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Controlling wind erosion in field pea stubbles

By Jeff Russell, Research Officer
Dryland Research Institute, Merredin

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 crusting 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.

Field pea stubbles blown onto a fence. This paddock had been grazed for about seven days.

Field pea stubbles grazed for four weeks on a heavy soil (30 per cent clay) where the cereal stubbles were retained and the field pea stubbles chopped and spread. The paddock was grazed safely for eight weeks.
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.

These results suggest that grazing should be short, about four weeks, to remove most of the seed. If the paddock can tolerate further grazing, six weeks is probably the maximum time before sheep liveweights start to decline. By this time sheep would have eaten most of the available seed.

**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.

Row spacing
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.

Good broad-leaf weed control is essential for this practise to succeed because weeds such as wild radish can take advantage of these conditions.

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

<table>
<thead>
<tr>
<th>Establishment methods</th>
<th>Merredin Duplex soil</th>
<th>Merredin Heavy land</th>
<th>Merredin Light land</th>
<th>Avondale Duplex soil</th>
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</thead>
<tbody>
<tr>
<td>Direct drill</td>
<td>1.82</td>
<td>1.07</td>
<td>0.66</td>
<td>1.48</td>
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<tr>
<td>Direct drill and roll</td>
<td>1.62</td>
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<td>1.11</td>
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<td>1.23</td>
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<tr>
<td>Cultivation and roll</td>
<td>1.90</td>
<td>1.14</td>
<td>0.76</td>
<td>-</td>
</tr>
</tbody>
</table>

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.

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.

Row spacing
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.

Good broad-leaf weed control is essential for this practise to succeed because weeds such as wild radish can take advantage of these conditions.
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.
To estimate the amount of spilt 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.

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