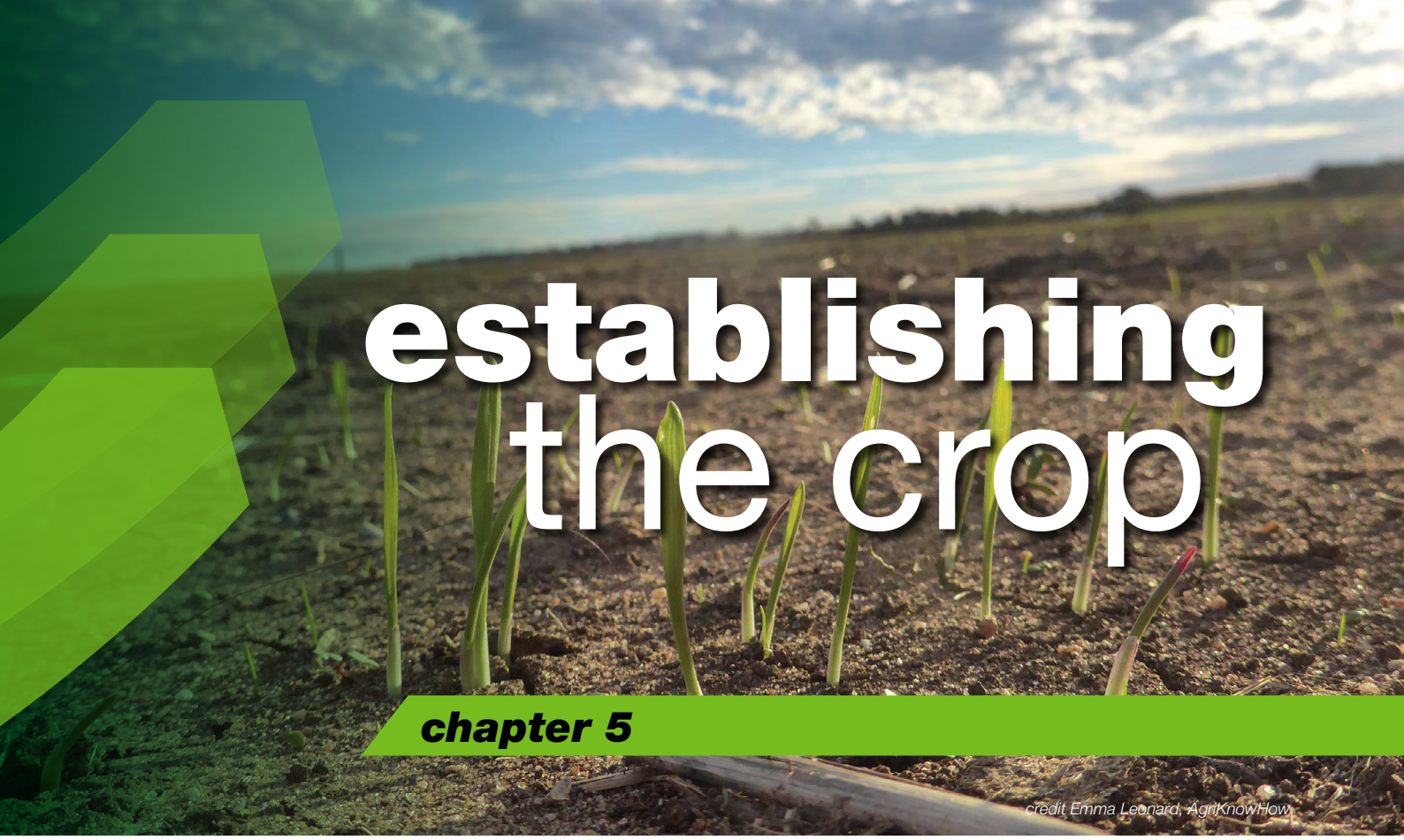

establishing the crop

chapter 5

credit Emma Leonard, AgriKnowHow

Paddock selection

Impact on hay quality

- Feed analysis
- Colour
- Contamination
- Toxins

Paddock selection for oat hay crops is a little different than for grain crops, especially in relation to soil fertility.

While good weed control in the previous crop and pre-seeding is essential, herbicide residues can be a problem.

Triasulfuron is generally more damaging than chlorsulfuron or metsulfuron methyl. Group B herbicides used on Clearfield® varieties of wheat or canola can have residual effects on oat crops but damage is usually less than seen in barley.

Always check product labels for residue risk and test prior to sowing if unsure. Potential contaminants such as animal carcasses, old fencing wire and rocks should be avoided. These contaminants should be removed and rocks rolled into the soil.

Other factors to consider in relation to paddock selection are slope and orientation. Crops grown on north facing slopes may mature faster but can also be more susceptible to hot wind damage. Newer oat

Select paddocks with:

- moderate fertility of less than 80kg/ha of available nitrogen in the top 60cm at seeding. Any higher and bulky, fibrous crops rather than quality hay are produced. High nitrogen also promotes lodging;
- low levels of crop residue, especially after canola paddocks and a low level of stem and leaf disease carryover and a low history of rhizoctonia bare patch and take-all;
- minimal weed burdens and where effective pre-seeding weed control can be achieved; and
- good drainage – long periods of perched water within 30cm of the soil surface can reduce yield by 60%.

Avoid paddocks with:

- pulse and pasture legume stubbles as these are likely to have high net mineralised nitrogen;
- herbicide residues - on high pH soils sulfonylurea herbicide residues can be damaging. The imidazolinone herbicides are usually more residual in acidic soils. Be aware of the long plant back period (630 days) for planting oats in paddocks previously treated with Sakura®;
- a history of prickly weeds e.g. doublegee and annual ryegrass toxicity (ARGT). There is zero tolerance for ARGT in export hay (see ARGT Chapter 7);
- low pH <4.5 or high salinity and compaction.

varieties have been bred to reduce this problem. In some regions, western slopes suffer more rain damage. Bacterial blight is more severe where frost or wind-borne rain occur.

Rotation

Canola is an ideal break crop for oats as it allows grass weeds to be reduced, does not boost soil nitrogen and reduces foliar and root disease carryover. The use of residual herbicides should be avoided in canola sown before oats. Canola stubble should be removed by slashing rolling, raking, chaining, burning etc to to avoid contamination in the bales.

Following good legume pastures or grain crops with oat hay is not recommended as soil nitrogen levels could impact on quality.

See Chapter 7 for disease carryover from other cereals.

Seeding

Sowing date

Impact on hay quality

- Feed analysis
- Staining and moulds
- Colour

Oats are a spring cereal sown in autumn. Hay paddocks need to be clean and weed free, so seeding date may be dictated by the need to wait for weeds and volunteers, especially barley and wheat, to germinate.

Generally higher yields are associated with early sown crops but quality may be adversely affected, especially if early sowing is accompanied by a warm winter which promotes rapid, prolonged early growth. This tends to lead to rank, fibrous crops that are susceptible to lodging and bleaching of the lower stem.

Early sowing may increase severity of foliar diseases, so varieties with greater disease resistance should be selected (see Table 4.4).

Sowing date needs to be matched to variety maturity, rainfall zone and likelihood of rain at cutting date. Maturity differences between varieties are greater than maturity differences for the same variety sown at different times (Figure 5.1).

Early maturing varieties (see Table 4.1) will be compromised in a high rainfall area due to the increased risk of weather damage on the cut hay. Conversely, late maturing varieties in low rainfall districts are more prone to damage by heat and moisture stress.

If varieties with different maturities are being sown in districts with the same rainfall, late maturing varieties will usually be sown first.

In a 500mm rainfall district, delaying seeding by seven days will generally delay cutting by less than two days.

Diseases such as bacterial blight and septoria can cause leaf damage, especially in early sown crops in higher rainfall regions.

Seeding rate

Impact on hay quality

- Stem diameter
- Weed competition
- Colour

Seeding rate and plant population play a major role in hay yield and quality. Seeding rates for hay

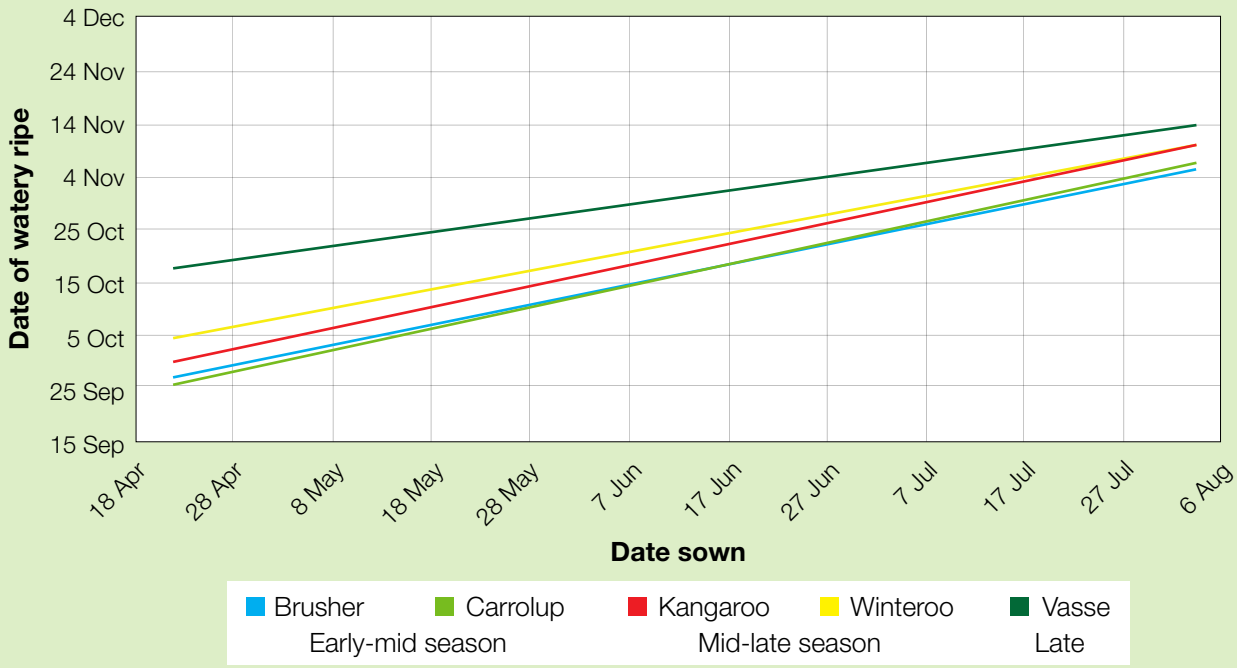

Figure 5.1 Impact of sowing date on date of reaching watery dough (GS71), ideal cutting date, by variety maturity group – *source Department of Agriculture and Food, Western Australia.*

are 30 to 50% higher than for grain crops grown in the same rainfall district. This is because hay is cut before grain fill and generally will be harvested before moisture stress occurs. It is also because denser crops have thinner stems that are more desirable to the export market.

Seed size varies between varieties and seasons, so it is important to calculate seeding rates based on the seed 1000 grain weight to achieve target plant populations (see Table 4.4). For example, in Table 4.4 the 1000 grain weight for Brusher was 32.9g per 1000 grains, for Mulgara 35.5g and for Tungoo 29.4g.

Plant populations need to be matched to rainfall and soil fertility (Table 5.1).

When varieties with poor early vigour (see Table 4.4) are grown in soils with low to medium nitrogen fertility, seeding rates can be increased by 20 to 30% above the target to compensate.

Higher plant populations produce higher yield and generally quality, greater weed competition and plants with thinner stems, but they can be more at risk of lodging.

To calculate seeding rate (kg/ha) from a target plant population.

Seeding rate=10 x average weight of one seed x target plants per square metre

Example: Variety – Mulgara, seed weight 35.5/1000, target plants per square metre 230

Seeding rate =10 x 0.0355 x 230 = 81.65kg/ha

To check plant populations, count 10 sites about five weeks after seeding.

Plant population (plants/m^2) = total number of plants counted/(total length x row spacing in metres)

Example: 800 plants counted at 10 sites each 2m long on 15cm row spacing

Plant population = 800/(20 x 0.15) = 266 plants/m^2

Table 5.1 Target plants per square metre by rainfall (winter and spring rainfall dominant regions) and soil fertility – *source Agrilink Agricultural Consultants.*

Rainfall	Soil nitrogen fertility		
	High	Average	Low
<350mm	120-160	150-180	150-200
350-425mm	160-200	180-220	200-240
425-500 mm	200-220	220-250	240-280
>500 mm	210-230	250-280	250-300

Row spacing and seed placement

Impact on hay quality

- Weed competition
- Feed analysis
- Colour
- Staining and moulds

To optimise hay yield and quality, a row spacing of 7.5cm (3 inches) is the ideal, but many croppers find this difficult to achieve with modern machinery.

The narrow row spacing achieves better weed competition and greater access to nutrients. The density of stems across the paddock is high and when cut, these stems better support the cut hay off the ground, minimising the risk of soil contamination and uneven curing.

In many situations, narrow row spacing is impractical due to:

- existing machinery set-up;
- seed mixing with pre-sowing herbicide causing reduced emergence; and
- an increased proportion of the paddock being cultivated, resulting in greater weed seed germination.

Where row spacing is wider than 22.5cm (9 inches), the risk of reducing hay quality increases due to:

- high concentrations of plant nitrogen;
- increased weed competition and contamination in the cut hay; and
- cut hay hitting the ground and becoming contaminated with soil.

Increasing seed spread across the furrow can help reduce the risks of wider row spacing (Table 5.2). Standard tined seeders produce a band of seed about 2-3cm.

Where seeding equipment has 30cm (12 inch) spacing, some growers cross-seed to produce a row spacing of 15cm (6 inches). However, considerations about row orientation (Figure 5.2) must be taken into account. The use of high accuracy (2cm) GPS autosteer systems may allow a second pass to be sown on the inter-row to produce a 15cm spacing.

The recommended seeding depth for oats is 3 to 6cm; oats are able to germinate from a greater depth than wheat and barley.

The addition of press wheels helps compress soil above the seed for more even distribution. Press wheels help improve seed germination in water repellent soils.

Table 5.2 The impact of seed and fertiliser spread and row spacing on plant spacing and theoretical nitrogen concentration in the plant – *source Agrilink Agricultural Consultants.*

Lateral seed spread	**2.5cm (1 inch)**			**5cm (2 inches)**			**7.5cm (3 inches)**		
Tyne spacing	17.5cm 7”	22.5cm 9”	30cm 12”	17.5cm 7”	22.5cm 9”	30cm 12”	17.5cm 7”	22.5cm 9”	30cm 12”
% of surface covered with stems[1]	17%	11%	8%	33%	22%	17%	50%	33%	25%
Theoretical change in plant nitrogen status from the base[2]	Base 0%	+28%	+71%	-10%	+14%	+36%	-25%	+10%	+22%

[1] *The higher the percentage, the lower the risk of hay hitting the ground and being weather damaged.*

[2] *The greater the positive deviation from the base, the poorer the hay quality.*

Cross seeding (pictured), inter row seeding and increasing seed spread across the furrow all help to bring row spacing closer to the ideal of 7.5cm (3 inches).

credit Emma Leonard, AgriKnowHow

Impact on hay quality

- Staining and moulds
- Colour
- Contamination

Choice of seeding direction should take into consideration the direction that the crop will be cut.

This is because it is desirable to use the remaining stubble to support the hay off the ground. This helps hay cure evenly and minimises contamination at baling.

Oat crops can be sown round and round, up and back or diagonally. Figure 5.2 details the different sowing and cutting combinations.

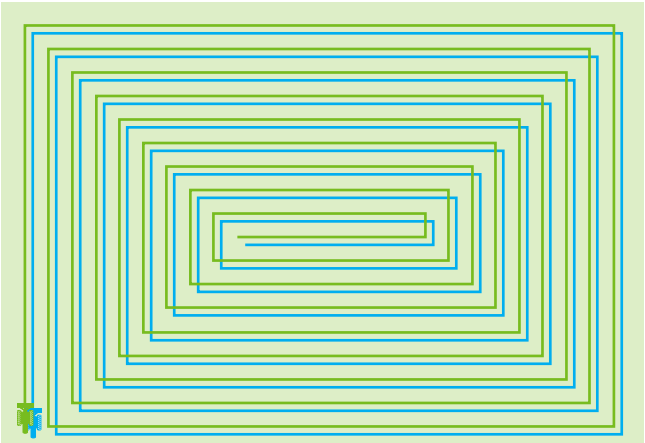

Figure 5.2a Sown round and round – cut round and round.

With this combination, more cut hay is likely to fall between the seeding rows. This results in uneven curing and increased risk of contamination as windrowers and rakes have to be set closer to the ground. Super conditioners struggle to pick up hay that has fallen to the ground. Another problem is that seed and fertiliser rates are double on the headlands, therefore plants in this area are likely to lodge, have bleached stems and poorer feed analysis results due to lower levels of water soluble carbohydrates.

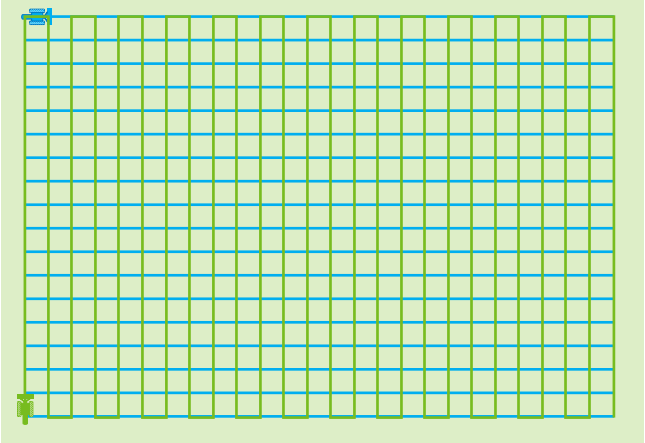

Figure 5.2b Sown up and back – cut up and back at 90 degrees.

Self propelled or swinging arm mowers allow hay to be cut up and back. This combination of seeding and mowing direction should ensure the majority of hay remains off the ground.

Headland areas are minimised and bales made on the headlands can easily be separated.

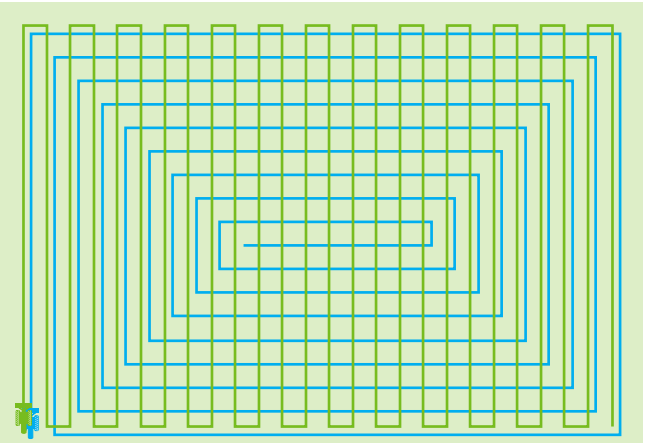

Figure 5.2c Sown up and back – cut round and round.

Off-set, 'PTO' driven mowers can only be used round and round. Therefore, to minimise hay damage, sowing should be done on the shortest run and mowing round and round.

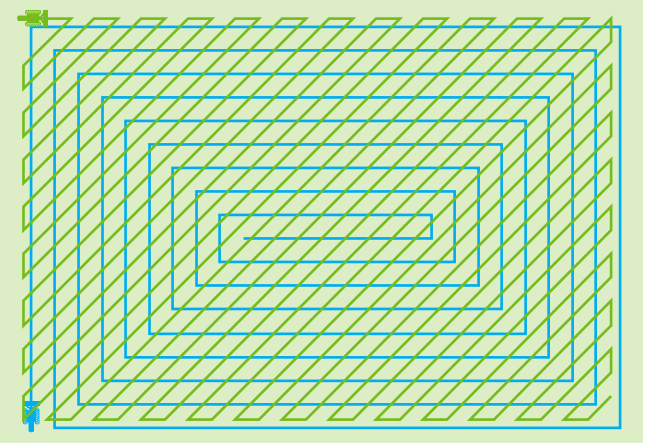

Figure 5.2d Sown diagonally – cut up and back or round and round.

Cutting round and round will still result in damage on the headlands. However, sowing diagonally minimises the risk of hay damage because seeding and cutting operations are never in the same direction.

Rolling

Impact on hay quality

- Contamination

If hay making machinery is running at an angle to press wheel furrows, damaging vibration can occur. Rolling paddocks after seeding, but before the start of tillering (GS24), reduces the severe ridge/furrow effects. After this growth stage, rolling can cause long term damage and reduce yield.

Paddocks should not be rolled after a frost or when leaves are wet as this increases the chance of spreading bacterial blight.

Rolling prior to applying post sowing pre-emergent herbicide can reduce the risk of herbicide washing into the furrow.