5. Crop establishment

Leigh Jenkins, NSW DPI

Successful crop establishment is crucial to achieve maximum potential yield. Timeliness of sowing is the most important factor followed by an evenly established and uniform plant stand. Canola has a small seed and should ideally be sown into good moisture at an even and shallow depth.

Successful establishment is linked to crop profitability through:

- higher yields, from quick and uniformly emerging seedlings;
- maximum yields are achieved from crops which have at least 90 per cent ground cover prior to bud appearance;
- improving the ability of canola to withstand insect attack and compete with weeds in the first six weeks;
- even growth and maturity, allowing timely in-crop management decisions such as weed control, fertiliser applications and insect control; and
- more even ripening improving the timing of windrowing and harvest.

PRE-SOWING MANAGEMENT

Soil preparation

To ensure good seed to soil contact, place the seed into a seedbed that is firm, level and moist near the surface. Avoid sowing into loose or 'fluffy' soil. If adequate seed soil contact does not occur, the small canola seed cannot absorb enough moisture from the loose drying soil, resulting in a reduced and/or staggered germination (often occurring over six weeks). Heavy stubble cover on the surface can reduce emergence and early vigour. However, some surface cover is desirable to prevent wind and water erosion and sand blasting on sandy soils.

Like wheat, canola will benefit from stored subsoil moisture, particularly in marginal cropping areas, where winter and spring rainfall is unreliable. Manage fallows efficiently to maximise the amount of moisture at sowing.

Generally, pre-sowing operations for dryland crops should be finalised by the end of March or early April in low-rainfall

A uniformly established crop is the foundation for a potential high yield.
PHOTO: F. PRITCHARD, ICF

Keep as much stubble away from the planting row as possible.

PHOTO: S. BRUCE and J. KIRKEGAARD, CSIRO

Excellent establishment using no-till in South Australia. PHOTO: SARDI

areas, allowing sowing to commence with the first opportunity rain in early to mid-April. In medium rainfall areas, paddocks should ideally be prepared by mid April. In cooler, long-season, high rainfall districts prepare paddocks by early May.

The definition of low, medium and high-rainfall areas varies between states, as the climate ranges from Mediterranean (winter dominant rainfall) in South Australia through to temperate in southern and central NSW to a summer dominant rainfall pattern in northern NSW.

Sowing equipment

Canola can be established successfully using a wide variety of seeders, from those suited to cultivated seedbeds through to full no-till implements. Tined or disc seeders can be used, depending on factors such as the farming system, soil types, stubble loads, and the grower's personal preferences.

Attention to weed control during the preceding crop rotation is needed to provide weed-free and problem-free sowing. Substituting cultivations before sowing with one or more knockdown herbicides enables better moisture retention and sowing with minimum soil disturbance.

Stubble management

Stubble retention plays a significant role in most modern cropping systems, with many benefits including reduced risk of erosion, maintaining organic matter, increased water infiltration and reduced evaporation.

In the lower rainfall areas of Victoria and South Australia, stubble retention appears to have few negative impacts where stubble loads are less than 4 t/ha. However, in the higher rainfall areas of southern NSW and Victoria, stubble loads of 7–10 t/ha can cause physical problems during sowing, as low summer rainfall limits stubble decomposition. Research has consistently demonstrated that increasing stubble loads (particularly over the seed row), can reduce emergence, plant establishment, growth and, in some instances, yield. On average, a 5 t/ha stubble can reduce emergence by 25 per cent and plant establishment by 33 per cent.

When sowing into stubble, ensure that stubble is pushed away from the sowing row (into the inter-row spaces) to reduce the problems causing poor early crop growth but still maintaining the benefits of stubble cover.

SEED QUALITY

Desirable seed quality characteristics

Seed quality will determine the likelihood of producing a strong healthy seedling and sufficient plant population for a potential high yield. It is usually measured by germination percentage but seedling vigour is equally important.

Under quality assurance (QA) schemes, seed companies supply seed which has been tested for germination and purity. Seed crops are generally produced under irrigation or in high-rainfall zones to maximise seed size and quality. They are grown in isolation from other canola crops to minimise genetic drift and guarantee genetic purity.

Minimum guaranteed standards for canola seed include:

- minimum germination percentage of 85 per cent;
- minimum purity of 99.8 per cent;
- first generation seed;
- tested free of wild radish and other noxious weed seeds; and
- tested free of sclerotes (carrier of sclerotinia stem rot)

Seed source and purity can have a negative impact on subsequent canola crops if seed is retained and grown over a number of years. Canola is a crop which self-pollinates and outcrosses. As a result of out-crossing of individual plants with different characteristics, the characteristics of a variety can 'drift' slightly from one generation to the next. In most instances, the characteristics for which the variety was originally selected tend to regress and the undesirable characteristics tend to become more prominent.

Varieties that possess the Clearfield® trait of herbicide tolerance are also subject to this process of 'genetic drift' which means there is no guarantee that farmer-retained Clearfield® varieties will demonstrate the same level of herbicide tolerance as displayed by quality-assured seed.

Use of grower-retained seed

The use of farmer-grown seed is not recommended as it increases the potential for establishment failure and reduced yield and oil content. Studies in Australia and Canada have shown that germination and vigour can be reduced from seed harvested and retained by growers of commercial

Certified seed is your guarantee of quality.
PHOTO: D. McCAFFERY, NSW DPI

crops not grown specifically for seed. Recent studies in Canada have also shown that farmer-saved hybrid seed resulted in a yield reduction of up to 13 per cent, amounting to a significant loss of income.

Canola seed is difficult to clean and contamination from weed seeds helps weeds spread from paddock to paddock across a farm. Also, several diseases of canola are known to be either seed-borne, for example, alternaria leaf spot, or can be carried over with the seed, for example, the sclerotes of sclerotinia stem rot.

Trials conducted around Australia in the mid 1990s showed that it can be false economy for canola growers to retain their own seed for planting. The added costs of cleaning, grading and treating seed, combined with potential reductions in yield and less consistent yield when poor quality seed is used, can result in lower financial returns. As well, successive generations of farmer-retained seed lead to significant variability in several key agronomic traits, such as oil content, plant height, days to flowering and blackleg disease resistance. If you want to retain your own seed, make sure it comes from a weed-free part of your farm and do a germination and vigour test before sowing to ensure that seed quality is good. Do not retain seed from crops that have experienced drought, frost, waterlogging, insect or disease stress during the flowering and pod development growth stages.

Where possible, purchase certified seed or company quality assured seed to ensure minimum germination standards and varietal purity. Inadvertently sowing the wrong variety can have disastrous consequences, particularly where herbicide-tolerant varieties are being used. To avoid the introduction of undesirable weed seeds ask for a copy of the full purity analysis for each line of seed and check it thoroughly. All Seed Industry Association of Australia (SIAA) members and reputable merchants will be able to supply these.

Keep seed labels with a small quantity of seed in a cool dry place. If any problems arise after sowing discuss with an adviser or seed company representative.

Under Plant Breeder's Rights (PBR) legislation, farmer-retained seed, although not recommended, is legal, provided the seed is only used for the purpose of sowing and harvesting subsequent crops. Over-the-fence sales and trade in PBR protected varieties are illegal, and penalties for infringements are significant.

Pre-sowing seed and fertiliser treatments

Insecticide treatments

Imidacloprid products, such as Gaucho® 600 or Picus, are registered for use on canola seed for protection against redlegged earth mite (RLEM), blue oat mite (BOM) and aphids. These chemicals work through repellency and anti-feeding action, rather than by directly killing earth mites or aphids. They will protect emerging seedlings for three to four weeks after sowing. As well as the direct effects of controlling aphids, the use of imidacloprid may also reduce the incidence and spread of aphid-transmitted virus diseases during this period. This product can only be applied by registered operators. All seed companies can supply seed pre-treated with imidacloprid.

Fipronil, for example Cosmos®, is registered for control of RLEM in canola. It should be used as part of an integrated pest management (IPM) approach to RLEM management. Fipronil can be applied either on-farm, or off-farm by a contractor or seed company.

Fungicide treatments

Fluquinconazole products, for example Jockey® can be used in high-risk situations as a seed dressing to help minimise the effects of blackleg disease. These products may shorten the hypocotyl length of canola. To avoid the possibility of reduced emergence, do not sow treated seed deeper than 20 mm or in soils prone to crusting. Ensure treated seed is sown in the season of treatment.

Fludioxonil/metalaxyl-M (Maxim® XL) is a fungicidal seed dressing which provides suppression of blackleg as well as protection against seedling diseases caused by *Pythium* spp. and *Rhizoctonia solani*. It will not cause shortening of the hypocotyl or affect seed viability.

Flutriafol products, for example Impact®, are in-furrow fungicide treatments which are mixed and sown with the fertiliser to assist in minimising the effects of blackleg disease. In high blackleg pressure situations research has shown flutriafol products to be superior to other fungicides for controlling blackleg disease.

SOWING METHOD

Sow canola seed into the soil, rather than dropping it on the soil surface and harrowing it in, as drilled seed is more accurately placed in contact with moisture and will germinate more uniformly.

Seed placement

In marginal rainfall areas, drilling seed to a pre-determined depth is the only sowing method recommended.

On heavy clay soils, growers have had success with moisture seeking points, press wheels, rubber tyred rollers and trailing cultipackers. Deep furrow planting, which allows sowing into subsurface moisture through the dry surface soil, is a proven technique in these soils, where rainfall is summer dominant and surface seedbeds are often dry at sowing time. When deep furrow planting, it is critical that moist soil is firmed around the seed but only 2–3 cm of moist soil is covering the seed.

On lighter, sandier soils moisture seeking points in conjunction with 'V' shaped press wheels give excellent results.

When sowing into wet soils, take care to avoid a smearing action by the moisture seeking points, which could reduce crop emergence.

Broadcasting seed through the combine small seed box is unreliable and usually results in staggered germination. Bandseeding is more suited to high rainfall areas.

Thoroughly clean out the seeder after sowing to prevent seed residue from contaminating other crops sown later in the season.

Sowing equipment and calibration

Sow seed through either the main seed box or small seed box of standard wheat sowing equipment. The airseeder or combine should be in good condition and the level adjusted (from side to side, front to back, and tine to tine) to ensure sowing at a uniform depth. Regulate ground speed to avoid tine bounce as it causes an uneven sowing depth. Diffusers are fitted to the sowing tines of airseeders to stop seed being blown from the seed row. A maximum sowing speed of 8–10 km/hour is suggested for most soils.

Several options are available to level the seedbed and help compact moist soil around the seed. These include the use of press wheels or a rubber tyred roller, coil packers (flexi coil roller), trailing light harrows or mesh behind the planter. Knife points with press wheels are the preferred option. Avoid heavy harrows with long tines as they can disturb seed placement.

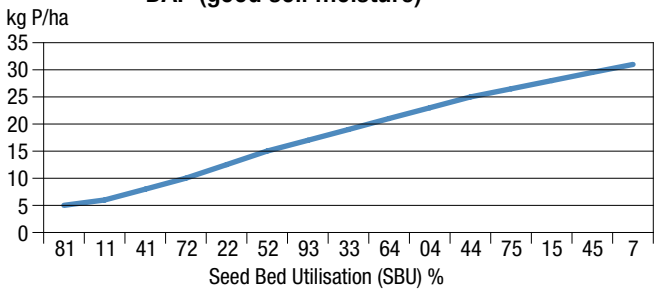
The seed box on most modern airseeders and combines can be calibrated for low seeding rates. Check calibrations from year to year as seed size can change and affect actual sowing rate.

Fertiliser management at sowing

Nitrogen and starter (N & P) fertilisers can affect germination and reduce establishment if sown in contact with canola seed. Seed can be affected in a number of ways; toxic chemical effects from ammonium vapour, most likely from urea and ammonium phosphates such as MAP and DAP; osmotic or salt effect due to high concentrations of salts produced from soluble fertiliser dissolving in water (both N and P); and seed desiccation from direct moisture absorption by fertiliser in very dry soil.

Fertiliser at high rates is best separated from the seed at sowing by banding. The risk of seed damage from fertiliser increases with (i) narrow sowing tines or discs, particularly at wider row spacing, as fertiliser becomes more concentrated close to the seed, (ii) in more sandy soils; and (iii) in dry soils. Figure 5.1 shows the approximate safe rates of phosphorus that can be sown with the seed using DAP fertiliser (18% N). Seedbed utilisation is used to take into account the width of the seed row and the row spacing. In dry soils, the amounts shown in the graph should be halved.

Figure 5.1 Approximate Safe Rates of P with seed using DAP (good soil moisture)



Seed Bed Utilisation %
= Seed spacing mm / Row spacing mm x 100
= 25 mm / 180 mm x 100 = 14%
In dry soils only use half these rates

SOURCE: R Rainbow, SARDI

Checklist for sowing equipment:

- Accurate calibration for sowing rate.
- Even wear of points for accurate seed placement.
- Narrow points to reduce ridging.
- Front and rear rows of tines level.
- Sow slower rather than faster, to avoid overly shallow depth, seed bounce, or increased soil throw by tines, which effectively results in front tine seed being sown too deep.
- Level ridges behind the seeder. If using harrows, heavy harrows may be too severe and finger harrows too light.
- Avoid seed/super mixes that contain excess rates of nitrogen (see above).

Alternate sowing techniques

The use of wider row spacing to conserve moisture in low rainfall areas has seen an expansion of the areas in which canola is grown. Other techniques, such as dry sowing, aerial sowing and the use of raised beds, have been further refined, which can reduce sowing delays caused by unseasonably dry or wet conditions.

Dry sowing in dry autumns is a means of managing the risk of not getting all of the farm's crop sown on time.
PHOTO: P. BOWDEN, NSW DPI

Wide row spacing

Early-sown canola crops were traditionally sown on 15–20 cm row spacing to suit conventional combine configurations. Wider row spacings suit minimum and no-till systems and can provide moisture conservation in low rainfall (< 350 mm) areas.

In low rainfall areas of winter-dominant rainfall regions, wider rows (30–33 cm) will yield similarly to traditional row spacing, and have become increasingly popular.

In summer-dominant rainfall regions, wider row spacing of either 50 cm, or the blocking of every second tine to produce 60 or 66 cm, have been used with some success but a yield penalty almost always occurs.

Sowing rates should be progressively reduced as row spacing is widened beyond 30 cm, to avoid an excess number of plants competing within the plant row, causing plants to have thinner stems and hence a greater risk of lodging.

Early weed control is more critical with wider row spacing, as the inter-row gap encourages weeds to establish. As previously discussed, starter fertiliser rates need to be carefully managed when sowing in wide rows.

Dry sowing

Benefits of dry sowing

Dry sowing is a valuable management technique in more reliable production districts to both maximise season length and as a risk management tool for getting some of the total farm crop sown on time. Seed is sown into the dry soil to await germinating rain. A dry sown crop which receives good rainfall will emerge much faster than one sown after the autumn break.

If canola is to be sown dry, it must be sown into a completely dry soil, with no areas of marginal moisture. Otherwise, some seed may germinate on the marginal moisture, resulting in a very uneven and staggered germination, which will prove difficult for ongoing management decisions. Dry sowing is risky where there is little or no subsoil moisture in reserve.

Drawbacks of dry sowing

Dry sowing in low rainfall areas is more risky than in higher-rainfall, longer season areas. It is risky to sow too far ahead

Dry sowing can result in a staggered germination, which can cause subsequent problems with weed and insect control, and harvest.
PHOTO: D. McCAFFERY, NSW DPI

of the germinating rain. The result may be that a longer season variety (later maturing) is effectively planted outside its optimum sowing window.

Specific issues which need to be considered include weed control, sowing depth, paddock conditions, variety choice and the risk of a false break, particularly in marginal, low rainfall areas.

The primary issue with dry sowing is weed control. Paddocks should have had prior weed treatment such as spray topping, fallowing or trifluralin incorporation, or weeds must be able to be controlled using post-emergence herbicides. Herbicide-tolerant varieties are highly recommended when dry sowing, as a broader spectrum of weeds can be economically controlled in-crop.

Sowing depth should be slightly deeper than normal (up to 1 cm) to reduce the possibility of light rainfalls only partially germinating the crop and resulting in a patchy or staggered establishment.

Avoid paddocks which are prone to prolonged waterlogging, or have hardsetting (crusting) soils, particularly where heavy rainfall is possible.

If sowing dry due to a late break, select a faster maturing variety than you would normally sow. Avoid late maturing except in the most reliable of high-rainfall, cool-finish districts, such as south-eastern South Australia and the Western District of Victoria.

Table 5.1 Number of plants established per square metre from different sowing rates and establishment percentages of open-pollinated varieties based on 290,000 seeds/kg

Sowing rate	Establishment percentage					
kg/ha	40%	50%	60%	70%	80%	90%
2.0	23	29	35	41	46	52
3.0	35	44	52	61	70	78
4.0	46	58	70	81	93	104
5.0	58	73	87	102	116	131

Table 5.2 Number of plants established per square metre from different sowing rates and establishment percentages of hybrids based on 175,000 seeds/kg

Sowing rate	Establishment percentage					
kg/ha	40%	50%	60%	70%	80%	90%
2.0	14	18	21	25	28	32
3.0	21	26	32	37	42	47
4.0	28	35	42	49	56	63
5.0	35	44	53	61	70	79

Raised beds

Sowing canola into raised beds has proven very successful in southern Victoria. Many soil types in this region (heavy duplex soils and impervious clay subsoils) are prone to severe waterlogging in winter. Raised bed cropping provides a relatively inexpensive and practical drainage solution, enabling growers to successfully produce canola and other crops and obtain much higher yields.

Research in southern Victoria has demonstrated yield improvements of 60 per cent where canola was sown on narrow raised beds (1.5–2.0 m wide and 25 cm high) compared to canola sown on much wider beds (20 to 30 m wide and 20 cm high). Root development and trafficability after rainfall events were also improved and, in subsequent years, indications are that the soil structure of raised beds starts to improve.

Raised beds have also been adopted in some of the wetter areas of south-west Western Australia. They have been trialled in southern NSW but a string of dry years has reduced grower interest.

Sowing rate

Evenness of plant population, both within the row and across the paddock, is more important than having an ideal population. Where plant populations are low, plants compensate by producing extra branches.

For most canola growing regions, the recommended seeding rate for *B. napus* canola is 3–4 kg/ha. Many growers have reduced this rate to 2 kg/ha but only after they have gained considerable experience in the skills and machinery refinements required to produce consistent establishment of the crop under a range of seasonal conditions. The trend towards hybrids with superior seedling vigour over open-pollinated varieties is allowing experienced growers to reduce seeding rates to as low as 1.5–2.0 kg/ha.

Excessively high seeding rates, for example 6–8 kg/ha cause crops to grow too tall with weak spindly stems, making them susceptible to lodging in the spring as flowering and pod development occur.

It is advisable to sow 1.0–1.5 kg/ha heavier than normal when seedbed conditions are not ideal, such as sowing late into cold, wet soils or no-till sowing into dense stubbles.

Within the recommended plant population range, it is better to have too many canola plants than too few, although high plant densities have been linked to an increased incidence of the disease, sclerotinia stem rot.

Typically, about 40–60 per cent of sown seeds establish as plants. However, if conditions are really favourable, establishment can be as high as 80 per cent.

Check the seed size every year, as it can vary depending on how well the seed crop finished in the previous spring. For *B. napus* varieties, the range lies between 250,000 and 350,000 seeds/kg for open-pollinated varieties and between 150,000 and 200,000 for hybrids. Tables 5.1 and 5.2 show the large difference in plant establishment rates for a given seeding rate between open-pollinated varieties and hybrids.

SOWING DEPTH – GENERAL

Canola has a small seed and is not as easy to establish as cereals. Soil temperature and the amount of surface moisture will influence sowing depth. It is better to drill canola at a shallow depth rather than drop it on the surface and attempt to harrow it in.

Plant seed at an even depth of 12–30 mm in most soil types, or deeper if dry sowing. Sown at this depth germination is rapid and the shoot will emerge within 4–5 days in warm moist soil. Deeper sowing, especially in hard setting soils, may result in slow, patchy emergence. Late sowing into cold soils slows emergence to 10–14 days.

New South Wales

Early in the season canola can be sown deeper provided seeds are placed on a firm base of moist soil (particularly when using no-till equipment), as temperatures are higher and the seedbed will dry out faster and to a greater depth. This is particularly important in low rainfall western areas and in self-mulching clays of north-west NSW, where it is better to 'chase' the firm, moist base of soil rather than sow into the loose topsoil which will dry quickly.

Victoria and South Australia

The ideal situation is to drill seed 10–30 mm into warm, moist soil. However, on the friable Wimmera self-mulching clays, it can be sown 30–40 mm deep to avoid temperature and moisture fluctuations near the surface. On soils that are likely to slump when it rains sow canola to as shallow a depth as possible.

Shallow seeding can be used where soil moisture is high or rainfall is imminent. Sowing can be deeper in sandy soils so place seed into moisture but do not exceed 30 mm.

TIME OF SOWING – GENERAL

Sowing time is a compromise between sowing too early, which may increase the risk of frost damage and lodging, and sowing too late which increases the risk of the crop undergoing seed development in increasingly hot and dry conditions, reducing the yield potential and oil content of the grain.

For each week sowing is delayed, yields drop by around five per cent in South Australia and Victoria and around 10 per cent in central and southern NSW. The yield penalty can be even higher in seasons with a dry finish.

In general, sowing at the earliest time within the optimum window pays off in a number of ways, as earlier sown crops:

- generally have higher seed and oil yields as the crop finishes under cooler, moister, conditions. A premium is paid for oil content above 42 per cent;
- allow for better coordination of sowing and harvesting, as these operations for canola are well ahead of wheat;
- grow faster initially and so compete better with weeds; and
- normally have fewer problems with insect pests, such as aphids, in spring.

Because canola seed is very small it takes longer than cereals to establish. Late sowing into cold soils further reduces plant growth, making canola seedlings more vulnerable to disease, insects, slugs and other constraints. Late sowing also results in canola maturing when the weather is typically warmer and drier. Hot weather during the flowering to pod-set stages may cause pods to be aborted, fewer seeds per pod and reduced oil content.

In general, sowing later to avoid frost is not a good strategy as canola flowers for 4–6 weeks and can usually compensate for aborted flowers if frosts occur at early to mid flowering. Canola is most susceptible to frost during late flowering/early pod fill as a heavy frost can destroy immature seeds. Canola usually tolerates frosts better than cereals. In western and northern zones of NSW, early maturing varieties should not be sown early as September frosts may coincide with the pod-fill stage.

Late-sown paddocks must be well prepared and planned for canola as, in higher rainfall areas, poorly drained paddocks may be at greater risk with later sowings.

The optimum time to sow may depend on a range of factors but the relative maturity of a variety is important. Mid and mid-late maturing varieties should be sown early in the recommended sowing window for a particular region, and early maturing varieties sown later.

Establishment check

Carry out crop establishment counts within four weeks of emergence to review the success of the sowing operation and help decide whether the seed rate or equipment needs to be adjusted for next year's crop. The impact of establishment pests (such as earth mites, aphids, slugs or

Table 5.3 Recommended sowing times for south-eastern Australia

		APRIL				MAY				JUNE				JULY		COMMENTS
NSW - Region	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
Northern – West																Sowing time should be balanced against frost risk at late flowering/pod-fill.
– East																The sowing window is extended for higher rainfall areas of central and southern Liverpool Plains.
Central – West																Capitalise on any sowing opportunity from 10 April.
– East																Yield potential declines by 10% per week after mid-May.
Southern – West																Select early maturing varieties if sowing in May.
– East																Yield potential declines by 10% per week after 20 May.
Southern Irrigation																Early establishment reduces the potential damage from waterlogging in heavy clay soils.
		APRIL				MAY				JUNE				JULY		
Victoria – Region	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
Mallee																Early sowing time gives highest yield potential.
Wimmera																Yield potential declines by 5-7% per week after mid-May.
North Central																Yield potential declines by 5-7% per week after mid-May.
North East																Yield potential declines by 5-7% per week after mid-May.
South West																Optimum sowing time for well-drained soils. Delaying sowing till August-September is a strategy for soils prone to winter waterlogging.
Northern Irrigation																Early establishment reduces the potential damage from waterlogging in heavy clay soils. Crops can be sown slightly later than in southern NSW.
		APRIL				MAY				JUNE				JULY		
SA - Region	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	
Low rainfall																< 375 mm per annum Early sowing time gives highest yield potential.
Medium rainfall																375-450 mm per annum
High rainfall																> 450 mm per annum

Best sowing time

Later or earlier than desirable, possible yield reduction:
- earlier – too vegetative, lodging, disease and/or frost risk
- later – spring moisture and heat stress

Too late for good yields, unless favourable spring

soil dwelling pests) can also be assessed at this time.

For narrow row spacing (up to 30 cm), use a square quadrat (0.25 m^2), whilst for a wider row spacing a 1-metre ruler placed along the row is more convenient. Count as many sites as possible (minimum of 20) across a widely representative area of the whole crop.

In NSW ideal plant populations (plants per square metre) are:

- central and southern wheatbelt – 40–60;
- irrigation – 40–60 (up to 75 if sown late);
- northern wheatbelt – 30–50; and
- low rainfall areas – 30–50.

In Victoria, ideal plant populations (plants per square metre) are:

- Mallee, Wimmera, Northern, North-east – 30–50;
- northern irrigation districts – 40–60 (up to 75 if sown late); and
- southern Victoria – 50–75.

In South Australia, optimum plant density range (plants per square metre) varies with rainfall:

- low rainfall (250–350 mm) – 40–70; and
- medium rainfall (350–500 mm) – 50–80.

Managing low plant establishment

While plant populations as low as 20 plants per square metre can still produce good yields, such crops are more susceptible to weed competition. Also, the variable pod development on these plants makes timing of windrowing difficult to determine, especially if germination has been staggered.

At less than 15 plants per square metre, the crop is likely to be patchy and lower yielding. Before re-sowing or abandoning a crop, always double check with an experienced agronomist or grower, because plants can compensate remarkably well and the yield potential may be equal to or higher than a better established but later sown crop.