and fewer seeding units) outweigh the negative yield impacts. Row spacings of 250-300mm have been commonly adopted as a compromise, although careful agronomic management will ultimately have the greatest impact on yield, regardless of row spacing.



Photo: G. Condon

summer fallow:
control summer weeds
to prevent seeder blockages



Photo: G. Condon

pre sowing:
consider late burning
for very high stubble loads or
heavy weed burdens



Photo: G. Condon

at sowing:
consider wider row spacing
for improved trash flow

- **Consider adaptations for seeding equipment** - Tyne shank add-ons, including Pig's Tails™ or other plastic/metal guards, improve trash flow around the tyne. Alternatively, treadwheel residue managers hold down the stubble beside the shank as it moves through.

Residue managers are often used with disc seeders, including row cleaners such as Aricks wheels which move stubble away from the discs to prevent hair pinning and improve crop establishment. They can also improve herbicide efficacy by creating soil throw. Aricks wheels are often used with single disc openers such as the John Deere or Excel machines, but have also been successfully added to large diameter disc machines such as the Daybreak. Residue pinning wheels (eg. Morris Never-Pin wheels) are another option for residue management, holding the straw tightly either side of the disc to improve cutting ability.

- **Select pre-emergent herbicides suited for use in stubble*** - Some herbicide labels support higher rates for use in heavy stubbles, eg. Triflur® X, to reduce herbicide tie-up. Other herbicides are better suited to higher stubble loads (up to 50% stubble cover) due to their ability to wash off stubble onto the soil (eg. atrazine, simazine, Logran®, diuron, Boxer Gold®, Sakura®, etc). If stubble loads are too high, burning may be considered to ensure weed control is not jeopardised.

**Be aware of herbicide label restrictions in disc systems to avoid crop damage. Crop safety is improved in both disc and tyne systems when pre-emergent herbicides are incorporated by sowing (IBS) rather than applied post sowing (PSPE).*

- **Adapt water rates and nozzles** - higher water rates (> 80L/ha) and larger, non-air inducted nozzles (eg. Magnojet) allow more herbicide to reach the soil.
- **Consider band spraying** - matching nozzle spacing to row spacing using RTK guidance allows nozzles to be positioned precisely between stubble rows, preventing stubble from obstructing the herbicide.



Photo: K. Condon

at sowing:

consider seeder adaptations
to improve trash flow and/or
reduce hair-pinning



Photo: G. Condon

at sowing:

select pre-emergent herbicides
suited for use in stubble



Photo: G. Condon

at sowing:

be aware of crop damage
in disc systems with
pre-emergent herbicides

Stubble Management Snapshot...

Curry Family, Junee Reefs

mixed farming . medium-high rainfall . tyne seeder

- **10 years ago:** burnt all stubbles
- **Now:** most stubbles retained due to 300mm stubble height and improved straw distribution (new header), inter-row sowing, grazed stubbles
- No-till system with 12m Flexicoil on 225mm row spacing and press wheels

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title: 'Stubble Management
medium-high rainfall'



The 12-metre header cuts stubble at 300mm height and spreads straw evenly over the header width (in favourable conditions).

Photo: G. Condon



The 12-metre Flexi-Coil tyne seeder is set up to inter-row sow between the previous year's stubble rows.

Photo: G. Condon

Ten years ago, Brian and Glenn Curry were burning all stubbles on their 2100ha mixed farming operation. However in 2005, they started inter-row sowing with their 12 metre Flexi-Coil tyne seeder with press wheels, allowing them to retain stubbles and retain valuable moisture during the drought years.

In 2011, the Currys purchased a new John Deere 9770 12-metre header with PowerCast™ tailboard. The ability to cut stubble at approximately 300mm height and spread it evenly across the header width (in ideal conditions) greatly improved the seeder's ability to sow through heavy stubbles.

In 2012, the Currys were able to successfully sow through stubbles from Sunvale, Wedgetail and Lincoln wheat crops yielding 4t/ha, as well as 4.5t/ha Gairdner barley crops. The weak plant structure of Gregory, however, meant these stubbles were burnt - but the Currys are happy to maintain a flexible approach to stubble management and burn where necessary.

With 3800 ewes in a self-replacing merino flock, grazing is an important component of the mixed farming operation. Stubbles are grazed for approximately three to four weeks after harvest to clean up spilt grain. Additional grazing has been limited in the recent wet summers when the priority has been on conserving moisture through a strict summer spraying program.

The stubble retention program has meant the Currys have had to adopt changes to their agronomic management. The risk of yellow leaf spot, carried over on retained wheat stubbles, has been reduced by including 40% canola and 10% barley in the rotation with wheat and lucerne based pastures.

Weed management is carefully planned to avoid the use of trifluralin on retained stubbles and risking herbicide 'tie-up'. Alternative pre-emergent herbicides are selected based on their ability to 'wash off' stubbles. Where no suitable alternative exists, eg. for conventional or Clearfield® tolerant canola, stubbles are burnt to improve trifluralin efficacy.

Stubble Management Snapshot...

DB Ag/Gleeson Family, Mirrool

continuous cropping . medium-low rainfall . disc seeder

The Gleeson family purchased the Mirrool farm in late 2009. With low ground cover due to a long history of grazing and drought, a plan was established in conjunction with farm managers DB Ag to turn the farm into productive cropping land.

A no-till, stubble retention program was established from the outset, aided by a committed 'stubble retention' contractor using a Flexi-Coil tyne seeder and rotary harrows. Stubbles were retained through a combination of practices including stubble mulching (of heavier stubbles), and low harvest height.

To maximise moisture retention, a zero-till system was adopted in 2012 using a 15 metre Serafin Ultisow single disc seeder on 305mm row spacing. This has allowed them to sow through heavier stubbles without the need for a mulcher. The purchase of a Case 9120 header in 2011 has also improved the system, cutting straw height at approximately 300mm. Fitted with a standard straw spreader, stubble is partially spread over the 13.5 metre header width, subject to wind, with no major impacts on sowing into stubbles from 3.5 to 4t/ha wheat crops. Although inter-row sowing is attempted with mixed success using 10cm guidance, it is not seen as a priority under these stubble loads.

Rotary harrows are towed behind the seeder at sowing to improve chemical incorporation and increase stubble breakdown. For wheat, the harrowed stubble also acts as a mulch to buffer soil temperatures, while for canola, it is used to manage blackleg and reduce surface crusting.

Weed management has been adapted to suit the stubble retained system. Triazine tolerant canola is grown to avoid the need for trifluralin, whilst other pre-emergent herbicide options are used for wheat. Some paddocks have been sown to a lupin/triticale mix and spray fallowed for additional weed management, while also improving soil structure.

Yellow leaf spot is minimised through the use of canola and fallow in the rotation, as well as through tolerant wheat varieties and fungicides when necessary.

- **10 years ago:** farm purchased 2009, low ground cover
- **Now:** all stubbles retained due to 300mm stubble height (new header), disc seeding
- Zero-till system with 15m Serafin Ultisow disc seeder on 305mm row spacing (contractor).

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A 15-metre Serafin Ultisow disc seeder on 305mm row spacing allows sowing through heavier stubbles without the need for mulching.



Photo: G. Condon



Photo: G. Condon

Residue is partially spread over the 13.5 metre header width, with no major impact on sowing conditions into 3.5-4t/ha stubble loads.

Stubble Management Snapshot...

Lane Family, Lockhart

continuous cropping . medium rainfall . tyne seeder

- ▶ **10 years ago:** all stubbles retained (since 1994)
- ▶ **Now:** all stubbles retained due to 9m CTF system, inter-row sowing, 300mm stubble height, coulters
- ▶ No-till, CTF system with Gason tyne seeder on 300mm row spacing and press wheels.

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Photo: G. Condon

All machinery operates on 3 metre wheel tracks. The header cuts stubble at 300mm height and the straw spreader has been modified to improve straw distribution.



Photo: G. Condon

Break crops are sown on 600mm row spacing to further improve stubble handling of cereal crops.

Long term advocates of stubble retention, the Lane family have been retaining stubbles on their 1350ha operation since 1994. They began inter-row sowing in 2008 but decided to take the 'next step' in 2010 by selling the sheep to fund machinery upgrades for a 9.3-metre CTF system.

The system includes a Gason tyne seeder on 300mm row spacing with press wheels, coulters and stubble guards to improve trash flow. The Case 2388 header cuts stubble at approximately 300mm height and the Lanes have modified the straw spreader to achieve more uniform distribution. They have successfully sown through wheat stubbles from 4t/ha crops using this system.

Careful agronomic management has allowed the Lanes to retain stubbles over many years. Strict calendar sowing, when conditions are still warm and generally dry, make stubble easier to penetrate. In contrast with district trends, they have also maintained a high proportion of break crops in their rotation. Faba beans, lupins (and canola) are now sown on 600mm row spacings for better crop architecture and to further improve stubble handling of cereal crops.

Trifluralin is still used at high rates in cereals where stubble loads are lighter, but alternative pre-emergent herbicides are used in heavier stubbles. Triazine tolerant canola, one-year fallows (for high pressure paddocks) and double break crops (faba beans followed by canola) are all used to further improve grass weed management. The double break crops have the added advantage of capturing nitrogen benefits for high demand canola crops, and the Lanes are planning to sow field peas for green manure for the same reasons.

To manage stubble borne diseases, the Lanes are diligent in selecting wheat varieties with yellow leaf spot tolerance, including Ellison and Lincoln. However anecdotal evidence in recent years suggests that good crop nutrition and inter-row sowing may be minimising the presence of the disease.

Stubble Management Snapshot...

Smirl Family, Cootamundra

mixed farming . high rainfall . tyne seeder

In a high rainfall environment, the Smirls have focused on strict summer weed control and no-till farming to maximise moisture retention. Although stubbles are retained through summer and burnt just prior to sowing, the difficulties in penetrating heavy stubble loads and slug infestations remain two major barriers to implementing a full stubble retention program.

Running 3400 1st-cross ewes and 250 agisted cattle, the ability to graze stubbles is an important management tool. Cereal stubbles are grazed at relatively high stocking rates for six to eight weeks after harvest, although care is taken to maintain 70% ground cover. Summer weeds are strictly controlled to conserve moisture over summer, then cereal stubbles are burnt in late April/early May. The late burn allows moisture to be conserved for as long as possible while also preventing erosion on sloping country from summer storms.

Canola stubbles are lightly grazed then only the higher yielding paddocks are harrowed in early autumn.

The Smirl's no-till system consists of a 6-metre Agrowdrill on 225mm row spacing with Flexi-Coil tynes and Agmaster rotary harrows. They use a Case 2388 header as well as a header contractor at harvest, both cutting at standard straw height to remove the crop as quickly as possible and avoid weather damage.

Stubble retention remains a challenge in high rainfall environments when faced with average wheat yields of 5 to 6t/ha. Although the Smirls have considered stubble management options such as slashing and inter-row sowing, they remain a low priority compared with other business objectives. The ability to maintain a flexible approach to stubble management has allowed the Smirls to run a high yielding, low cost, low risk system.

- **10 years ago:** stubbles burnt
- **Now:** all stubbles grazed, burnt late
- No-till system with 6m Agrodill on 225mm row spacing and Agmaster rotary harrows
- 1820 hectares mixed farming - 50% crop, 50% pasture



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Photo: G. Condon



Heavy stubble loads are retained over summer to retain moisture and prevent erosion on sloping country, then burnt just prior to sowing.

Photo: G. Condon



Cereal stubbles are grazed for six to eight weeks after harvest, with care taken to maintain 70% ground cover.



For further information:
www.farmlink.com.au