DAIRY EXTENSION CENTRE
a collaboration between DPI, DA & PIRSA

"What to Sow and Should I Water it?"

Information Session Notes

Location	Date	Time
Cohuna Bowls Club	Monday 8th February	10.30am – 1.00pm
Rochester Black Culvert Golf Club	Tuesday 9th February	10.30am – 1.00pm
Congupna Community Centre	Wednesday 10th February	10.30am – 1.00pm
Kyabram, Wilf Cox Community Complex	Thursday 11th February	10.30am – 1.00pm
Katunga Football Club Rooms	Friday 12th February	10.30am – 1.00pm
Finley RSC	Friday 19th February	10.30am – 1.00pm

State Government Victoria Department of Primary Industries

Dairy Australia Your Levy at Work

Government of South Australia Primary Industries and Resources SA

Autumn 2010 Options

What are the options for sowing this autumn?

There are a number of different species that could be selected to be sown this autumn on dairy farms in the Northern Irrigation Region of Victoria (NIR). To help narrow down the species, and then which cultivar within the species that would best suit any given paddock on your farm, thought needs to be given to a number of different factors. Some of the main factors are:

- End purpose of the species e.g. lots of high quality grazing; summer feed; large bulk of feed to conserve.
- Water availability.
- Soil type/ paddock layout e.g. free draining, good irrigation layout
- Fertility of paddock
- How the paddock fits into **whole forage system** e.g. already got heaps of cereal sown; too far away from dairy to graze with milking cows; close to wheel and easy to water.
- Season outlook e.g. likely to have wet/dry autumn/winter/spring.

There are many options available to consider sowing this autumn. There is however no new, magic "silver bullet" out there, just steady improvements. The main stays of ryegrass and cereals will still make up the majority of sowing this autumn. The more common options that most farmers will be using this year are:

- Annual ryegrass
- Italian ryegrass
- Cereals – Wheat, Barley, Triticale and Oats
- Perennial & Hybrid ryegrass
- Sub clover
- Other clovers e.g. Persian (Shaftal), Balansa, Berseem, White, Strawberry
- Lucerne
- Vetch
- Peas
- Brassicas
- Herbs – Chicory and Plantain
- Fescue – Winter and summer active

The further down the list you go the less common it will be to see them sown this autumn.

To help sort out which options might best suit you this autumn an overview of these options has been put together including pro's and con's, suitability and what situations it would fit.

Ryegrass

Ryegrass has been the main stay of Victorian dairy pastures for a long time now. This is because it offers many advantages.

- It can produce high yields of good quality feed.
- Depending on the farm system a large proportion of the feed can be direct grazed saving both time and money.
- It is suited to a large range of soil types and climatic conditions.
- It doesn't require high fertility (yields will be higher under good fertility).
- It is relatively easy to establish and manage.
- It can be flexible depending on variety chosen.
- It has good resistance to pests and disease.

The major reason that in recent years farmers in northern Victoria have begun to look at alternatives to ryegrass is because ryegrass requires a reasonable amount of moisture (rainfall or irrigation) to survive and perform. It needs moisture fairly regularly and doesn't cope very well with extended dry periods. There are other options that can be more water-use efficient. Ryegrass can also struggle to perform under hot conditions.

There is a range of ryegrass species used in pastures. The most important difference between them is their lifespan.

- **Perennial ryegrass** e.g. Vic, Impact, Banquet, Avalon, Fitzroy. It will survive for more than 2 years with greater persistence and grazing tolerance. The big benefit of perennial ryegrass is that if you have enough irrigation water they produce year-round relatively high quality feed. They don't need to be sown each year and depending on forage system and cow numbers, most of it can be directly grazed. It is relatively easy to manage. When water is a relatively low price it provides a high quality and normally relatively cheap feed source.
- **Italian ryegrass** e.g. Crusader, Feast II**.** Is normally a biennial and will normally grow for 2 years. The first year is the most productive as it generally thins out by the second year in the hotter, harsher environments. It can add more flexibility than a westerwold, if only sown for a single season due to its ability to keep growing into the early summer if adequate moisture is present.
- **Annual Westerwold ryegrass** e.g. Tetila, Winter Star. Strictly an annual as there is almost no growth in the second year unless there is some seedling regeneration from seeds set in year 1. This means that they will need to be re-sown each year. The biggest difference in this group is flowering dates which influences which cultivars will grow for the longest.
- **Hybrid ryegrass** e.g. Maverick. Is the result of a cross between perennial and Italian ryegrasses. Their lifespan is affected to some extent by the proportion of their genotype derived from each of their perennial and Italian parents. Some cultivars may have up to 90% perennial ryegrass parentage and therefore behave very similarly to true perennial ryegrasses, while others behave more like biennials.
- **Annual ryegrass (self-regenerating)** e.g. Wimmera ryegrass. These are generally used in dryland situations and can regenerate from seed each year. They normally only

have a short growing season which limits their productivity. Some cultivars are susceptible to annual ryegrass toxicity (these susceptible cultivars should not be sown).

Ryegrass cultivars may be either diploid or tetraploid

- **Diploid cultivars** have a single pair of each chromosome
- **Tetraploid cultivars** have two pairs of each chromosome. This results in larger leaves and tillers (although tiller numbers are reduced) and a higher ratio of cell contents to cell walls (resulting in higher nutritive value). Tetraploid and diploid cultivars exist within each ryegrass species.
- In many cases **tetraploid ryegrasses** are less persistent than diploid cultivars.
- There are numerous tetraploid hybrid and Italian ryegrass cultivars with an increasing number of tetraploid perennial ryegrass cultivars becoming available.

Within each species there are a wide range of cultivars which differ in:

- Lifespan – perennial vs. short rotation vs. annual
- Growth habit – prostrate vs. erect; high vs. low tiller density
- Growth patterns – seasonal pattern and summer dormancy
- Persistence during summer drought conditions
- Annual production levels
- Nutritive characteristics – digestibility and water soluble carbohydrate content
- Endophyte status – type and level of a fungus that produces a number of beneficial and/or adverse chemicals.

Cereals

When discussing cereals, it is referring to Wheat, Barley, Triticale, and Oats and to a lesser extent Rye Corn. Traditionally cereals have been grown to produce grain, with oats sometimes being grown for hay.

Cereals are commonly grown for forage purposes, with some varieties being bred especially for this purpose. ***Any variety of cereal can be sown for grazing and fodder production,*** but some varieties have characteristics that will allow it to achieve better results.
In recent years there have been many new varieties released. This now means that there is a huge variance across each type of cereal. This also means that there are no longer characteristics that are unique to only one type of cereal.

Cereals have been gaining popularity in recent years on dairy farms for use as a forage crop. The major reason for this is that they are relatively drought tolerant and generally yield better than ryegrass when moisture is limited. During the vegetative stage when they are grazed quality is comparable to ryegrass. However the more mature a cereal gets the more its quality declines. Cereals are fairly cheap (depending on variety and methods used) and simple to establish. Once understood their management is fairly simple. They are suited to a range of soil types, fertility levels and climatic conditions.

Cereals will generally suffer badly from water logging and pugging. While cereals are suitable for grazing, under most situations grazing will reduce the total yields. Cereals can only be grazed up until the time they switch over to reproductive mode (average grazing window of 4-8 weeks), or large yield penalties will apply. This means that normally a large proportion of a cereals yield will need to be conserved. Conservation adds extra cost onto the feed produced from cereals. This conserved feed, depending on when it was harvested, is normally only of modest quality, which can only make up a limited proportion of a dairy cows diet without milk yield penalties. Cereals are a true annual that haven't got a lot of flexibility in the way they can be managed once they are sown.

There is a limited window of opportunity to graze cereals

Peas

- Traditionally grown for grain but pea hay has been available from frost-damaged crops
- Pea hay is usually excellent quality
  - Crude protein (CP) around 16%
  - Digestibility 70%
  - Metabolisable energy (ME) 11MJ/kg

There are several types of peas are available, based on either seed colour or plant growth habit (traditional sprawling vine or semi-leafless 'clinging' type). The traditional peas can suffer from lodging and this makes mowing difficult. The semi-leafless peas stay more upright but can be a problem to mow.

- Peas suit slightly acid to alkaline soils
- Can tolerate heavier soils – but relatively intolerant of water logging (particularly late season)
- More drought resistant than traditional pasture legumes
- Offer a break crop opportunity – controls pests and diseases that effect cereals and grasses

- Sowing rates 100 kg/ha – depending on seed size
- Sowing can start mid-April into pre-irrigated soil
- Watering up can be risky
- Peas for grain are normally sown May/June to limit plant growth and control leaf diseases
  - Aim to avoid frost damage at flowering/early pod development
- Early-sown crops are ready to cut for hay late September/early October

A trial conducted in Kerang in 2008 (appendix 1) saw peas sown into moisture in late April and irrigated at the start of September yield 7 – 8 t DM/ha. Autumn/winter growth was approximately 2-3 t DM/ha.

- Being legumes, peas can make their own nitrogen (N)
- Inoculation with Group E rhizobia is recommended if peas haven't been grown before
- Whilst peas add N to the soil, cutting it for hay removes a lot of the N

In the early stages of growth peas are poor competitors against weeds, but there are several control options. Peas are very sensitive to many of the Group B chemicals commonly used.

Peas should not be grazed as recovery is poor

Peas have their share of pests and diseases. Apart from the seedling pests, such as RLEM, many are grain pests and present very few problems for hay growers.

- Disease can be an issue – particularly in wet weather
- Many diseases are either seed borne; harboured in stubble; some varieties have resistance
- Quality seed and rotations can avoid most disease problems

Vetch

Vetches are a group of similar plants to peas. There are differences between the vetch groups. The common vetch groups include the Morava and Blanchfleur varieties. They are typically shorter season types

- Purple vetch group includes Popany
  - Later maturing
  - Best tolerance of water logging
  - Reported problems with palatability – with crops grazed around flowering

- Third group is the woolypods
    - Includes Namoi, Capello and Haymaker Plus
    - Namoi is hard seeded
      - Relatively unpalatable to stock
      - Cases of poisoning have occurred

Vetches are legumes and so can produce their own nitrogen requirements. Inoculating with Group E rhizobia is recommended if growing for the first time

- Sowing rates approximately 40kg/ha
- Sow from mid-April
- Can water up as long as paddock is well drained and soil surface doesn't crust

- Vetch has similar soil requirements to peas
  - Well drained
  - More tolerant of acid soils
- Reasonably drought tolerant
  - Will drop leaves if stressed
- Vetch hay generally high quality
  - Average crude protein levels of 18%
  - Digestibility around 70%

- Energy levels just over 10MJ/kg

A trial at Kerang (appendix 1) saw the vetches produce 6 – 8 t DM/ha from a mid April start and an irrigation at the beginning of September. Winter production was quite low (<2tDM/ha) for all varieties except Popany

Vetch can be used for light grazing, but recovery is poor if overgrazed. It is not tolerant of water logging. Popany can tolerate occasional water logging and is the most suitable for irrigation.

Vetch has limited grazing potential

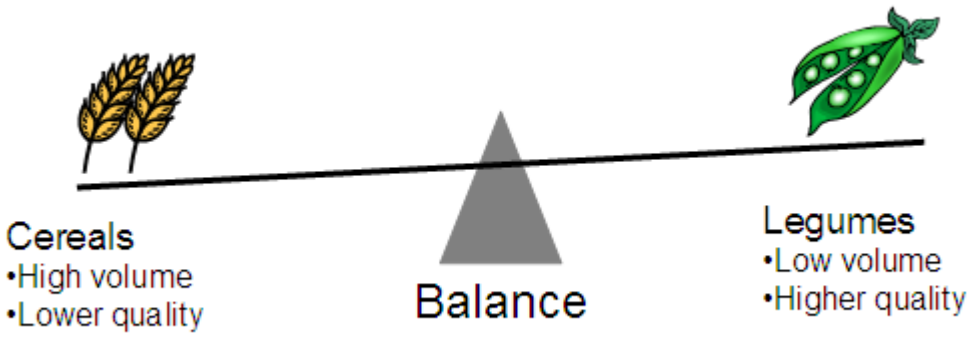
Lodging at maturity can be an issue with vetch. Using low rates of cereals can sometimes help keep plants off the ground.

- Vetch is relatively disease free
- Insect pests are only normally an issue early in the season

Woolypod Vetches have a reputation for hard seediness. They suit long term vetch pastures, but can be a weed in other situations.

- Weeds can be an issue in vetch crops
- There are limited post emergent sprays available
- It is also sensitive to Group B herbicide residues

Cereals and Vetch/Peas



In order to try and get high yields of quality hay, a mix of cereal and legume are sometimes sown together.

A trial sown at Rutherglen aimed to see what the effects of various ratios of oats to vetch.

- Pure oats gave the best DM yields, almost double the pure vetch (11.1t/ha vs. 5.9 t/ha).
- The energy levels and digestibility decreased with increasing vetch content.
- As a compromise, a 50/50 mix of oats and vetch had a small trade off in yield and a higher crude protein level. This would be around 30 kg/ha for each in a limited irrigation situation.

- If peas were substituted for vetch, a similar plant ratio would see a 30/70 oats to pea mix.

Some guides recommend sowing low rates of cereals to act as support for the legumes in an effort to stop them lodging and losing quality with composting.

However a mix of cereals presents a few issues that have to be kept in mind. The first is the mix reduces the options you may have for weed control.

Another is the hit and miss nature of sowing the mix. If one component is favoured by the growing conditions, then it can have a negative impact on the growth of the other. For example if the establishment of the oats is reduced, then the legume may overrun the cereal, or vice versa. If this occurs, then the anticipated quality of the hay may not be as planned. Added to this is the fact that both components have had there individual rates reduced than if they were sown individually and therefore may not yield to its potential.

Brassicas

Brassicas for animal forage have traditionally been used in cooler regions as a summer crop. In more recent times forage brassicas have been gaining popularity, to some extent and are largely still experimental. This has been in warmer and dryer regions like the northern irrigation region, and sown in late winter/early spring for late spring/early summer feed for purposes such as finishing off lambs. ***They are also beginning to be used more for sowing in the autumn as a winter crop and this is where these notes will focus.***

The Brassica family includes;

Forage rape	Turnips	Broccoli	Canola
Kale	Swedes	Hybrids	

Brassicas have mostly been sown on their own but are showing some promise in certain situations when other species are under sown with them, such as ryegrass or Persian clover (shaftal). The theory with under sowing ryegrass or clover is that initially the brassica will provide the bulk of feed, and then after each grazing the brassica thins out allowing the ryegrass or clover to thicken and provide more bulk. By late winter/early spring the brassica has nearly disappeared leaving the ryegrass or clover as the bulk of the crop. To have this happen consistently a fair bit of skill and compromise is needed.

Some of the benefits of Brassicas are:

- They produce a high quality feed
- Good yields on limited moisture in relatively short time
- Provide a good break crop for disease and weeds
- Cheap to sow because of low sowing rates (1-5kg/ha)
- Deep rooted and fairly drought tolerant

Some of the disadvantages of Brassicas are:

- Grazing management can be hard to get right
- It can take stock 3 days to adapt to grazing brassicas
- There is the risk of a wide range of animal health issues, so to avoid this it is recommended to keep intake down to a maximum of 5kg Dry Matter per cow per day.

- Can't be grazed for the first time until a certain time frame has elapsed for animal health reasons (varies but normally around 6-12 weeks depending on variety)
- Hate wet feet and pugging

In general, flood irrigating once they have germinated should be avoided. Pre-irrigating or irrigating up may be possible. While they are sometimes successfully established from direct drilling, more consistent results have been achieved from cultivating the paddock prior to sowing. Brassicas have low fibre content so the addition of fibrous feeds, such as hay, may be required to balance the diet.

Persian Clover, Balansa Clover and Berseem Clover

- The clover commonly referred to as "shaftal" or "Maral" is a late maturing, soft-seeded Persian clover and isn't actually in the Shaftal clover family.
- Wide range of maturity dates. This affects the length of the growing season and potential dry matter production. Early maturing will help guarantee that the clover will set seed if the season ends early but will reduce the potential yield if the season persists.
- Persian clovers can be both hard and soft-seeded. Hard-seeded varieties are more likely to have enough viable seed left in the soil to regenerate successfully each year. This needs to be managed in the first year to ensure a good seed set, normally ruling out a hay or silage cut.
- Persian and balansa varieties vary in their ability to perform well in different soil types and ability to withstand water-logging.
- The main variety grown for irrigation is Maral (shaftal), due to its suitability to irrigation and its late maturity.
- If sowing with a ryegrass make sure that the clover and the ryegrass flowering dates are about the same.

Sub Clover

- Wide range of maturity dates. This affects the length of the growing season and potential dry matter production. Early maturing will help guarantee that the clover will set seed if the season ends early.
- Sub varieties vary in their ability to perform well in different soil types and ability to with stand water-logging. Always seek local advice on varieties.
- If sowing with a ryegrass, make sure that the clover and the ryegrass flowering dates are about the same.
- The main benefit of sowing an annual clover is that they are legumes and therefore fix nitrogen into the soil. They are a high quality plant and maintain their quality well, whilst still providing good quality feed or hay/silage when they are flowering. They can also cope reasonably well with poor grazing management where ryegrass might struggle, due to frequent grazing or set stocking and/or grazing to hard.

Chicory

Chicory is a perennial herb that has a summer growing pattern with a peak growth period from mid-spring through summer until mid-autumn. It has a high nutritive value, a high mineral content and achieves reasonable yields similar to Lucerne.

Chicory prefers soils with reasonable fertility but is reasonably tolerant of acidic soils.

It is better suited to well-drained soils as it doesn't like water logging and can suffer from disease under this situation. Chicory is slow to establish due to its deep tap root but once established it is relatively drought tolerant.

Chicory is suitable to place in a perennial pasture mix or to sow on its own. Sowing rates for chicory range from 1-3kg depending if it is in a pasture mix or sown on its own.
Herbicide options are limited for chicory so including it in a pasture mix can make weed control difficult. Chicory (as with all herbs) does not fix nitrogen into the soil.

Good grazing management is needed for chicory, including rotationally grazing and making sure that stock do not graze the crown. Persistence varies; most farmers find it lasts from 2-4 years. Where Lucerne grows well, chicory will have few advantages.

Plantain

Plantain is a perennial herb that has a year round growing pattern. Plantain has a high nutritive value, a high mineral content and achieves reasonable yields comparable to other perennial pasture species. It has been known to increase animals' dry matter intake.

Plantain is widely considered to be only suitable when sown as part of a perennial pasture mix, due to it being a poor competitor that allows too many weeds to establish if sown on its own.

Plantain is relatively quick to establish for a perennial plant and will perform reasonably well on low fertility soils. Soil type isn't important, however it doesn't like compaction and for good persistence it requires a soil that allows deep taproot penetration. Due to plantain's deep taproot it is relatively drought tolerant.

Plantain severely reduces herbicide options making weed control in-crop difficult. Plantain (as with all herbs) does not fix nitrogen into the soil.

Mediterranean (winter active) fescue

This group of tall fescues refers to a Mediterranean strain that is designed to only grow through the cooler months of the year and to go dormant during the summer. Some of these Mediterranean fescues require soil temperature to fall below a certain level and also to have moisture present to break their dormancy.

They are a perennial grass and the existing plants are the ones that begin regrowing once dormancy has been broken. This trait gives this group of plants (if managed well) very good persistence under many dryland situations, and gives them potential in the northern irrigation region to be grown in the traditional sub clover systems.

This means that during autumn once the weather has begun to cool you can irrigate them up the same as an annual and then stop watering them during late spring. They should survive okay if not irrigated and will grow on natural rainfall. Yields are generally fairly comparable to other alternatives such as sub clover, ryegrass and phalaris and quality can be expected to be similar to most other grasses (without any animal health risks). However, they will deteriorate rapidly if allowed to grow taller than recommended (15cm during vegetative stages and 5cm during heading).

The use of an annual clover like a sub is generally recommended to improve quality and to fix nitrogen. Do not sow a Mediterranean fescue with maxP entophytes if there is any chance of horses grazing it.

This group of fescues are:

- Hard to establish and do not produce much in their first season.
- Require a good seedbed and very little competition during establishment.
- Preparation should begin in the seasons prior to sowing.
- They are expensive to sow requiring 12 - 20kg/ha of seed and the seed is normally $10-14/kg.
- Once established they do not require re-sowing each year
- If managed well they should persist a long time.

Complexity

Remember:

★ The more options that you choose the more complex it is to manage

★ Greater complexity = harder to achieve = more stress for you = a poorer job is done = reduced profits

★ If you don't get what you are currently doing right, then you are more likely to struggle with extra options

Keeping it simple for many will be the most productive and profitable option this autumn.

Effects of changing crop balances

Making major changes to the different species that you sow on your farm will have major impacts on your **whole farm system**. It can affect things like:

- When feed is available
- Feed quality
- More conservation may be needed
- More hand feeding
- More infrastructure and machinery

An example of this is farms that were traditionally pasture based that have now put large areas of cereals in. These farms now have to re-sow large areas of the farm each year, they only get 6 weeks of grazing from the cereals each year and they then make large pits of silage. This then gets fed back to the cows. They now find that most of the 6 week grazing period on the cereals is when most of the herd is dried off. Because of the high wastage levels when feeding the cereals out in the paddock they have put in a feed pad. Because the cereals were not high enough quality they started adding canola meal. To do this they needed a mixer wagon. This then took up a lot of time so they employed an extra worker. They have now found that while the cereals were water efficient and seemed cheap to grow they now have an expensive and more complex system to run.

For any change to your farm system that you may be considering you need to think and plan for it, and not just stumble along by accident.

Key Factors that determine when to sow

When deciding the best time to sow or irrigate up pasture and crops several key factors need to be considered:

1. Temperature - Will the pasture/crop successfully germinate and what will the growth be like?
2. Moisture – How much irrigation water do I have? When will it rain? What is the risk of a false break? How efficiently will it use the water at that time of the year?
3. Species chosen – What temperature requirements does it have? What is its growth habit?
4. When is the feed needed?

Other key elements to ensure a successful pasture/crop include:

- Good seedbed and seed to soil contact
- High establishment density
- Good soil fertility
- Minimal effect of pests and diseases.

The success of these is determined by the level of time and preparation that goes into each.

All of these decisions are easy in hindsight – but we do not have this benefit. As the farm manager you need to interpret the information and make decisions based on how YOU think the seasonal conditions will unfold.

Temperature effects on germination

High temperatures limit the germination of many crops and pastures even if soil water is available.

Clovers

- For annual clovers such as subterranean, balansa and berseem, the proportion of seeds that will germinate is greatly reduced at soil surface temperatures above 25°C.
- The germination of the Persian clover cultivar “Maral” (also known as shaftal clover) is not affected by soil surface temperatures up to 35°C.
- The germination of other Persian clover cultivars at high temperatures is between that of subterranean and “Maral” Persian clover.

Ryegrass

The germination of ryegrass is also reduced at high soil surface temperatures over 25°C. This limits the likelihood of successful ryegrass establishment from early starts.

Cereals

- Germination of oats is normally satisfactory within a surface soil temperature range of 10°C to 25°C.
- Some varieties can germinate at higher soil surface temperatures, but no varieties will germinate at 35°C.
- In general, maximum soil surface temperatures need to be a couple of degrees lower for germination of wheats and barleys.
- If soil temperatures are above 20°C the coleoptile (first shoot) will normally be shorter. If adequate soil moisture is present it is best to sow cereals shallower than 4-5cm to allow them to establish successfully. The seed still needs to be sown deep enough to ensure it has access to enough moisture.
- An indication of maximum daily soil temperature can be determined by placing a thermometer at the planting depth from mid to late afternoon.

Cold temperatures

The cooler the temperature gets the slower the germination and growth of plants.
As the season progresses and day length and temperature decrease, it may be better to select plant species that are more suited to those conditions e.g. winter cereals, annual ryegrasses.

Dry sowing? Or waiting for the break?

There are many pro's and con's for either sowing a pasture or crop into dry soil and waiting for the rain; or waiting for the soil to be moist from rain and then sowing.

When sowing dry without the assistance of irrigation, false breaks or small rain events need to be taken into account. They can germinate the seed but then without follow up rain or irrigation, the seedling can run out of moisture.

Sowing into a dry soil is most common when the break arrives later than desired. This means that the day length will be getting shorter and soil temperature is also dropping and getting the crop or pasture up and growing becomes the highest priority. This situation also normally means that farmers with large areas to sow need to get started so that they are finished before it gets too cold. Having the seed in the soil, sitting and waiting for the rain means that it will be up and growing far quicker than if the seed wasn't sown until after moisture arrives.

If sowing without the use of irrigation a number of things need to be considered.

- Firstly if waiting for rainfall to sow, caution needs to be taken into account to make sure that the rainfall event isn't likely to become a false break. This is where there is adequate moisture from rainfall to germinate the seed, but not enough to sustain it. The risk of this occurring decreases later in the season. Generally there will be a high risk up until April, and even in April it will generally need to be a large rainfall event, or a reliable forecast for follow-up rain.
- Many farmers use Anzac day as a date to start dry sowing as this is a guide to when the risk of a false break has decreased enough.

- Sowing dry refers to sowing into a dry soil and waiting for a rainfall event to come along that is large enough to germinate the seed. It is used as an option because it allows the plants to germinate and start growing as soon as moisture does arrive. This becomes more of a priority the later in the season it gets. It is also used when large areas need to be sown and if farmers wait until the break to start sowing they won't finish sowing the last paddock before it gets too cold.
- The risk of a false break is even greater for dry sowing, because a small rainfall event that you wouldn't have sown on can sometimes be enough to germinate the crop, but won't be able to sustain it for very long.

Apart from delaying dry sowing there are some other techniques that can be used to lessen the risk of a false break. They are:

- To sow the seed deeper, requiring a larger rainfall event to germinate the seed. You still need to make sure that the seed isn't sown so deep that it won't emerge or has run out of energy when it does. This technique is mostly suited to larger seeded plants like cereals.
- The larger seeded plants like cereals generally have a better ability to survive what would have been a false break than many other plants. This doesn't mean that small seeded plants can't be sown dry; it is just that they are more risky. However this becomes a more viable option later in the season i.e. May.
- Waiting for the rain not only greatly reduces the risk of a false break but it also gives you the opportunity of getting good weed control prior to sowing. By waiting for the rain to germinate the weeds and subsequently spraying or cultivating them, and then sowing generally gives you a far better and more cost effective weed control, as opposed to trying to control weeds once the crop or pasture has come up, (the only option when dry sowing). Also many weeds like capeweed can get going quickly and smother crops and pastures while they are establishing, reducing the density of the pasture even once the weeds have been sprayed out.
- Finally there is also a smaller risk with dry sowing that if the seed is sitting in the ground a long time before the break arrives, then pests such ants, crickets, mice and birds will remove seed.

Historical Data on 'the Break'

Table 1 looks at 121 years of rainfall data in Kyabram and identifies, for each month, the percentage of true versus false breaks. For example, 16% of the historical records show a germination event occurring in January. However, all of these events were a false break, with none of them providing adequate soil moisture to maintain plant growth after germination. In contrast, a true break occurred in May 38% of the years with only 7% of the years producing a false break.

Table 1: Rainfall (1886-2007) at Kyabram that may result in germination (% years)

Month	False break	True break*	Cumulative true break
January	16	0	0
February	18	1	1
March	18	7	8
April	8	22	30
May	7	38	68
June	2	24	92
July	1	6	98

*True break - defined as adequate soil moisture following germination to maintain plant growth for a minimum of three months. Data from Kevin Kelly (DPI Kyabram)

The table tells us that the later we push into autumn, the better the chance that a rainfall event will be a true break. It is very risky to sow without any irrigation before late April due to the increased chance of a false break.

Autumn Water Use

The quantity of water required largely depends on the number of irrigations required in autumn and spring. Climatic conditions (amount and distribution of rainfall and evaporation), soil type and depth of water table will also influence water requirements.

The typical number of irrigations required for annual pastures and forages in autumn are:

- Early February start-up, 7 irrigations
- March start-up, 4 irrigations
- Early April start-up, 2 irrigations

The number of required irrigations can be 1 or 2 less in a wet year and 1 or 2 more in a dry year with high evaporation rates.

The amount of water applied at the first irrigation in autumn on annual pastures or forages is typically 1–3 ML/ha. Subsequent irrigations typically require 0.5 ML/ha, depending on your soil type or irrigation layout.

Water use varies greatly from farm to farm and also from paddock to paddock. **Recording your own water use will help greatly in the future to plan your irrigation strategies**

Cereals

Cereals can be started up in March if the temperature has cooled down enough (refer to temperature requirement section), and provided that a suitable variety has been chosen. Cereals will survive better than ryegrass and clover if irrigation frequencies are spread out, due to a better drought tolerance.

Spreading out the irrigation frequencies is normally used with cereals due to their dislike for getting wet feet. Also, in the warmer temperatures (over about a maximum temperature of 25°C) irrigating a cereal crop that hasn't developed a canopy yet which is capable of shading the water, can result in cooking the plants. Spreading out irrigations does not mean that you will necessarily use less water, because the next watering you do will use more water.

The benefit of cereals' ability to survive better if irrigation frequency is spread out is that if you run out of irrigation water it is more likely to survive until rainfall does come, within reason. However, if you do not have enough irrigation water to irrigate the crop through until you could reliably expect rainfall, delaying sowing is a safer strategy to avoid the risk of losing the crop or stressing it to the point that it will struggle to recover properly.

The farmers who have been starting up cereals early have mostly found that:

- early March start-up uses 2-3 irrigations
- mid to late March start-up uses 1-2 irrigations
- April start-up uses 1 irrigation

It is risky to water cereals too late (past late April) because they are susceptible to water logging and will typically suffer far more than a ryegrass or clover will.

Stretching out irrigation frequencies will mean that each irrigation uses more water than more frequent irrigations would, often saving little or no water at all. If irrigations are stretched to the point that the cereal plants are placed under considerable stress this can cause poor water use efficiency.

Note: The typical number of irrigations required for **annual pastures** and forages in **spring** are:

- August requires an irrigation in 25% of years
- Late September finish = 1 irrigation
- Late October finish = 2 irrigations
- Late November finish = 4 irrigations

The number of required irrigations can be 1 or 2 less in a wet year and up to 2 or 3 more in a dry year with high evaporation rates. The first irrigation in spring following a dry winter may require up to 1.0 ML/ha and normally about 0.5 ML/ha for subsequent irrigations.

Autumn Yields

The time of establishment effects autumn-winter Dry Matter (DM) production.

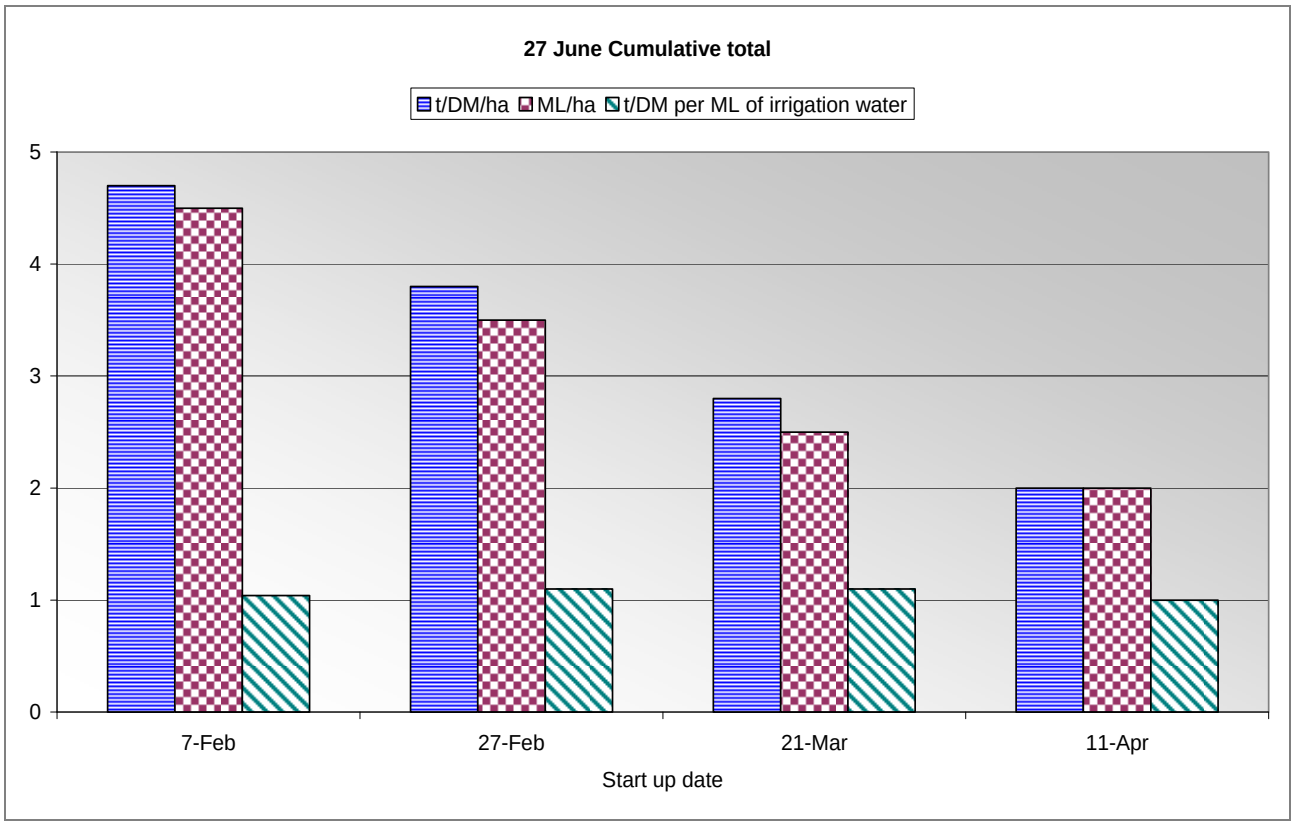
For every month that irrigation start-up is delayed after early February, the potential autumn-winter DM production from annual pastures declines by 0.5 to 1.5 t DM/ha, with a decline of 1.0 t DM/ha being typical.

However, starting up early in February or early March has a high risk of poorer responses or complete failure if hot weather is experienced.

The DM production from annual pasture species is similar up to late June (given similar starting times), averaging 4.7 t DM/ha for an early February start-up, 3.8 t DM/ha for a late February start-up and 2.8 t DM/ha for a late March start-up.

With annual pasture species a late **autumn** start-up time has little effect on DM production in spring. However by sowing some varieties earlier than recommended it can cause them to flower earlier in the spring. Flowering earlier normally reduces the amount that they will grow during the spring. This can also reduce the total amount grown for the year despite growing more in the autumn.

The following graphs show how yield, water use and water use efficiencies are affected by varying autumn start ups. The numbers can vary a lot from season to season. The following data is based on averages and shows trends that might be observed during 'typical' seasons. However, hot, dry, cool or wetter than normal seasons will show up different trends, with hot and dry seasons favouring the later start-ups, while cooler, wetter autumns favour earlier start-ups in terms of water use efficiencies. Over recent seasons higher water use has often been observed.

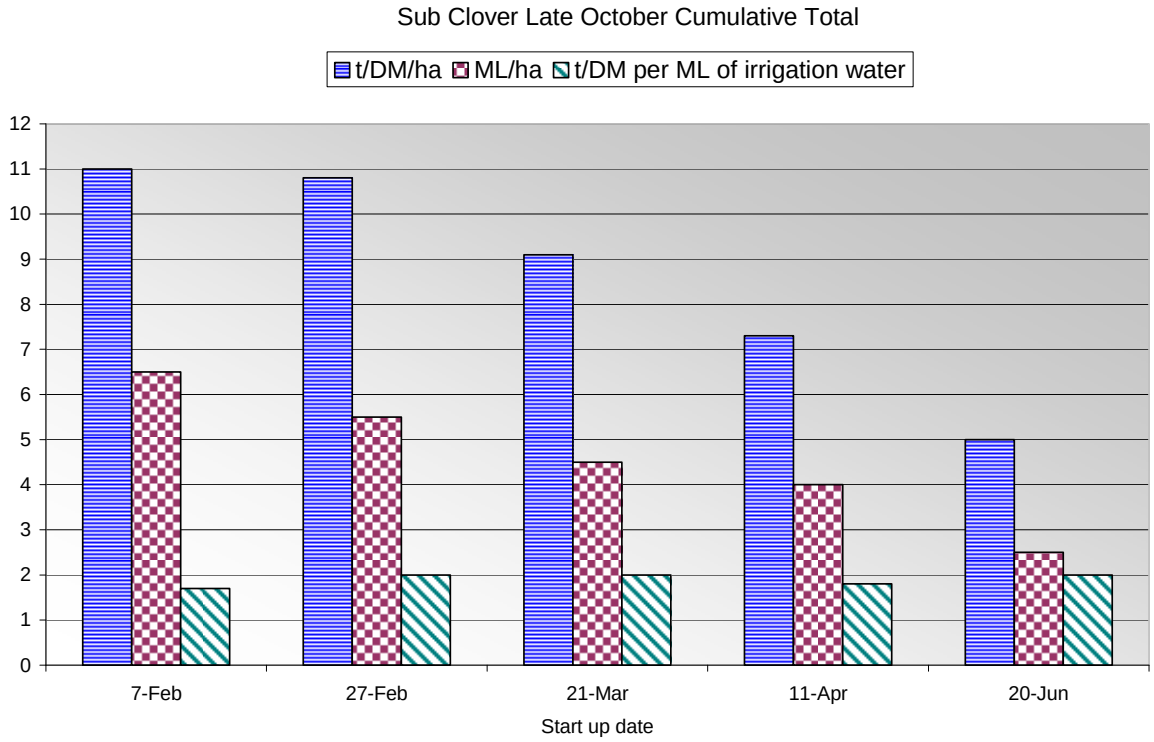


Graph 1: This graph shows DM grown to 27th June with different start-up dates and the associated water used and the water use efficiencies.

This graph shows that yield during autumn/early winter is greatly reduced by starting up later. In contrast water use starting up in early February is more than double that if you waited until mid April.

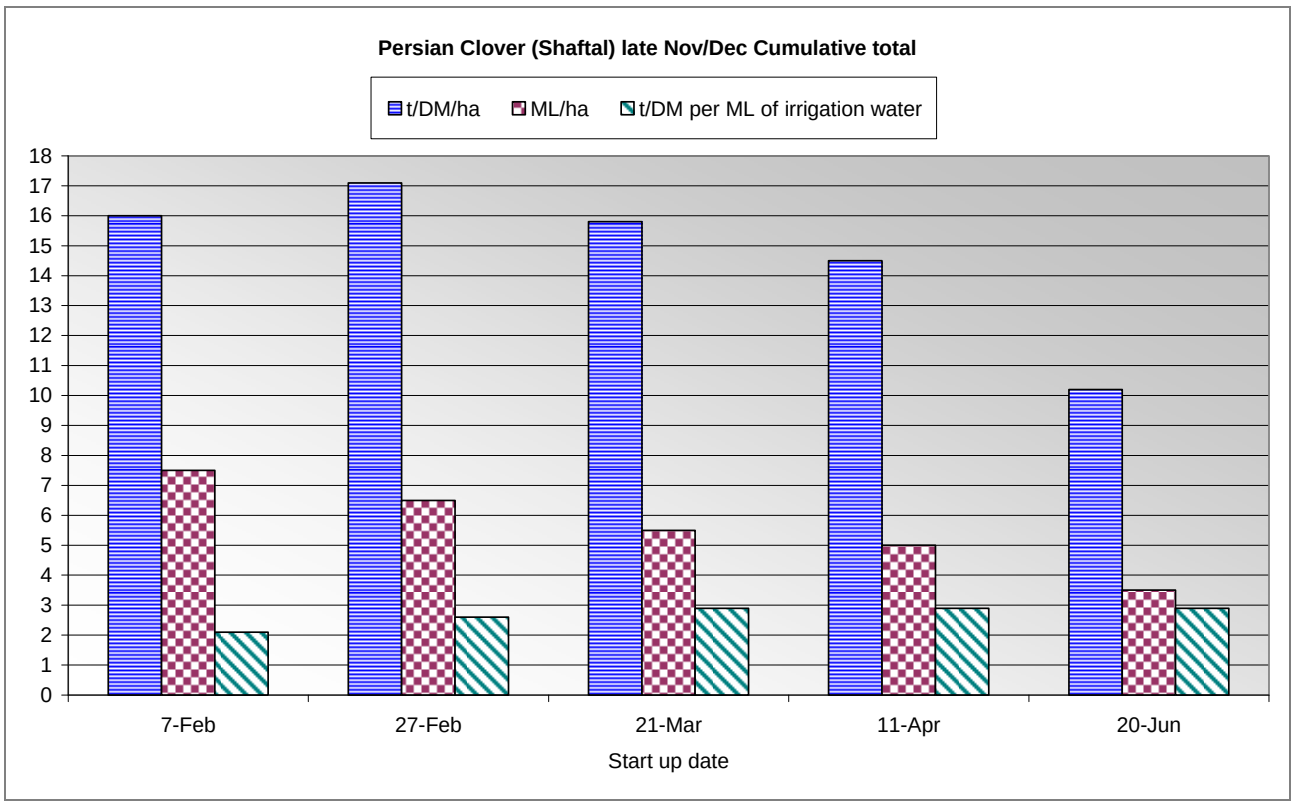
★ yield vs. water use

In this data the water use efficiencies are similar between all the start-up times. An earlier start-up is a much riskier strategy due to the fact that if it gets hot, you may get a poor germination. In addition, you are likely to use more water while possibly getting poorer growth. Another factor affecting water use efficiency is that the first irrigation normally uses about 3 times as much water as the subsequent irrigations e.g. to water one hectare once uses typically about 1.5ML in total, to water twice uses typically 2ML in total.



Graph 2: This graph shows DM grown by sub clover until the end of October with different start-up dates and the associated water used and the water use efficiency. The 20th June start-up was sown without irrigation but was irrigated the same as the others during spring.

This graph shows how start up times can impact on the full season in sub clover pastures. Starting up annuals early will generally cause them to flower earlier at the other end of the season. This will mean that quite often the annuals growth rates will slow down even though it is a peak growth time of the year (October), and this is the reason for the 7-February yielding similar to the 27-February. The water use efficiency is lower as a comparison to the others for the February 7th due to the poorer spring performance due to the earlier flowering.



Graph 3: This graph shows DM grown by shaftal until December with different start-up dates and the associated water used and the water use efficiency. The 20th June start-up was sown with out irrigation but was irrigated the same as the others during spring.

The reason for the 7 February yielding less than the 27th February is because the shaftal will have started to flower earlier in the spring due to the earlier start-up meaning that its growth slowed during a peak growth period. This data set also shows that the optimum use of irrigation water over the full season was achieved by waiting until after mid March to begin irrigating. Similar water use efficiency of irrigation water was achieved by all start-ups after mid March.

Recently there has been research carried out at Kerang to see what effect different start up times had on cereals and an irrigated legumes trial (e.g. Peas, Vetch, Sulla, Medics) (appendix 1). In conclusion from the trial and from farmers and agronomists that have tried irrigating cereals up in late February or early March have indicated that the cereals seem to grow as well as and sometimes a little worse than annual pastures over the autumn period. However in terms of total dry matter grown over the season not much extra was achieved from starting up in early March compared to later in March. Many of these farmers have learnt the hard way that if you are going to start a cereal up earlier than mid April it is critical that you choose a very late maturing variety. Even better in many cases is a cereal with a "winter" habit, an example is Mackellar wheat. Some farmers that have started up early maturing cereals in early March have found that they have come out in head by May and produce very little quality feed and have needed to re-sow something else.

Grazing

The amount of time that is needed from when a pasture or crop is sown or first irrigated (this includes rainfall) and when it can be grazed varies greatly. Both the species and varieties chosen effect this, with some being faster to establish or not needing to be as well established at first grazing. Day length and temperature also affect how quickly a pasture or crop can get to a stage that is ready to be grazed. Longer days or warmer weather encourages quicker growth and increases leaf appearance rates in many plants.

If sowing in early March it is reasonable to expect that you may be able to start grazing in 6-8 weeks for most crop and pasture types. If not sowing until early June it is probably more likely that you will be waiting 8-12 weeks for your first grazing.

It is important to make sure that all plants are firmly anchored into the ground prior to grazing by doing the ‘pluck test’.

Appropriate grazing management can make a huge difference to the amount that your crop or pasture will grow. Normally the first grazing is the most critical to get right in terms of setting up your pastures or crops to grow the most possible.

Should I start up a large area late, or a small area early?

Available research data was used to look at a range of scenarios to try and find the optimum use for a set amount of irrigation water on a set amount of land. Some interesting results were revealed:

- There is very little difference in the total amount grown by using different start-ups times (after mid March).
- Using a range of start-up times will spread the risk associated with climate conditions.
- Using different start-ups can help to avoid large amounts of feed being ready to graze all at once.
- Warm and dry conditions will favour holding off a bit and starting-up a larger area later while a cool and/or damp autumn will favour starting up earlier. Unless you can predict the upcoming weather, using a range of start up dates will spread the risk.
- If quality feed is required early then starting up early can make good sense as long as the cost of the water to grow this feed doesn’t outweigh the amount you could purchase feed of similar quality for.

Tom's Top 10 Tips

1. High temperatures limit the germination of many crops and pastures even if soil water is available.

2. A high establishment density (good germination) is critical to have a productive crop/pasture.

3. Just because it is cool in one month doesn't mean it will stay cool in the next. This lesson was learnt by many farmers in 2008 after the cool February. There were many complete failures of late February/early March sown pastures and higher water use and poor growth of many others after temperatures rose again in March.

4. Water use varies greatly from farm to farm and from paddock to paddock. Recording your own water use will help greatly in the future for water budgeting and to plan your irrigation strategies.

5. **The more species that you choose the more complex it is to manage and the harder it is to get right. If you don't get what you already grow right then you most likely won't get any other options right.**

6. **Using a range of start-up times will spread the risk associated with climate conditions.**

7. It is risky to water cereals too late (past late April) because they are susceptible to water logging and will typically suffer far more than a ryegrass or clover will.

8. For every month irrigation is delayed in autumn, typically 1.0t/ha less will be grown (up until the end of June).

9. The later we push into autumn, the better the chance that a rainfall event will be a true break. It is risky to sow without any irrigation before late April due to the increased chance of a false break.

10. Starting up some species (e.g. annual clovers and 'spring' cereals) earlier than recommend will result in them flowering earlier. This will mean they will grow less DM for the season also often resulting in poorer water use efficiency over the full season.

What is water worth?

Water is worth a different amount to each farmer. Its value depends on the amount of feed you can grow with it and the value of that feed. The following information looks at one process for valuing temporary water for use in autumn start-up.

The value of the water on any individual farm will depend on:

1. Amount of irrigation water used

2. Amount of extra feed grown and consumed from autumn irrigations

3. The value of the extra feed grown

1. Amount of irrigation water used

How much irrigation water will you use to start up your pasture or crops or to get one or two extra irrigations? This will depend on soil types, moisture profile of the soil and when you decide to start up. The typical number of irrigations required for annual pastures and forages in autumn are:

- Early February start-up, 7 irrigations
- March start-up, 4 irrigations
- Early April start-up, 2 irrigations.

The number of required irrigations can be 1 or 2 less in a wet year and 1 or 2 more in a dry year with high evaporation rates.

The amount of water applied at the first irrigation in autumn on annual pastures or forages is typically 1–3 ML/ha (keeping good irrigation records will help to determine the exact amount for your farm). Subsequent irrigations typically require 0.5 ML/ha or more, depending on your soil type or irrigation layout.

2. Amount of extra feed grown and consumed from water purchased

How much extra feed will be grown from the water that you purchase (versus starting up one fortnight or one month later or waiting for the autumn break to sow)?

For every month earlier that pastures are irrigated up, there is potential to increase autumn-winter DM production from 0.5 to 1.5 t DM/ha, with an increase of 0.9 t DM/ha being typical. This increase is seen up until early February or when temperatures are too high for good germination. Extra feed grown will depend on pasture density, good weed and pest control and climatic conditions.

Good grazing management is then required to ensure as much as possible goes down the cow's throat. A farm that consumes only 7 t DM of pasture per hectare per year will not get the same value out of water as a farm that consumes 11 t DM per hectare per year.

3. The value of the extra feed grown

What is the value of the extra feed you have grown? Or in other words, what would it cost you to buy a tonne of feed of the same quality to feed your cows?

What is the quality of the pasture or crop you will grow? What is happening on the hay and grain markets? Also think about potential wastage and feed-out costs of bought in feeds and always compare feeds on a dry matter basis.

Should I buy some water?

Calculating a value:

Amount of purchased water used	_____ ML	**(A)**
Amount of extra feed grown & consumed from water purchased	_____ t DM	**(B)**
Tonnes DM ÷ ML used (B ÷ A)	_____ t DM/ML	**(C)**
Value of purchased feed of equal quality	_____ $/t DM	**(D)**
t DM/ML x $/t DM (C x D)	_____ $/ML	**(E)**

This last number (E) gives you a rough idea of how much you could pay for temporary water versus buying in equivalent quality feed to feed your cows. The estimate for any individual farmer will vary according to their personal feeling about risk. Some margin for risk should always be included in any analysis. This is the risk that the figures you use don't eventuate, i.e. you use more water on your first irrigation than expected or don't get the growth rates you counted on.

An example:

Amount of irrigation water used	(two irrigations) 1.5 + .5 = 2 ML	**(A)**
Amount of extra feed grown & consumed from water purchased	1.5 t DM	**(B)**
Tonnes DM ÷ ML used (B ÷ A)	1.5 ÷ 2 = 0.75 t DM/ML	**(C)**
Value of purchased feed of equal quality	$350/t DM	**(D)**
t DM/ML x $/t DM (C x D)	0.75 x 350 = $263/ML	**(E)**

Every farm will have a different price they are willing to pay but the process above shows one way to work through the calculations. As with many decisions, the right answer will only be known with hindsight.

If you would like help working through this process for your farm, contact a DPI dairy extension officer at:

Echuca (03) 5482 1922

Cobram (03) 5871 0600

Tatura (03) 5833 5222

Wodonga (02) 6043 7900

Appendix 1:

2009 CROPPING TRIALS – LESSONS LEARNED

Damian Jones, DPI Kerang

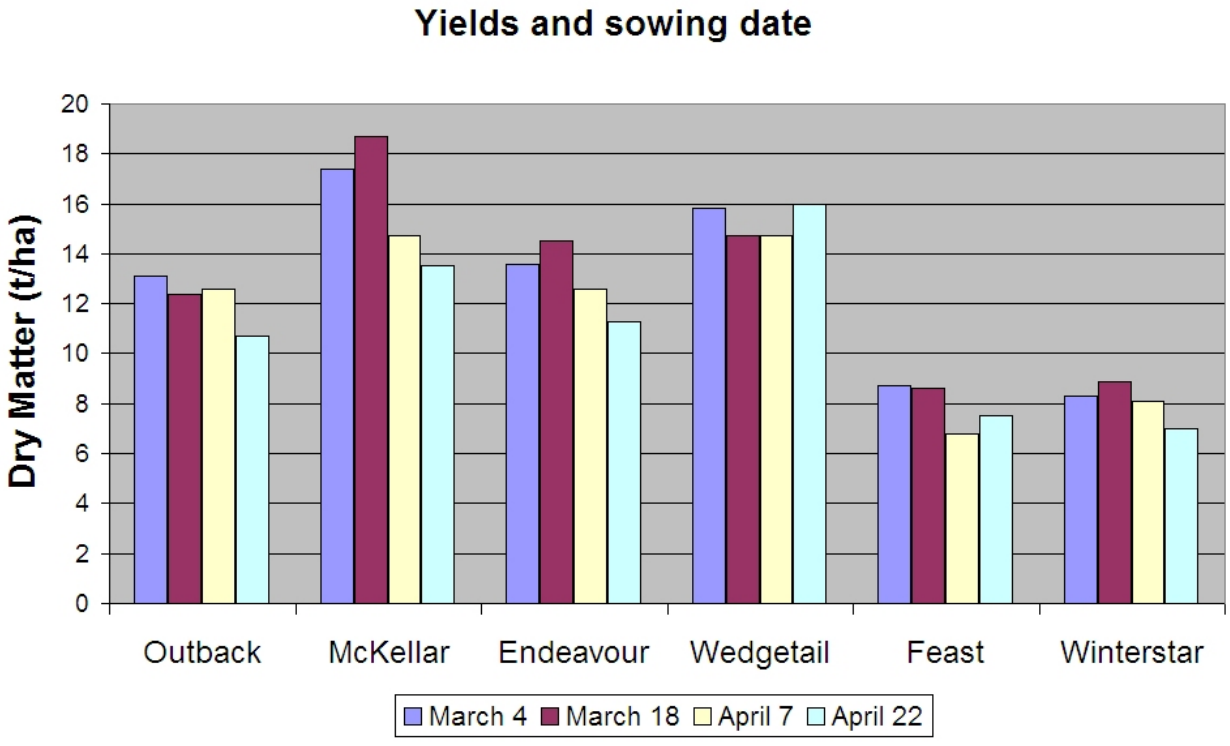
Early Cereals Trial

The trial was sown in response to questions and feedback from the "Cropping for Dairy Farmers" workshops run in February 2009. Questions arose regarding whether the timing for sowing cereals was similar to the typical local practice of starting annual ryegrass pastures in early March.

- Chosen varieties were Wedgetail and MacKellar wheat, Endeavour triticale, Outback oats and Feast II, and Winter star ryegrass.
- Ryegrass plots irrigated March 18th
- Dry matter cuts taken to simulate grazing
- Final cuts taken at milky dough stage
- Soil temperatures were also recorded during March & April to see if there was any effect on establishment from relatively high soil temperatures

	Sowing Date	Watered up	Second watering	Simulated Grazing		
				May 11th	June 22nd	July 21st
1	March 4th	✓	Yes = April 7th	✓	✓	✓
2	March 18th	✓	nil	✓	✓	✓
3	April 7th	✓	nil	✖	✓	✓
4	April 22nd	✖	nil	✖	✖	✓

Note: On lighter soils the March 18th would normally need a 2nd irrigation. The Ryegrass sown in March got irrigated 3 times.



Once again rabbits grazed the early production of the trial. They preferred the ryegrasses so the total production of the ryegrasses is reduced. ***A 2008 trial containing ryegrass and the cereals saw similar dry matter totals for both.***

Separate germination tests (using the maximum temperatures experienced by the germinating cereals in March), revealed reductions in all cereal germination rates, particularly with the oats. There is a varietal response, with the Wedgetail wheat having a slightly reduced germination rate compared with McKellar (89% vs. 56%). This germination test used the maximum temperatures and for longer periods than in reality, but it is important to note that they did show the negative effect from early sowing.

Looking at the dry matter totals, there seems to be little benefit in starting too early when the temperatures are still high. Soil temperatures didn't fall below 25ºC until later in March. This seems to match the rule of thumb for starting autumn pastures when soil temperatures fall below 25ºC. Once again, there are other factors to consider, such as the slower start of the winter wheats compared with the other cereals, and the increased likelihood of needing to water twice if starting in March.

Sowing early
= High soil temperatures in March had a negative effect on germination
= There was little benefit to Dry Matter totals

Irrigated Legumes for Fodder Trial

With irrigation allocations at low levels, farmers are seeking alternatives to the traditional pasture legumes such as sub clover and shaftal (Persian) clover. While the focus of this trial was the dry matter produced by peas and vetch under **limited** flood irrigation, the trial included some of the medics and clovers suitable for the heavier soils.

All species except for the peas were sown and irrigated up on April 8th 2009. The peas were then sown into moisture on April 22nd. Sowing rates were unusually high (125 kg/ha) in the medics and some of the clovers. This was to compare "apples with apples", i.e. the performance of established medic pastures (which may contain 200+ kg/ha of seed) with the legumes sown as a fodder crop.

There was a problem with rabbits grazing the palatable species (most of the clovers) early in the season. However, they tended to leave the snail medic, peas and vetch alone. Grazing pressure from the rabbits declined in May as rain brought alternative sources of feed

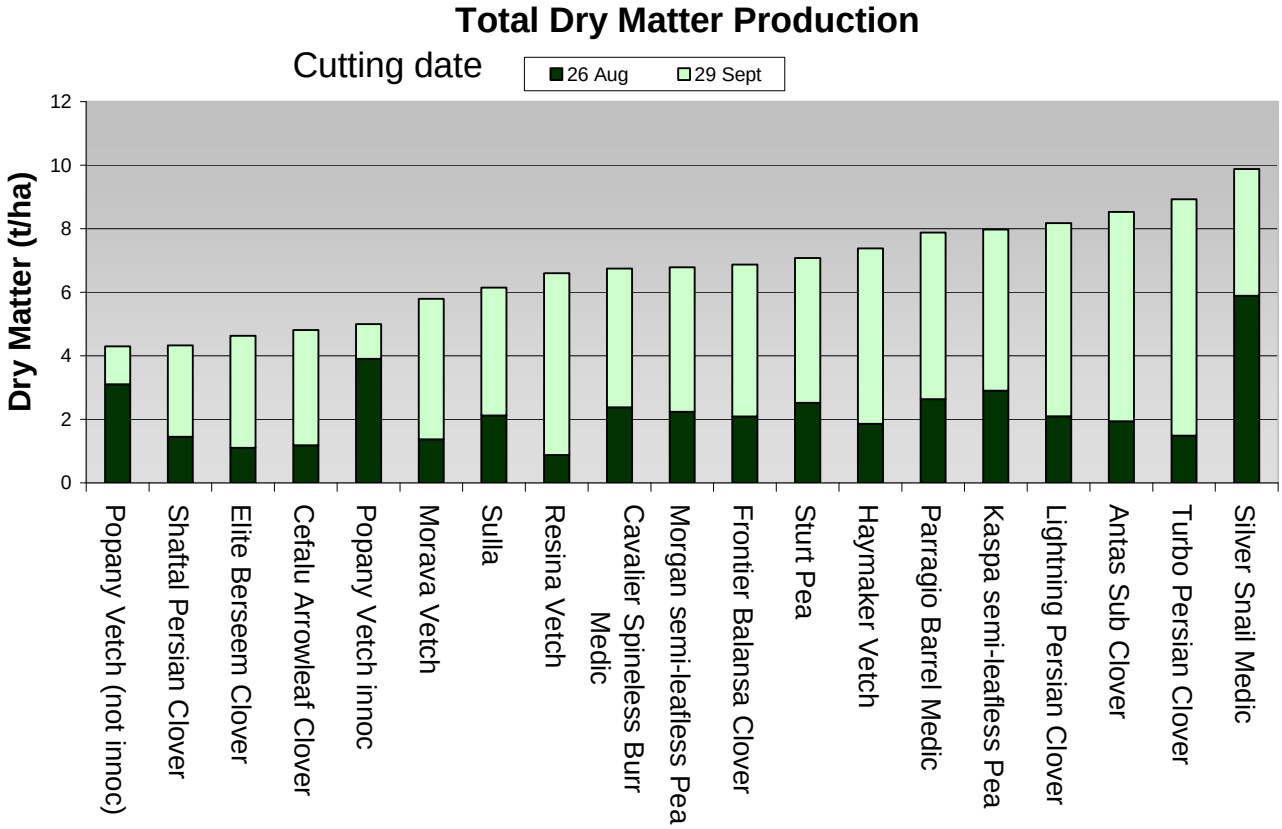
The first dry matter assessment was taken on August 26th.This cut represented what could be achieved with a start-up autumn watering and winter rainfall only. At this stage most of the legumes were moisture-stressed and likely to die without subsequent rain or irrigation.

Small areas from each plot were harvested and the dry matter calculated. This was done so as to see what dry matter was produced up until this stage of growth, which could be typical of plant growth under **dryland conditions**. The cut was not intended to measure a response to grazing, but only to determine the dry matter present.

Following this assessment, the trial was irrigated on September 2nd to represent the situation whereby spring irrigation was permissible. The total water use, including watering up, was 3.5 ML/ha.

The second cut on the remaining portion of the plot was taken on September 29th. Hence, this cut did not represent regrowth, but the growth for the total trial period. Once again there was little soil moisture left, but many species had already reached sufficient maturity to cut for forage.

The graph below illustrates the amount of dry matter produced by the various legumes. The lower bar is the dry matter produced by August 26th, and the entire bar corresponds to the total dry matter present on September 29th.



The graph shows that many of the legumes have differing winter/spring growth habits. Some featured more winter growth and others showed more growth in spring (i.e. after August 26th). This includes different varieties from the same broad groups of plants such as the vetches. Other options would be expected to perform better if the season was extended and subsequent irrigations were available, e.g. shaftal.

This trial gives an indication of the potential dry matter possible under flood irrigated conditions. Other factors would have to be considered such as grazing potential, palatability and water logging tolerance if it was a wet winter.