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MANAGING STUBBLES TO REDUCE BURNING BEST MANAGEMENT PRACTICE

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Summary

The rationale in developing a 'fact sheet' based on the retention of crop stubbles throughout south-eastern Australia, together with a brief description and location of the local Victorian sites and their focus of study is given below.

Figure 1 (right):
Typical Autumn "stubble burning" within close proximity to Geelong, Victoria.



Introduction

The project aims to develop better crop stubble management systems that are more profitable, sustainable and friendlier to the farming operation and environment than the current burning regime. It aims to provide training and skills development for producers to undertake best management practice within the field of stubble retention. Given that many farmers currently are forced into a burning regime due to machinery limitations, this project also has a focus on developing better machinery solutions. With a change in stubble management, the impact on pests and diseases is also being investigated, through the incorporating of an integrated pest management approach.

Why Stubble Retention?

Research from various sources over time has been able to provide us with a list of benefits from stubble retention, including:

- increases in soil water and plant available water (PAW);
- decreases in surface (slaking) & subsoil (sodic) hostilities;
- increases in organic carbon percentages;
- decreases in soil erosion potentials;
- decreases in soil bulk densities;
- increases in the amount of available energy to grazing animals;
- decreases in off-site leakage/loss of nutrients & pesticides.

Why NOT Stubble Retention?

Some of the problems associated with stubble retention can include:

- blockages at seeding – toolbar design;
- increases in biodiversity ... slugs, snails, mice and other pests;
- decreases in nitrogen availability & immobilization – changes to the C:N balance;
- decreased efficacy of some residual herbicides;
- increased severity of foliar diseases including Yellow Leaf Spot and Scald;
- toxins released from stubbles after rainfall event during crop establishment;
- change in the micro-climate – cooler and wetter conditions slowing germination.

Phytotoxic Liberation & Micro-Climatic Effects

Research from Bruce (*et al*; 2005) suggests that:

- Stubble retention can have a negative effect on plant establishment – up to 33%, with varietal influence (based on the vinegar effect) being highly significant;
- Shoot biomass can be reduced by 30%;
- Overall grain yield can be reduced (up to 23%) with wheat stubbles loads greater than 5-6t/ha – an obvious concern for all southern growers who exceed this amount annually.
- Stubble retention can also reduce surface soil temperatures by up to 3.8°C, resulting in seedling deaths. *This effect may even be worse in the colder environments throughout the Western Districts of Victoria, especially if crops are sown late.*

Project Objectives

Collectively, the four stubble retention sites (Inverleigh, Lismore, Lake Bolac & Hamilton) plan to explore the major production and environmental issues within the following objectives:

- determine the best stubble management solutions to optimise seeding efficiency and crop establishment;
- assess the profitability of the various stubble retention strategies;
- develop strategies which maximise water use and minimise rising watertables, salinity and acidity;
- develop stubble management solutions which best improve soil structure;
- identify strategies which reduce nutrient losses;
- determine the impact of stubble management systems on biodiversity.

Machinery Solutions – “Residue Managers”

Toolbar design is highly critical in delivering not only trash flow benefits, but seedling establishment in all sowing operations. Additional vertical and horizontal clearance is required, with minimisation of any pinch/blockage points throughout the undercarriage.

Residue managers (Figure 2 & 3), not only help push aside surface material allowing for a ‘clean run’ (Figure 4), but create mini windrows which minimize the ‘vinegar effect’ on the emerging crop. In addition, these windrows also act as a weed suppressive tool and as a compost layer.

Seeding tools such as parallelograms need to be capable of placing seed and fertiliser in a single pass with adjustable press-wheel pressure for optimal seed-soil contact.

Results So Far

At each of the sites, differences in establishment have been achieved following the use of a conventional airseeder. From this experience, Southern Farming Systems is now in the process of designing a seeder to ensure optimal field establishment when sowing into many retained stubble situations. It would appear that a combination of a single pass at harvest (that helps initiate immediate breakdown of stubble), earlier stem elongation nitrogen timings and inter-row seeding, are likely to give the best results. The 2005/06 harvest will bring with it the true performance of all systems.



Figure 2 (right): Gessner residue management system (foreground), Dawn management system (background)



Figure 3 (above): Yetta twin stars.



Figure 4 (above): Result of seeding pass using three types of mechanical residue management systems.

Potential Opportunities

There appears to be no “one” solution in the approach to complete stubble retention. Everyone has and will have a combination of differing strategies for various reasons. The following list forms components that can help build the stubble retention package:

- choice of variety at seeding (shorter, softer strawed crops);
- timing of nitrogen application – less upfront nitrogen producing inefficient biomass and more at stem elongation when needed;
- broad spreading of harvest residues, ensuring that the straw choppers and spreaders cover the width of the harvest operation;
- harvest height – cutting down to 200 to 300mm rather than leaving a long stubble which causes unnecessary shading at seedling emergence;
- post harvest incorporation of stubble using discing methods – some concern over trafficability at seeding and high energy demands;
- mulching of the stubble immediately after harvest;
- bale & remove crop residues for sale or use for livestock;
- microbial digesters – anecdotal evidence suggests they can reduce stubble loads remaining on the surface;
- inter-row seeding – using wider row spacings and seeding in the inter-row with 2cm auto-steer, also allowing for relay summer or forage cropping;
- rotational management – determining the best cropping rotation for stubble retention for all crops in the farming system. An example may include: canola, barley, wheat, then followed by a late pulse crop such as peas, before returning to a cereal prior to canola;
- a change in the mindset that burning is the only viable stubble management tool. Being a non-preferred approach and with proactive research, then this may still allow for its use as a strategic tool into the future!

The Future

If managed correctly, stubble retention can be a useful weed management tool. Every season however, will present variances to the alternative approaches.

Further Information

If you have any further interest contact Southern Farming Systems on 03-52290566 or you can visit our webpage: www.sfs.org.au for progress of the project from crop establishment through to harvest across all sites.

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