Controlling wind erosion in field pea stubbles

Jeff Russell
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Controlling wind erosion in field pea stubbles

By Jeff Russell, Research Officer
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The area sown to field peas in Western Australia’s eastern wheatbelt has increased from 4000 ha in 1985 to about 35,000 ha in 1992.

While field peas can be grown on soil types not suited to lupins, their stubble is highly fragile and prone to wind erosion, even at low grazing pressure. This is one reason why some farmers are hesitant to grow field peas.

Harvest losses of field peas can also be high; levels of 100 to 200 kg/ha of seed on the ground are not uncommon. For this reason farmers believe the stubbles should be grazed.

Farmers also thought that grazing would control pea weevil infestations in affected areas. Recent research has shown that grazing field pea stubbles does not reduce the pea weevil population.

Pea weevils have a good chance of survival by sheltering in the seed surrounded by stubble trash. Pea weevils are also able to leave the pea stubbles and survive over summer by sheltering beneath the bark of certain species of Eucalyptus trees.

Research by the Department of Agriculture has assessed the erodibility of various soil types suitable for field peas. Stubble management systems have been developed to minimise wind erosion and maintain or increase whole farm profit.

Crop establishment systems such as stubble retention and paddock rolling were investigated to determine their influence on crop production, harvest efficiency and soil erosion. Benefits and penalties of grazing field pea stubbles were also considered.

Soil erosion

Grazing field pea stubbles can easily loosen an additional 40 t/ha of surface soil, much of which is of a particle size that can be moved by wind. While sandy or ‘light’ soils are more prone to erosion than heavier textured soils, it is the condition of the surface soil that greatly determines susceptibility to erosion. Soils that are compacted and firm to hard crust resist being loosened more than soils of similar or heavier texture that are in better structural condition.

To avoid soil erosion it is best not to graze field pea stubbles. Wind tunnel measurements have shown that ungrazed field pea stubbles suffer little soil erosion; the main problem being stubble blown onto fences. Cultivation of the paddock after summer rain is one way of overcoming this problem, and this works well for soils that produce big clods when cultivated. Retaining cereal stubbles from the previous crop also helps.

Keeping cereal stubble from a previous cereal crop on the soil surface during seeding can prevent wind erosion. This retained cereal stubble helps stabilise loose field pea stubble by trapping and anchoring it. This helps to stop the field pea vine from blowing into mounds and gives a more even cover over the soil surface. It may also act as a cushion when grazed, helping to stop soil from being broken up into smaller fragments. Chopping and spreading the field pea stubble at harvest also minimises stubble movement, especially if the paddock is grazed.
Although not grazing field pea stubbles might seem to be wasting good summer feed, it may have some advantages. There is a greatly reduced risk of wind erosion and of losing topsoil and nutrients from the paddock. In some cases, it may even save fences because loose stubbles and soil will not be blown up against them. For

**Stubble management**

If field pea stubbles must be grazed, graze them immediately after harvesting. This timing also depends on geographical location. It may not be practical in the Great Southern, South Coastal and northern agricultural regions, which may be much windier after November, than the central wheatbelt.

Only soils that have about 15 per cent or more clay, such as sandy loams, loams and clay soils, should be grazed. A common practice is to cultivate the paddock for seed-bed preparation after a summer rain of about 12 mm. This practice will minimise wind erosion on soil types that produce clods and form stable ridges.

Sandy surfaced soils should not be grazed. Some farmers defer grazing these soils until later in the summer or autumn, unless there are enough summer weeds to help control soil erosion. In this way, grazing can be part of the paddock preparation for the next cereal crop.

**Grazing stubbles**

Liveweight and condition score of a random sample of 100 sheep from six flocks grazing field pea stubbles were measured at various times. Seed harvest losses and decline in seed numbers on the ground over time were also estimated during grazing. Seed was determined as:

- visual, if it could be seen;
- under stubble, if on the surface but covered by stubble mounds; and
- buried, if below the surface and retrieved by brushing all loose soil out of a quadrat.

Good management of the flock before grazing produces the greatest benefit from grazing field pea stubbles. Liveweight gains were highest in flocks that had few worms. The results indicated that provided the flock is worm-free or has a low worm burden, weaner sheep can gain between 230 and 240 g/head/day for 30 to 35 days grazing. Ewes can gain up to 240 g/head/day over a 22-day period (see Figure 1).

The high protein content and digestibility of the stubbles also improved the condition of the flock.

Sheep ate most of the field pea seed. The rate of decrease was greatest during the first 20 to 30 days before levelling off (see Figure 2), depending on grazing pressure. With the stocking rates used, sheep ate 40 to 90 per cent of the field pea seed within four weeks. Some field pea seed, sometimes from 40 to 60 kg/ha, remained on the paddock, either buried under the field pea trash or trampled into the soil.

**Ungrazed stubbles**

Although not grazing field pea stubbles might seem to be wasting good summer feed, it may have some advantages. There is a greatly reduced risk of wind erosion and of losing topsoil and nutrients from the paddock. In some cases, it may even save fences because loose stubbles and soil will not be blown up against them. For
Good broad-leaf weed control is essential for this practise to succeed because weeds such as wild radish can take advantage of these conditions.

Increasing the width between the rows may be a simple way of overcoming problems with cereal stubbles. Results from a few experiments comparing 36-cm row spacings (14 inches) with the more conventional 18-cm width (7 inches) indicate no loss in yield of field peas.

These experiments compared the direct drilling of field peas into grazed wheat stubbles, a one-pass cultivation to work the stubbles in before seeding, raking and burning to remove the stubbles before seeding, and rolling the paddock at seeding.

None of these methods increased pea yields significantly (see Table). It is not necessary to remove the cereal stubble by raking and burning.

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### Field pea crop yields (t/ha) for different methods of crop establishment

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<td>1.90</td>
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### Crop establishment methods

Various methods to help improve harvesting efficiency and retain cereal stubbles have been investigated. Several experiments on field pea establishment have been conducted to see if retention of cereal stubble adversely affects crop production.

Keeping field pea stubble on the paddock may help to increase cereal yields, as research in Australia’s eastern States suggests (Purvis 1990; Ralph 1990).

In Western Australia, wheat yields increased by 7 to 12 per cent on an ungrazed field pea stubble compared with a grazed site (see Figure 3), but this depended on whether a disc plough was used in January after early rain or in May as part of paddock preparation. Yields were higher after disc ploughing in May.

Wheat grain protein content increased by 2 percentage units on the ungrazed site regardless of the treatments.

However, yields of a following field pea crop were about 10 to 20 per cent lower on the ungrazed site. Further research is needed before firm conclusions can be drawn.

### Crop management

Wind erosion can be minimised by efficient harvesting and retaining as much cereal stubble cover as possible on the soil surface before seeding field peas. If harvest seed losses are minimised, there is less need to graze the paddock.

A smooth paddock surface and a dense crop are essential for efficient field pea harvesting. Retention of cereal stubble helps stabilise field pea stubbles and gives additional soil cover, even if the stubbles are grazed. However, stubble retention poses a few problems in handling the stubble at seeding and producing a smooth surface for harvesting. There is the additional concern that extra soil will be brought into the harvester by the field pea vine entangling itself in the stubble.

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Future expansion

The Department of Agriculture's MIDAS farm model (Model of an Integrated Dryland Agricultural System) indicates peas are a long term, profitable farming option on medium soils and friable heavy soils (Pannell and Bathgate, 1991). These two soils account for about 20 per cent of the 'average' eastern wheatbelt farm.

Assuming a wheat:wheat:field pea rotation in the eastern wheatbelt alone, about 200,000 ha of field peas could be cropped. This is based on not grazing the stubbles, which considerably reduces the risks of erosion.

Rolling the crop carefully. The surface soil should be a bit dry and the subsoil moist. The rollers can then push the clods down level without breaking them into small pieces that might be at risk from wind erosion. Medium and heavy soil should not be too wet, otherwise soil can stick to the roller and cause worse soil surface conditions than before. Another problem is that the soil can be smeared if the roller becomes blocked and can’t roll. This creates a crust when dry that can affect seedling emergence.

Other experiments have compared the effects on yield of rolling the crop at different times. Results showed that rolling does not increase or reduce yield greatly, and the crop does not need rolling immediately after seeding. Rolling can be delayed for up to eight days after seeding or when the crop is 7 to 10 cm tall. It is not wise to roll the crop at seedling emergence or when plants are small because they may be damaged. A rubber-tyred roller is far better than a metal roller, especially when rolling after seedling emergence.

Rolling the pea crop

Perhaps the main reason for removing cereal stubbles before seeding field peas is the belief that the stubbles will make harvesting the field pea crop even more difficult than it already is. Rolling flattens the stubble to give a level surface, but also maintains soil cover to help minimise erosion. A level paddock and a dense field pea crop reduces harvest losses and makes harvesting easier.

Reducing the number of tines used for seeding in widely spaced rows is becoming an accepted method in the establishment of lupin crops in Western Australia. This method should work well for field peas.

LEFT: Seeding field peas in widely spaced rows (left plot) may help overcome stubble blockages when field peas are sown at conventional narrow (18 cm) spacings.

RIGHT: Rolling the soil after seeding may help to make harvesting easier and more efficient.
To estimate the amount of split field pea seed in a paddock, place a 1/10 sq m quadrat on the ground and count the number of seeds within it.

One seed represents about 20 kg/ha.

Sheep had just started grazing this paddock of Wirrega peas.

Further reading

References

Although most of the research on growing field peas has been conducted mainly on clay loam soils, Western Australian research has found that field peas produce more reliable yields on shallow sandy duplex soils (French and Ewing, 1989). In regions with less than 250 mm of growing season rainfall, field peas will outyield lupins by 35 per cent on average on the shallower duplex soils with a sand depth of 40 cm or less over clay.

MIDAS has also indicated that a lupin:wheat:field pea:wheat rotation could be viable on good sandplain soils and duplex soils, provided the field peas are not grazed.

Many farmers hesitate to grow field peas on good sandplain and shallow duplex soils because of the risk of wind erosion. At the same time other farmers are considering field peas in the lupin:wheat rotation on these soils to extend the disease break against brown leaf spot, Pleiochaeta setosa, of lupins.

Inclusion of field peas provides a three-year break for the lupin crop and still allows a one-year cereal:one-year legume rotation. Under this rotation, a much bigger area could be sown to field peas in this State.

Acknowledgements
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