Controlled Traffic as a Consequence of Raised Beds

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BACKGROUND

In spring of 1990, we installed 40 ha of under ground drains into old long term phalaris pasture. By the time the subsequent workings to prepare a seedbed were complete, the soil was too dry to seed. However 90mm of rain one Friday in early January, and the effective drainage of the fallow, allowed us to sow sunflowers the next Monday. Normally this would have remained wet for a few weeks. We trialed the new red winter wheats in 1992 and in a very wet spring and summer, where other crops rotted in the ground, our Lawson wheat yielded 7t/ha Having shown that high yielding crops could be grown by eliminating water logging with underground drainage, when the raised bed cropping system became available, and the establishment cost of about $200 / ha was only 20% of the underground drainage system, we could then factor the cost into our annual gross margin.

SOUTHERN FARMING SYSTEMS

The trial set up in 1996 of 2 ha each of underground drains, wide raised beds, and narrow raised beds, with each yielding around 3.5t/ha of canola in a very wet winter reinforced the value of drainage. The narrow raised beds were favoured because of the lower cost compared to underground drains, and the more uniform crop compared to wide raised beds. In 1997 satellite sites established a further 300 ha of narrow beds. Despite the dry year there appeared to be little or no yield penalty on beds.

ESTABLISHING NARROW RAISED BEDS AT HOME

With wool prices continuing low and unprofitable, cropping a larger area seemed a logical solution to remain viable. For this to be safe the crops needed to be grown on drained country. We now had 80 ha of underground drains, increased by 40 ha in 1995. Together with 70 ha of creek bank, we only had 150 ha of safe crop. A decision was made to install 140 ha of narrow beds. A topographical map using a tracking theodolite was made, a deep ripper procured, and our 4m roterra converted to a bed former. A plan was developed and grader hired to form the main drains, and beds installed. By 2001 all our crops were planted on drained country, with 450 ha of narrow raised beds.

SEEDING EQUIPMENT

The first year we used our 21 tyne Shearer trash culti-drill to sow the crop. This sowed two 2m beds with the combine wheels running on top of the beds. Although the tractor was running in the furrows, it was interesting that the combine wheel compaction alone, was sufficient to reduce the ability to penetrate the soil next summer. A 5/8” steel rod could be pushed in the full 20cm. of uncompacted bed and only 5cm under the wheel marks. The turning land at each end was virtually impenetrable, as was any flat land. One consequence of loose soil however, was an increased area damaged by false wireworms in canola.

The following year we converted a 28 run Chamberlain combine, taking off the front and back rows of cultivating tynes, and installing three gangs of eight press wheels to follow the seeding tynes. This worked well except in wet conditions, when mud built up between the press wheels, preventing them from turning. With all vehicle wheels now running in the furrows, compaction was no longer a problem. In 2002 we purchased a Multi-planter seeding bar and Simplicity air-seeder. This allowed us to have individual depth control, deep banding and the ability to split fertilizer. By using 28 tynes on 24 heads, and splitting the tubes adjacent to the furrows, we can sow 50% seed and 10% fertilizer into the furrows, hopefully minimizing nutrient run off and still allowing some crop growth to compete with weeds. We can also block one of the two main seed tubes, so that crops like beans can be sown on 40cm spacing.

COLLECTOR DRAINS

Because the collector drains are designed with the lower grades, many of our slopes were .1% or less, and shallow pooling occurring. In conjunction with DPI, we established laser graded, gravel covered slotted pipes, in the bottom of the collector drains. These very effectively dry the main drains after rainfall events. When the furrows are trafficked following rain, we now no longer form deeper and deeper wheel marks across the collector drains. Cost at about $10 / lineal metre is a bit expensive, but probably worth it long term.

MONITORING

Several soil pits have been dug in the last few years, with interesting results. Compared to long term improved perennial pasture, soil bulk densities have improved from 1.2gms/cc to .9gms/cc after four years in beds. Two year old beds are in between, so it appears that the soil structure is improving each year. Penetration in dry soil is now possible to 50cm and root growth at depth is correspondingly better. Moisture content at various depths measured by tensiometer, tends to show that roots are accessing more moisture at depth under beds, than on the flat. In summer there is now no hard compacted layer between 100-300mm. Our cracking self mulching soils don’t tend to have a permanent hard pan when wet.

STILL TO IMPROVE

Harvest indices are very low, .3-.4, We might grow 4.5t wheat/ha and leave 9t straw/ha although usually a little better. We put nitrogen out at GS 32 and try to manipulate the canopy, grow fungal disease resistant varieties etc. Stubble handling without burning is difficult in high rainfall areas where phytotoxicity, slugs and ground larks are all, as yet, unsolved problems. Microbe application is showing some promise. Grazing of barley stubbles thus treated are preferentially grazed, with stock maintaining condition well. Wheat stubble plus mineral mix including 6% urea, was thinned right out. However, straw falling into the furrows becomes a problem, filling them. We use a lister bar with grader blades set high to deepen furrows, the blades preventing spillage back into the furrow. A chopper on the header means we can direct seed without too many problems into canola and pulse stubbles. In the future, land grading may be advantageous in removing the less than perfect drainage of low spots. Initially, it was more economical to get a high percentage of the land drained as cheaply as possible.

CONCLUSION

While the installation of raised beds has meant an incidental application of controlled traffic, the improvement in soil structure in the beds, as compared to the turning lands, where water logging has

also been minimized, indicate that traffic has a serious deleterious affect on soil structure, and hence root penetration and plant growth.

Some rules; don’t take short cuts in establishment, plan well using topographical maps. If the slopes allow, run beds north-south to even sunlight distribution, keeping in mind that the lower flows should be on the steeper slopes. Rip deep enough to establish 200mm high beds after settling. This allows for free board if grades aren’t perfect, and shallow water pools in furrows. On low grades collector drains are much better with underground drains installed. Dams to collect run off, and even out peak flows when this discharges to public land, makes authorities happy.