DEPARTMENT OF
PRIMARY INDUSTRIES

Irrigated Winter Forages in Northern Victoria

Managing Winter Cereals

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DAIRY AUSTRALIA

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Irrigated Winter Forages: Managing Winter Cereals

Irrigated winter cereals are grown as annual crops in northern Victoria. They can provide valuable feed for stock during winter when pasture growth slows and can be conserved as forage in spring.

Oats are the cereal best suited to grazing due to its high forage production compared to the other cereals (barley, wheat, triticale and cereal rye).

All cereals can be grazed. However, some cereals have been bred with an emphasis on forage regrowth (and often grain yield) following grazing, these are the preferred choice for grazing. Where a grain harvest is also required, dual purpose varieties should be grown.

Some cereals (barley, triticale, cereal rye and some wheats) produce large awns which can result in mouth injuries to livestock. These cereals should be avoided when stock are likely to consume emerged heads through grazing or eating late-cut conserved forage.

1. Establishment

1.1. Seedbed conditions

Cereals can be conventionally sown or direct drilled into a weed free seedbed from March to mid June.

Pre-irrigation is favoured over "irrigating up" after sowing, as seeds can swell and burst. Sowing after pre-irrigation should be as soon as soil conditions allow. For an April 1st pre-irrigation, this delay may range from 1 week on light soils to 3–4 weeks on some heavy clay soils.

Following the initial irrigation, subsequent irrigations should be at a cumulative evaporation less rainfall interval (E-R) of 75 mm on grey soils and 50 mm on red soils.

Pre-irrigation completed by April 1st is a safe option in most years. Later irrigations can cause problems by making the ground too wet for both sowing and grazing.

If not pre-irrigated, then the crop should be sown following sufficient rainfall to wet the soil to 100 mm depth.

Sow at a depth of 30–50 mm when pre-irrigated or at a depth of up to 100 mm (depending on soil type) when seeking moisture. When vetch is included in the mix, it should be sown at the same depth as the cereal.

1.2. Sowing rates

A sowing rate of up to 125 kg/ha is advisable. Seed size for oats can vary markedly, and so seeding rates should be adjusted accordingly. (For example, Saia can be one third the size of Coolabah). Seed size can be determined, and an ideal sowing rate calculated, at many DPI Offices and seed suppliers. Aim for plant numbers of around 250 plants/m^2.

When vetch is sown with cereals:

- seeding rates should be 30 kg/ha for the cereal and 30 kg/ha for the vetch.
- the vetch will be very slow to establish in autumn, but can dominate the forage crop during spring.

Note that while including vetch is a good option for dryland situations, vetch is not ideal when a crop is likely to be flood irrigated at any stage due to potential disease problems.

1.3. Fertilisers

Pay close attention to crop nutrition. A full soil test before sowing, combined with knowing the history of the paddock, is necessary to determine likely fertiliser requirements.

When deciding fertiliser rates, the quantity of nutrients to be removed needs to be considered. As a rule of thumb, a cereal crop will remove:

- 24 kg nitrogen (N) (oats often removes less N than other cereals)
- 3–5 kg phosphorus (P)

for each t DM of hay or silage removed.

This means that for a hay crop of 4–5 t DM/ha, 100–120 kg N/ha and 15–25 kg P/ha may be removed.

Nitrogen can be applied before sowing or after grazing to boost the growth of the crop. It is often worthwhile sowing the crop with DAP (18% N and 20% P) and applying, if required, additional N following subsequent grazings.

A word of caution. When high soil N levels and/or high application rates of N fertilisers coincide with factors such as:

- high soil temperatures
- low light intensity,
- moisture stress,

there is a potential of nitrate toxicity.

Nitrate toxicity can result in the death of stock grazing the forage crop or consuming fodder conserved from it. Pregnant stock are more susceptible to nitrate toxicity than other stock.

1.4. Weeds and pests

Early weed control is important to minimise competition. Post-emergent herbicides are available to control broadleaf weeds and grass weeds such as ryegrass. See your chemical seller for further details.

Insecticides can be used to control insects such as redlegged earth mite. Regular crop monitoring should be carried out to gauge signs of insect prevalence and to determine if control is warranted.

2. Grazing management

Begin grazing 6–8 weeks (approximately the 3 leaf stage) following emergence (depending on variety), or when roots are well established and crop canopy is relatively thick. (Pluck a new seedling, if the seedling pulls out it is not ready to graze; if it breaks it can handle grazing).

Cereals can be grazed either continuously or on a rotational basis. In order to ensure adequate regrowth following grazing, do not graze erect varieties below 10–20 cm or prostrate varieties below 5–10 cm.

When a plant begins its reproductive phase, the stem will begin to elongate, raising the developing head of the tiller (located just above the top or last developed node) above ground level. If the developing head of a tiller is grazed, then that tiller will die.

When grazing cereals after the start of the stem elongation phase, it is important that the developing head is not grazed by stock in order to ensure adequate regrowth and hay yields.

3. Water management

The keys to good water management are to irrigate the forage crop before it is moisture stressed, and to minimise waterlogging. This is particularly important for areas that are to be established early, and involves attention to:

- **irrigation frequency.** Following the initial irrigation in autumn or spring, subsequent irrigations should be at a cumulative evaporation less rainfall interval (E-R) of 75 mm on grey soils and 50 mm on red soils. The scheduling of the initial spring irrigation should be based upon monitoring of soil moisture content (remembering that forage cereals can access moisture at a greater depth than annual pastures).
- **speed of irrigation.** Water should flow onto bays for a maximum of 4 to 6 hours. This requires good channel structure, good flow rates and well laid out bays.
- **quick drainage.** Surface water needs to drain off the bays quickly to minimise the period of water logging (ie. no standing water 18 hours after starting to irrigate). This requires well laid out bays with good slope for water flow over the pasture, well sealed channel plugs to avoid seepage, the use of spinner cuts (except on very short bays) to enhance surface drainage, clean drains so that water is able to drain off the end of the bays, and drains that run into a reuse system.
- **water quality.**
  - Tolerance to salt varies between the cereal species and between varieties within a species. While barley, oats and wheat are all *moderately tolerant* to salt, barley is generally regarded as more salt tolerant than the other cereals. This means that with good management, there will be little impact on its growth through the use of irrigation water with a salinity content of over 1,500 µS/cm (1,000 ppm) but some yield loss will occur when the salinity content of the irrigation water approaches 3,000 µS/cm (2,000 ppm).
  - These salinity tolerance levels are provided there is deep drainage of approximately 10% of applied water (irrigation plus rainfall) and no saline water table.
  - The quality of the water can be tested with an EC meter. Water from alternative water sources such a drain, bore or spear should also be tested regularly.

4. Soil management

A program to ensure adequate soil fertility includes:

- soil testing representative areas.
- setting nutrient targets.
- developing a fertiliser program. This needs to take into account nutrient imports and exports, so that the required nutrients are applied in the most economical way.
- implementing best management practices (BMPs) for fertiliser applications.
- planning a nitrogen use approach.

Phosphorus (P) targets for perennial pastures used for dairy production are in the range of 18–22 ppm of Olsen P. Phosphorus targets for irrigated forage cereals are likely to be of a similar range. Typically, maintenance applications of P for forage cereals are in the order of 20–25 kg P/ha.year.

Nitrogen fertilisers are required to optimise the production of forage cereals. A possible exception is when a high clover content pasture has been grown on the paddock in the last 1 or 2 years. Nitrogen fertilisers should be applied as soon as possible after grazing to allow the forage crop sufficient time to respond prior to the next grazing. Urea needs to be washed into the soil within 24 hours of application to minimise losses.

Surface crusting is a common problem on sodic or newly land-graded soils and can be of concern when establishing a forage cereal as it can prevent seedling emergence. In this situation, the use of gypsum can be beneficial.

Soil salinity can affect forage growth with the effect more pronounced in some species than in others. Approaches to reduce impacts include ensuring use of low EC water, applications of gypsum or lime (containing calcium) to displace sodium, using salt tolerant species or lowering the water table.

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5. Fodder conservation

The supply of pasture and forage during spring usually exceeds herd requirements on most dairy farms. To maximise the benefits of the surplus pasture, feed surpluses need to be identified and conserved.

During spring when there is a feed surplus, the first priority for conservation are forage crops and annual pastures. (Note that BMPs are required to maintain the density of perennial pastures and hence the priority for the conservation of forage crops and annual pastures).

The growth stage at which to harvest cereals for hay or silage is a compromise between forage quality and yield. For high quality conserved forage, the ideal conservation stages are:

- **Oats** – between boot and ear emergence.

  The digestibility (energy content) of oats falls rapidly from the boot stage onwards. Cutting later at around the milk to milky dough stage will result in higher yields, but lower forage quality.

- **Wheat and barley** – there are two ideal stages
  - between boot and ear emergence (feed quality is high, but yields are low)
  - at the soft dough stage (feed quality is lower, but yields are usually higher).

  The digestibility of wheat and barley shows an initial rapid decline after the boot stage (similar to that of oats), but then increases slightly during the early stages of grainfill (the flowering to the soft dough stage), before declining again.

  Wheat and barley should not be conserved at the flowering to early milk stage as quality and palatability are low.

For all cereals, the protein content of the forage falls with advancing maturity.

The inclusion of vetch in mixtures with cereals will increase the protein content of the conserved forage.

Cereal growth stages

Definitions of the sequential growth stages of cereals during the reproductive phase are:

- **Boot** – rapid growth of the head causes the head to swell within the stem.
- **Ear emergence** – the seedhead emerges from the last leaf.
- **Flowering** – period of time (usually 1 week) before the anthers are pushed out of the seedhead.
- **Milk (or milky dough)** – the grain is in the process of forming and when squeezed, a milky liquid exudes.
- **Soft dough** – the forming grain is soft when squeezed (but no milky liquid exudes).
- **Hard dough** – the forming grain is hard when squeezed.

6. Varieties

Growth habit and maturity differ between varieties, and influences sowing time, dry matter production and overall grazing performance.

Varieties can have either an **early, mid or late season maturity.** Generally,

- for early sowings, late maturing varieties should be sown.
- for late sowings, early maturing varieties are best sown.
- if more than one grazing is intended then mid or late season maturing varieties should be selected.
- early maturing varieties generally establish quicker and can be grazed earlier than mid or late season varieties.

Some varieties have a **winter growth habit.** This means that they do not begin their reproductive phase or initiate head development until they have been exposed to a period of cold weather (vernalisation response). Early growth is often slow, so grazing of these varieties should be light during the early stages of development.

When late maturing varieties, which **do not have a winter growth habit,** are sown early, they may begin head initiation in autumn or early winter due to the plant being exposed to warm autumn conditions. These varieties need to be grazed hard and early to slow early growth, delay head emergence, and ensure adequate growth later in the season.

Selecting a variety to grow

The decision on which variety to grow should be determined by when a feed shortage is likely to occur.

Cereal varieties appropriate for grazing are those that can quickly recover from one or two grazings.

For grazing purposes, a best bet option is to sow the crop early when warm soil temperatures allow rapid establishment and early growth.

For more information on varieties, refer to the crop variety guides listed in further reading.

7. Pests and Diseases

Select varieties on the basis of their tolerance or resistance to known diseases in the region. Common diseases of forage cereals include:

- **Barley yellow dwarf virus** - tends to occur in early sown crops and is transmitted by aphids.
- **Stem rust** - controlling volunteer cereals and wild oats during the summer helps to minimise sources of infection for the following season.

Other diseases to be aware of are:

- **Smut** - apply a seed dressing if smut occurred in the previous crop where the seed was sourced.
- **Cereal Cyst Nematode** – a root disease more prevalent on lighter soils. Options include the use of resistant varieties, crop rotations and adequate control of host weeds during the previous year.
- **Bacterial Blight** and **Septoria Blotch.** Remove residues from previous crop as both leaf diseases are carried over from the previous year's stubble.

Further reading

Crop Management Notes, Victoria 2003, DPI
Victorian Winter Crop Summary 2003, DPI
Winter Crop Variety Sowing Guide 2003, NSW Agriculture

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