Faba bean

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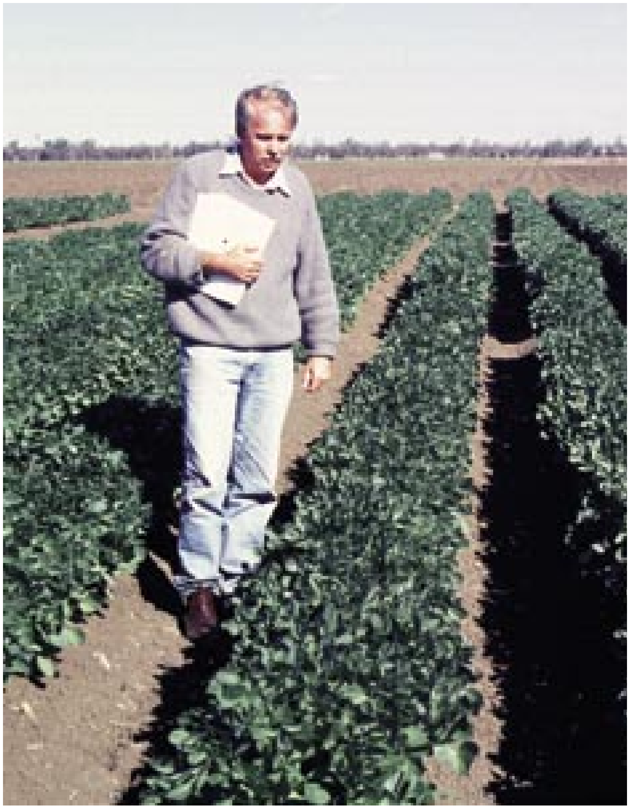
Harry Marcellos

NSW Agriculture

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Summary of statewide best practice management for faba beans

1. ***Make faba bean part of a cropping system*** involving either wheat or barley, or cotton, sorghum or maize. Take a systems perspective and assess financial performance over several seasons. Make sure you work through the economics, and have marketing options in place before committing to the crop.
2. ***Choose the right variety.*** The main considerations are market opportunities for human consumption or stock feed, and disease risks.
3. ***Use best quality seed.*** Obtain certified or good quality home-grown seed, with high germination (80%+), and freedom from seed-borne ascochyta infection. Before considering a large-seeded variety, make sure its seed will flow through the metering mechanism of your seeding machinery.
4. ***Paddock choice and fallow management.*** Select and manage paddocks well in advance to control weeds and retain crop residues. Soils should be well structured, clay loam or heavier in texture, and pH ($CaCl_2$) 5.2 to 8. In winter cereal systems for northern areas, direct drill faba beans in rows about 50 cm apart into no-till fallows after cereal; in southern areas direct drill in rows 20-30 cm apart after harrowing, slashing or burning cereal stubble. In cotton systems, twin rows can be sown either side of cotton stalks on 1 m beds.
5. ***Establish enough plants*** to ensure that the ground is covered by the time pod filling begins. Under well-watered and irrigated conditions, as few as 20 plants/m^2 should suffice, but it is advisable to increase this to 35 plants/m^2 for rain-fed crops.
6. ***Sow on time.*** Sowing time is critical. Follow regional recommendations. Late sowing reduces yield potential by lowering crop biomass, shortening the pod-filling period and increasing risks from moisture stress and high temperatures.
7. ***Nutrition:*** Nitrogen (N) fertiliser is unnecessary. Crop needs for N will be assured by inoculating the seed at sowing with commercially available rhizobia inoculant. On phosphorus (P) deficient country, apply fertiliser at sowing, at rates similar to or slightly above those for wheat. On alkaline clay soils, fertilising with zinc may be warranted. On acid soils, molybdenum may be deficient and should be applied at or before sowing.
8. ***Faba beans respond well to irrigation.*** Furrow irrigation is successful in both southern and northern NSW. To establish the crop either pre-water and sow, or dry-sow and water-up. To maximise yield potential, crops should be watered to produce maximum biomass, and not be stressed during flowering and pod-fill.
9. ***Know the disease threats to faba beans*** in your area, and how to manage them. No varieties are resistant to all fungal and virus diseases. Rust, chocolate spot and plant viruses are the major risks in northern areas; the risks in southern NSW are ascochyta blight, chocolate spot and plant viruses. The impact of fungal diseases on yield can be diminished in most seasons through the use of fungicides. Ideally, the current crop should be sown more than 500 m from faba bean paddocks in the previous year. This will isolate it from sources of infection for fungal diseases. Volunteer faba bean plants appearing in late summer can help to carry over diseases and should be eradicated.
10. ***Insect pests must be controlled.*** Aphids may infest the crop in the early stages and in spring, infecting the plants with viruses. Heliothis caterpillars are likely to infest the crop during pod-filling, damaging pods and seed; these must be controlled to ensure quality seed for human consumption.
11. ***Harvest early, with a properly set-up header.*** Start when nearly all pods are black, but before stems become completely dry and black. Pods will thresh easily to yield clean, whole seeds with a minimum of splits and cracks provided the header settings are correct.

THE FABA BEAN

Faba bean, *Vicia faba,* is a winter growing pulse, or food legume crop. It originated in the Middle East in the pre-historic period, and has since spread throughout Europe, North Africa, and Central Asia. It spread to China over 2,000 years ago via traders along the Silk Road, to South America in the Columbian period, and more recently to Canada and Australia.

Faba bean was first grown commercially for grain in South Australia in the early 1980s, and is now cultivated in Victoria, New South Wales and Western Australia. Small areas are grown in Tasmania and southern Queensland. It is a cool season crop in Australia, planted in autumn and harvested in late spring–early summer.

AUSTRALIAN PRODUCTION

China is the largest faba bean producer, with Australia ranking about fourth. The Australian area has increased steadily since the start of the 1990s to near 180,000 ha (Figure 1).

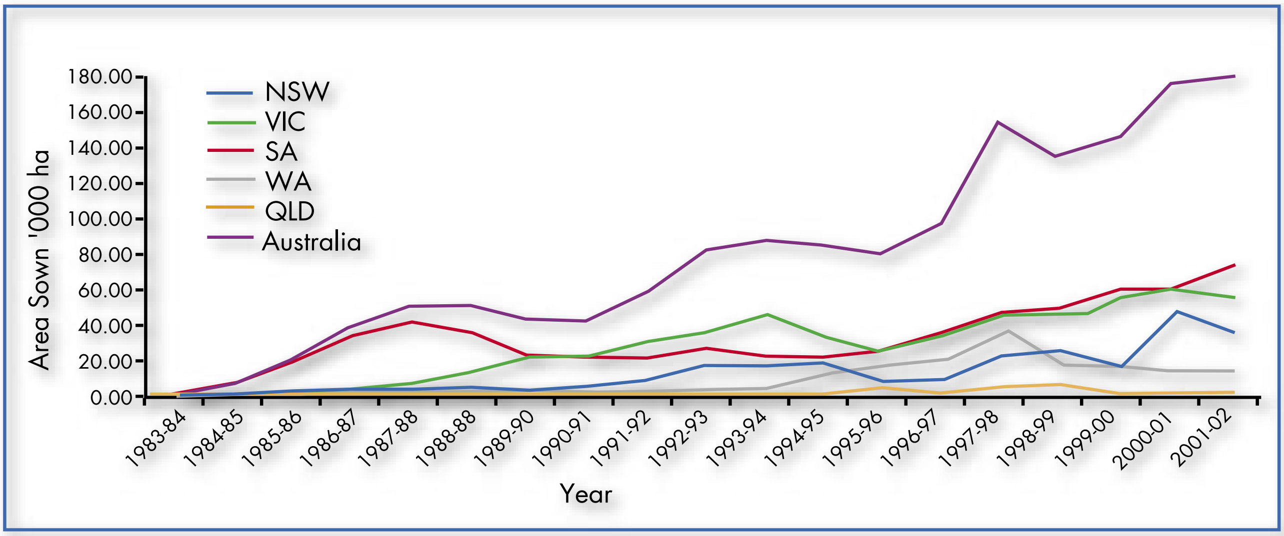
Most of the sown area in NSW is in the northern cropping region, in rotation with cereals and cotton (Table 1).

Table 1: Areas sown to faba bean in New South Wales ('000ha)

Region	97-98	98-99	99-00	00-01	01-02
North	21.4	21.3	15.9	32.5	23.8
Central	5.7	5.1	2.7	2.8	2.9
South	5.0	4.6	3.8	9.5	11.3
State	36.1	30.9	22.4	44.8	38.1

Source: NSW Agriculture estimates

Figure 1: Australian production of faba beans



Source: ABARE

SUITABLE ENVIRONMENTS

Faba beans may be grown over much of the NSW grains region, being well suited to the eastern districts where rainfall is higher and spring temperatures are milder than western areas. They respond well to irrigation on heavy clay soils.

The crop is planted in mid to late autumn and grows slowly during early winter. It develops rapidly from July to September during its flowering and podding stages, when daytime temperatures are in the range 15–25°C. Flowering stops as temperatures approach 30°C.

Faba bean plants can tolerate frost during vegetative stages, but severe frosts can deform and lodge stems. Frosts can also cause death of flowers and immature pods after flowering. The exact temperatures which damage flowers and pods are not known. Experience indicates that beans may tolerate temperatures which would normally damage wheat heads in their flowering stage; that is, below about -4°C. The loss of flowers due to frost may be compensated for by pod development at later flowering nodes. Pod development will be adversely affected by hot, dry periods in August and September in northern regions and during October in the south.

WHY GROW FABA BEANS?

There are three main reasons for growing this crop:

- Cash flow through marketing dry, coarse grain.
- As a component of a rotation based on winter or summer cereals or cotton.
- Green manure where soils have been degraded in organic and physical fertility.

Crop rotations which include faba bean in sequence with winter cereals and summer cereals, or cotton, are more productive and profitable than those in which legume phases are excluded. The benefits arise because:

- Yields and quality of cereal grain and cotton fibre are usually higher after faba bean.
- Nitrogen fixation in the root system of the faba bean makes more soil N available to the next crop, reducing the need for fertiliser-N, and in some cases adding to soil organic N. Up to 40% of the N in a faba bean crop is underground.
- Levels of soil-borne diseases (like crown rot) and pests (like root lesion nematode) of wheat are reduced by growing faba bean as a break crop.
- Growers claim that soil tilth is improved after faba bean.

THE PLANT

Faba bean plants may grow to a height of 2 m at maturity, but Australian crops are usually less than 1.5 m tall. The plant is erect, and produces stems from its base. Leaves are compound, having 2-7 leaflets. First leaves have only 2 leaflets, but there are 7 in the last formed leaves. The taproot bears a profusion of fibrous roots in the top 30 cm of soil.

Flowering in early varieties begins from about the 5-7th leaf bearing stem node (joint), and up to the 15th or higher node in late varieties. Flowers are borne in clusters (inflorescences) comprising 3 to 8 flowers (varying with variety) in the angle between leaf and stem (axil) at each node. Inflorescences form in succession up the stem as each new node is produced, over a period of 6–10 weeks, or about 15 flowering nodes.

Crop pollination by domestic honey bees

Peter Matthews

Harry Marcellos

Podded plant

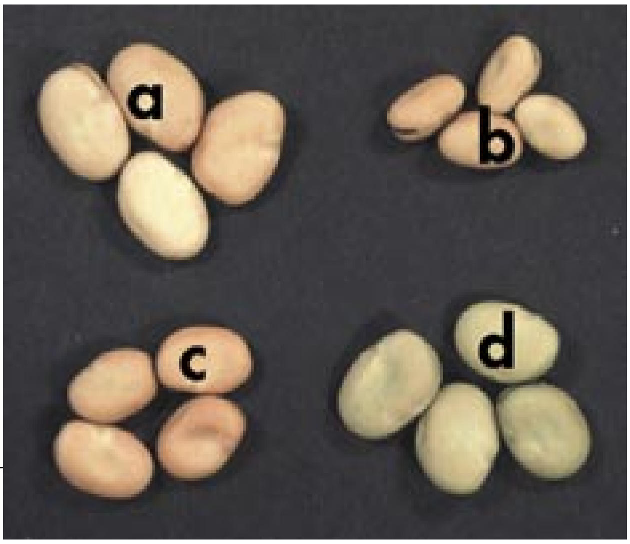
Like many legumes, excess flowers are produced and fewer than 15% will develop to produce pods.

Honeybees seek nectar from the flowers and in the process pick up pollen, transferring it between plants, and causing cross-pollination to occur at rates commonly in the range 25-30%.

Flowering finishes when daytime temperatures approach 30°C, after which an extra few leaf-bearing nodes are produced.

Pods in a well grown crop are borne from about 20 cm above ground to maybe 30 cm below crop height. Each pod contains 2 to 4 seeds. As pods mature they turn black, as eventually do the stems and leaves of the plant.

Seeds vary in size depending on variety, from large flattened beans (also known as broad beans) through medium sizes to smaller, rounded seeds like field peas. Varieties with medium sized seed are the main types grown in Australia whereas the smaller seeded types are common in Europe.



Di Carpenter

Faba bean seeds come in various sizes and colours: a. Aquadulce, b. Barkool, c. Fiesta VF, d. Icarus

All seed types are used as a dry bean for either human consumption or livestock feed. Large-seeded varieties are often used for human consumption as a green vegetable. Value adding in the form of canning, splitting, and preparation as snack foods services niche markets. In China, faba beans are used to make extruded starch products (vermicelli) and sauces. Faba bean is sometimes used as a green manure crop, as it is capable of producing a large amount of N-rich biomass.

Faba bean variety trials

Harry Marcellos

BREEDING OF FABA BEANS IN AUSTRALIA

The development of new varieties of faba bean for different regions is a high priority, supported across Australia by the Grains Research and Development Corporation (GRDC) in partnership with NSW Agriculture, the University of Adelaide and the Australian Centre for International Agricultural Research (ACIAR). Faba bean varieties have a reputation for showing a high degree of specific adaptation, which means that varieties are required for different regions. In general terms, improvements in yield and quality arising through improved specific adaptation and increased disease resistance are needed in new varieties.

All varieties released have been developed from genetic material introduced to Australia, mostly from an international genetic resources centre in Syria (known as ICARDA), with the best germplasm so far originating from the Mediterranean, southern China and South America.

Faba bean improvement for the southern half of NSW is catered for by breeding activities at the University of Adelaide, with evaluation units based at Wagga Wagga and Horsham. The varieties Fiord, Ascot VF, Icarus and Fiesta VF were developed through this program. They are adapted to environments south of Dubbo which receive more winter rainfall, and have shorter and cooler winter days than the northern half of the State. The most important diseases are chocolate spot and ascochyta blight, and significant increases in resistance to these are being incorporated in varieties under development.

In northern NSW/QLD, faba bean improvement is coordinated by NSW Agriculture with breeding activities at Narrabri and Tamworth.

The aim is to develop faba bean varieties suited to sub-tropical climates (narrower day length range, and earlier springs than southern Australia, and summer-dominant rainfall).

- The primary goal is to develop new varieties specifically adapted to the northern region with higher and more stable yield, quality and disease resistance. The breeding

Bee proof igloos are used to prevent cross pollination in seed increase plots at Narrabri

Harry Marcellos

program selects for traits that convert a crop of Mediterranean origin to one with improved adaptation to a sub-tropical environment.
- Advanced lines have been developed and are being assessed for their potential release as new varieties with improved resistance to the fungal diseases chocolate spot, ascochyta blight and rust, and to bean leaf roll virus. The first variety will be available to growers in 2004.

GROWING THE CROP

Suitable Paddocks

The best soils for faba bean are deep, neutral to alkaline, well structured soils with a high clay content. In northern NSW, grey clays, black earths and brigalow clay loams are ideal. In southern and central parts of the State, alluvial loams and heavy textured soils are preferred, but good results have been achieved on lighter textured soils on the central western slopes.

Soils to avoid are those that are shallow, acidic (less than pH 5.2 ($CaCl_2$)), or very light and sandy in texture. Growers considering growing faba beans on lower pH soils need to check for aluminium and manganese levels, as these will adversely affect plant growth. If soil pH is below 5.2, an application of lime should be considered. Avoid soils that are acid at depth (pH below 5.2 ($CaCl_2$) at 20-30 cm depth).

Soil sodicity should also be checked and soils with high exchangeable sodium percentages (ESP) avoided.

The crop can handle wet soil conditions better than other pulses, and does very well under furrow irrigation. It is common for dry seed beds to be pre-watered before sowing, or for dry-sown crops to be watered up. Strategic irrigation during flowering and pod filling is desirable to maintain high crop growth rates and to maximise pod development.

Fallow management

Paddocks for faba beans can be prepared using conventional or minimum cultivation as for other winter crops, but the use of no-till or direct-drill methods are preferred and recommended in NSW. However, some soils in southern and central NSW may require cultivation prior to sowing to remove the hardpans that reduce healthy root development.

Management of the fallow after wheat or barley should start at the time the cereal is harvested, making sure that straw is left about 30 cm in height, and kept as intact as possible by restricting access to support traffic like chaser bins. Repeated in-fallow herbicide applications should be done on tramlines to minimise damage to stubble.

Grazing of cereal stubbles is common in southern NSW. Where stubble loads are too heavy, or where the stubble has been disturbed by stock grazing and trash handling equipment is not available, harrowing, slashing or late fallow burning should be considered.

Varieties

Varieties of faba bean, unlike wheat and chickpea, are genetically variable because plants

Faba beans can be successfully sown using minimum tillage techniques–faba beans sown in north west NSW into standing wheat stubble

John Kneipp

cross-pollinate. If seed is required for next season's crop, or for sale as seed, crops should be sown in separate blocks, at least 500 m from the nearest faba bean crop, to prevent cross-pollination.

The number of varieties is limited, and none combine resistance to all diseases, high and stable yield, and quality suited for human consumption. The wider adoption of faba bean in New South Wales is dependent on the development of new varieties with improvements in these traits.

Variety choice will be influenced by:

- Marketing intentions–human consumption or stockfeed.
- The farm environment, particularly rainfall and temperature.
- Which diseases are important locally.
- Seed size, important for sowing and harvesting equipment.
- Whether the crop is for seed or green manure.

Before selecting a variety, study the most recent NSW *Winter Crop Variety Sowing Guide*. Consult your local adviser and the trader with whom you intend to market the crop. Some varieties are covered by Plant Breeder's Rights (PBR).

Sowing times

Greatest growth potential occurs with early planting, which in turn favours high yield and large amounts of N fixation. Sowing later than the recommended window results in shorter crops, lower biomass and reduced yield potential. Pods will be closer to the ground, making harvesting more difficult.

Minimum tillage and direct drilling equipment used to sow faba beans

Harry Marcellos

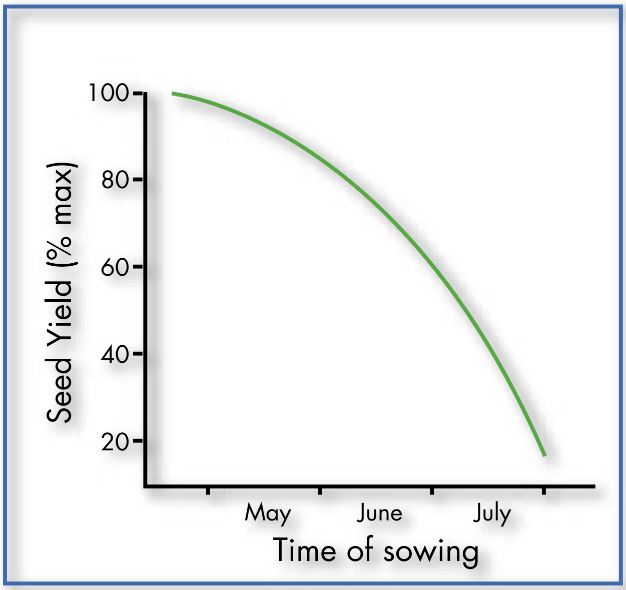


Figure 2: Influence of delay in sowing on yield of faba beans in northern NSW

Sowing of current disease-susceptible varieties later in the recommended sowing window in southern areas of the State may reduce pressure from chocolate spot, as the crop will have lower biomass, a more open canopy and be growing into warmer, drier weather than if sown earlier. Under these circumstances, any trade-off in yield potential may be offset by the likely reduction in disease risk and control costs.

Table 2: Recommended sowing times

Region	District	Month:	April				May				June			
		Week:	1	2	3	4	1	2	3	4	1	2	3	4
North	Narrabri to Boggabilla													
	Walgett to Coonamble													
	Liverpool Plains													
Central	Cowra to Forbes													
	Dubbo to Warren													
South	Temora-Wagga-Lockhart													
	Griffith to Hillston													

= Best sowing window
= Later than desirable, expect lower yield
= Much too late

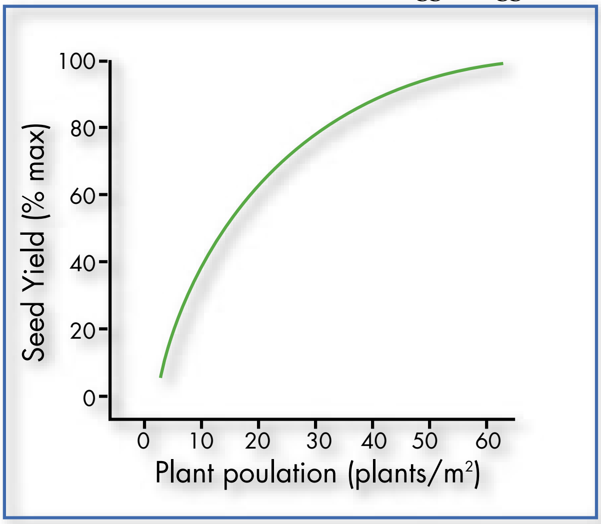
Plant population and sowing rate

Research in northern NSW with the variety Fiord and in southern NSW with Fiesta VF, under dryland conditions and narrow rows, showed that a plant population of 35–40 plants /m^2 gave near maximum yields over a wide range of conditions.

Sowing practices have shifted in line with conservation farming principles, so that sowing faba beans in wide rows, (up to 50 cm row spacing for northern NSW) into cereal residues following a no-till fallow is now recommended.

Research conducted in NSW has shown there is no yield penalty associated with these wider row spacings. Faba bean plants have a capacity to produce many stems and a large amount of biomass given abundant space and water, so that under wide rows or irrigated conditions, populations can be reduced to 20 plants/m^2.

Figure 3: Average effect of plant population on yield of Fiord under dryland conditions in NSW (trials done at Tamworth, Narrabri and Wagga Wagga).



Sowing rate formula

If the germination percentage has not been provided by the seed supplier, samples should be tested. The sowing rate of seed (kg/ha) can be worked out when the target plant population and the germination percentage of your seed are known (Table 3).

Seeders should be calibrated for sowing rate using inoculated seed, and vigilance exercised during sowing itself as large faba bean seed can 'bridge' across metering mechanisms in seed boxes, causing blockages in distributors, seed tubes and sowing boots.

Table 3: Working out your sowing rate.

Step	Procedure	Fiord	Icarus	Fiesta VF	Your seed
1	Count & weigh 100 seeds (grams)	40	70	60	
2	Target plant population (plants/m^2)	35	25	30	
3	Sowing rate at 100% establishment (= 100 seed weight x target plant population / 10) (kg/ha)	140	175	180	
4	Sowing rate at 80% establishment * (= sowing rate at 100% establishment x 100/80) (kg/ha)	175	218	225	

* Establishment % can be substituted with germination %, but growers need to be aware that not all germinating seeds will grow, so establishment losses should be taken into account.

Well-nodulated faba bean roots

Seed inoculation and dressing

It is important that the N-fixing capacity of the legume is assured by inoculating seed with rhizobia specific for faba bean. This will stimulate the production of root nodules in which N from the air is fixed into N compounds used by the legume plant. Growth and yield of crops grown on red soils in northern NSW have been increased by seed inoculation, but responses on black soils of the Liverpool Plains have been mixed. Responses in central and southern NSW have been significant, with uninoculated plants having very low biomass and yield, and increased sensitivity to disease. Trials in southern NSW have shown benefits in yield and nodulation associated with rates of inoculum 2–4 times higher than recommended.

Inoculation should be regarded as essential on all soil types. Use the commercially available faba bean inoculant. New formulations of inoculant are becoming available without peat, reducing seed bridging and blockage problems in sowing equipment. Fungicide seed dressings are not normally required for faba bean in NSW.

Seed is inoculated by coating with a slurry of inoculant, peat moss, water and methylcellulose adhesive. Coating seed can be done in various ways:

- Mixing by hand in bags or cement mixers.
- Injecting slurry through an auger
- Injecting liquid inoculant behind the sowing boot during sowing.

Faba beans being inoculated as the seed is loaded by auger into a grouper prior to sowing

Di Carpenter

Sowing depth

Faba bean seeds can be sown up to 100 mm deep, if necessary, to place them into good moisture. In northern NSW, where clay soils usually have good structure, growers practising conservation farming have had good results using 'moisture seeking' tynes. However, if it rains heavily while seed is emerging, seedling losses can occur from waterlogging.

Fertilising the crop

Fertilisation with nitrogen (N) is unnecessary as the crop can meet its N needs through biological N fixation in nodules formed on the roots.

Convention in NSW is to apply P with the seed at sowing as you would for wheat, at rates of 15-20 kg/ha of P.

On alkaline (high pH) clay soils on which crops like wheat, maize and soybeans have responded to zinc (Zn), fertilising with zinc at sowing is recommended. A minimum of 5 kg/ha of actual zinc should be applied.

Molybdenum (Mo) is likely to be needed if the paddock has a low pH. If no molybdenum has previously been applied in the rotation, 150 g/ha of sodium molybdate should be applied as an initial dose, followed 4-5 years later with 125 g/ha.

Use of bees to assist pollination

There is no strong case for bringing domestic bees into commercial crops of faba bean where feral bee (escaped domestic honey bee) populations are known to exist. Studies on the variety Fiord in northern NSW (around Tamworth and on the Liverpool Plains) have shown that almost 100% of flowers examined were pollinated either by self-pollination, or by foraging domestic honey bees or feral bees working the crop. Under these circumstances, and given that less than 15% of these flowers produce mature pods, the provision of beehives would not be expected to increase yield.

However, a study in the Riverina using bee-proof cages showed that plots of Fiord produced 24% more yield than those from which bees had been excluded. So where feral bees are absent, or scarce, as might be the case on an extensive, open plain, introducing beehives could be an advantage.

This issue will remain uncertain as new varieties of faba bean are developed without being tested for their self-fertility.

Irrigating faba beans

Furrow irrigation using bed layouts is the preferred method of growing faba beans under irrigation, although bordercheck bays are common in southern NSW. Beds have given consistently higher yields than bays, due primarily to more efficient and timely water management with less waterlogging. However, the crop can be successfully grown in bordercheck bays where slopes are steeper than 1:1200. Field drainage is a critical factor.

The crop can be sown into pre-watered beds or hills, or into a dry seed bed. Dry sown seed should be watered-up as soon as possible to maintain the viability of the inoculum applied to the seed. Once watered up, and/or given reasonable rainfall in June and July, the crop may not need watering until early spring. In relatively dry winters crops may need irrigating before spring. Faba beans need water earlier than winter cereals. Check soil moisture levels from early August and apply the first irrigation as soon as required. Crop water use increases rapidly during August. Any delays to the first spring irrigation will reduce yield potential by shortening the flowering period. Irrigate and drain within 15 hours on beds, and 8 hours on bordercheck.

The aim should be to provide the crop with ample soil water from flowering onwards (as that marks the beginning of active growth) to ensure that complete ground cover is achieved before the end of flowering. Follow-up irrigations can be scheduled to maintain adequate soil moisture until 75% of pods have turned black. Up to 4 spring irrigations may be required for high-yielding crops.

Cotton growers inspecting irrigated faba beans in northern NSW

Harry Marcellos

WEED CONTROL

Weed control in faba bean should be viewed in the context of overall weed management in the farming system. Consideration should be given to:

- residual herbicides that have been used in the crop before faba bean,
- pre- or post-emergent herbicides that will be used for the faba bean crop itself, and
- their impact on the following crop.

Effective weed management in faba beans begins with planning at least a season before sowing. Few herbicides are registered for the control of broadleaf weeds, so select a paddock with low weed burden, or utilise the preceding crop and fallow to reduce weed numbers.

For a list of registered herbicides see the annual NSW Agriculture publication *Weed Control in Winter Crops*. Consult the product label before using any herbicide.

Use of best management practices such as timely sowing, optimal plant population and adequate nutrition will greatly help weed management because faba beans compete strongly once canopy closure has occurred.

When planning weed control programs in crops and fallow prior to faba beans, be cautious about the use of herbicides with damaging residues. Many of the Group B herbicides have long plant-back periods, up to 24 months for faba beans, which are prolonged on dry soils with pH ($CaCl_2$) above 6.5.

Sulfonylurea damage on faba beans

Peter Matthews

Herbicide resistant weeds, particularly grasses, could become a major concern when growing faba beans. The number of farms which now have populations of grasses resistant to post emergent selective grass Group A herbicides has increased rapidly. As most faba bean growers rely on these herbicides for grass control, failure to be aware of resistance can lead to poor weed control and large yield losses. Grass species with populations resistant to Group A herbicides now include annual rye grass (*Lolium rigidum*), wild oats (*Avena spp.*) and paradoxa grass (*Phalaris paradoxa*).

Faba beans are generally tolerant of the residues of triazine herbicides used on prior summer cereals. Situations may arise where residues from herbicide used in a summer cereal (eg atrazine in grain sorghum) are still effective, so the crop may not need a pre-emergent residual herbicide.

DISEASE RISK AND MANAGEMENT

No current variety has resistance to all the diseases encountered in NSW, so growing faba beans involves greater risks than cereals, and requires an understanding of the main diseases and their management strategies.

The major leaf diseases caused by fungi in NSW are:

- Chocolate spot–a problem throughout NSW.
- Ascochyta blight–occurs mainly in central and southern NSW.
- Rust–a problem mainly in northern NSW, but can occur late in southern NSW.

There is also a number of virus diseases including:

- Alfalfa mosaic virus (AMV)
- Bean leafroll virus (BLRV)
- Bean yellow mosaic virus (BYMV)
- Beet western yellows virus (BWYV)
- Broad bean wilt virus (BBWV)
- Subterranean clover redleaf virus (SCRLV)
- Subterranean clover stunt virus (SCSV)

Management strategies have been developed to reduce the effects of fungal diseases, but control measures for viruses are still very restricted. Growers should inspect their crops regularly, and discuss disease management with their adviser. A number of fungicides are registered for use in NSW for the control of fungal diseases in faba beans. Current registrations and permits can be found on the Pulse Australia web-site, or consult your local agronomist.

Chocolate spot

This disease is caused by the fungus *Botrytis fabae*. It is first seen as reddish to chocolate brown, slightly flattened spots appearing on lower leaves. This is its 'non-aggressive' phase, which is thought to have little effect.

If mild, wet conditions in late winter and spring persist for several days, the disease will spread quickly and be termed 'aggressive'. The disease progresses up the canopy, with the spots rapidly expanding into large patches, which blight the leaves. Plants defoliate and lose flowers and pods. Stems can become reddish-brown and weakened, with a strong tendency to lodge. Flowers and pods may also develop lesions.

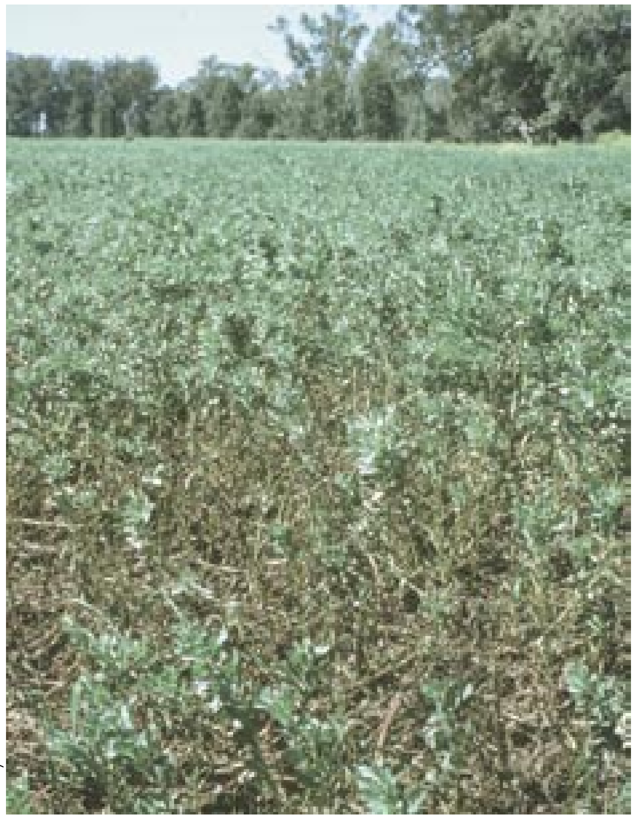

Peter Matthews

Non-aggressive chocolate spot lesions

Young leaves expanding at the top of the plant may outgrow the disease if conditions dry out; lost flowers and pods cannot be recovered. The greatest risk period is normally from late July to late September.

The frequency and severity of chocolate spot is greatest in southern NSW. Whereas chocolate spot is likely to be yield limiting in most seasons in southern NSW, the risk in northern areas is about 1 in 5 seasons.

Aggressive chocolate spot infection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All current faba bean varieties, except Icarus and Manafest, are susceptible to chocolate spot. Through plant breeding, new lines are being developed, which, although not immune to the disease, have much higher levels of tolerance than Fiord.

Effective control of this disease is heavily dependent on the strategic use of fungicides, but attention to other management practices can reduce disease pressure:

- Crop rotation–not more than 1 faba bean crop in 4 years.
- Crop separation–500 m between faba bean crops and the stubble from faba bean crops in the previous year.
- Paddock hygiene–control volunteers and manage stubble to breakdown as quickly as possible.
- Use clean, blemish-free seed.
- Delayed sowing and wide row spacing–keep the canopy open longer.

Ascochyta blight

This disease is caused by the fungus *Ascochyta fabae* and tends to develop under cooler conditions and therefore earlier in the season than chocolate spot. It can be distinguished from aggressive chocolate spot by the presence of small, black, pepper-like bodies in the centre of the dead patches (lesions) on leaves. Lesions often have a concentric zonal appearance.

Ascochyta blight on a faba bean leaf

Harry Marcellos

Ascochyta blight is only a problem in the central and southern half of the State, where the current control strategy, based on research at Cowra, involves an early application of fungicide about 6 weeks after sowing, followed by additional sprays depending on weather conditions and disease levels. Crops should be sprayed with fungicides during pod fill to prevent pod infection and seed blemishes/staining.

In southern NSW, chocolate spot and ascochyta blight should be managed in an integrated disease control program involving fungicides and crop management practices as previously outlined for chocolate spot disease.

Rust

Faba bean rust is caused by the fungus *Uromyces viciae-fabae,* and is of most concern in the north of the State. It is first seen on leaves as small, light green spots about 1mm in diameter which erupt into red powdery (rusty) lesions. These increase in time to densely cover the leaf surface, and later to develop on the stems.

Rust occurs in most years in north-western areas of the State, and may appear from late July in western districts, and from late September in the east. In southern NSW rust does not occur every

Rust on faba bean leaves

Harry Marcellos

year and tends to be a problem only from late September onwards.

Severe rust causes premature defoliation, and being more of a late-season disease, lowers yield by reducing pod set and seed size.

Management practices can help in slowing the onset of the disease:

- Hygiene–incorporate faba bean residues, eliminate volunteers.
- Paddock separation–select paddocks as far away from previous faba bean crops as practical.

In-crop management involves monitoring during early growth (4–6 weeks after sowing) for signs of rust, which, if present, warrants 'cleaning up' with a fungicidal spray. The earlier the disease develops the greater the potential damage.

Further fungicide applications after flowering might be required, and should be considered with reference to disease stage and level, yield potential, seasonal conditions and outlook. This decision should be made after consultation with your local agronomist.

Fortunately, the importance of rust in the northern region will be greatly reduced as the plant breeding program has identified sources of rust resistance which have been incorporated into breeding lines from which new varieties are being released.

Plots sprayed with fungicide to control rust stay green longer

Harry Marcellos

Viruses

Virus diseases have been of concern since the early 1990s, particularly in northern NSW, with two types of disease symptoms being observed. Virus mosaic (dark and light green areas on leaves) accompanied usually by leaf roughness or distortion and virus yellowing accompanied usually by leaf stiffness or rolling, stunting, and root blackening. Both types are carried into crops by aphids during autumn or late winter. Both reduce yields, but virus yellowing is more severe (sometimes lethal) and widespread. Virus species which cause mosaic symptoms include BYMV and BBWV. Virus species which cause yellowing (also referred to as luteoviruses or luteo-type viruses) include AMV, BLRV, BWYV, SCRLV, and SCSV, of which BLRV (often in mixed infection with SCRLV) has been most severe and widespread.

Plant breeding research in NSW Agriculture has identified sources of resistance to BLRV which have been introduced by crossing into lines having higher resistance to ascochyta blight, chocolate spot and rust. As a result, new varieties will be released from the northern breeding program in the medium term with resistance to BLRV as well as fungal diseases.

Virus yellowing in faba bean plants

Harry Marcellos

There are no current in-crop recommendations specifically for controlling virus diseases. The highest virus infection risks are associated with:

- Earlier than recommended sowing–higher likelihood of encountering late summer aphid flights. Follow recommendations for sowing time for each district.

- Sowing into bare, cultivated ground–standing cereal stubble deters aphids. Retain standing stubble and direct drill faba beans.
- Thin stands–a high population and dense canopy can reduce aphid visitation. Use recommended sowing densities.

Oedemas

Raised, black spots up to several millimetres in diameter are often seen on the surface of green pods during later stages of their development. These are caused by insect bites and although unsightly, are usually of no concern. In odd cases, the oedema penetrates the pod wall and can damage the developing seed through secondary infection.

For further information on diseases and disorders of faba beans refer to *Winter Pulse Disorders: The Ute Guide*, by M. Wurst, W. Hawthorne, A. Nikandrow and M. Ramsey.

Oedemas–raised spots commonly occur on pods

Harry Marcellos

INSECT THREATS

In very high numbers, quite a few species of insect could severely damage faba bean crops during their growth and development. Consult the latest edition of *Insect and Mite Control in Field Crops* for descriptions, effects and control of a wide range of insects.

The most important pests of faba bean in NSW have been the native budworm, corn earworm and aphids. On odd occasions, blue oat and red-legged earth mite, lucerne flea, and cutworm may cause damage while the crop is emerging and establishing.

Red legged earth mite (*Halotydeus destructor*) and blue oat mite (*Penthaleus major*)

Mites feed by a rasping and sucking action on the leaves of seedlings, turning the damaged tissue silvery in colour. Severe or older mite damage turns red-brown in colour. Mite damage is most severe at the seedling stage, where deformation of the developing buds and leaves occurs. In severe infestations seedlings may be killed at emergence. The damaged tissue and reduced vigour also increases disease infection potential. The mites usually feed from late afternoon until early morning, and may be active on overcast days. Crops should be monitored as they emerge, or a bare earth spray applied to the paddock post-sowing pre-emergent. Control mites at the first signs of plant damage.

Red legged earth mite (*Halotydeus destructor*)

Lowan Turton

Blue oat mite (*Penthaleus major*)

Lowan Turton

Red legged earthmite damage to faba bean leaves

Leigh Jemkins

Peter Matthews

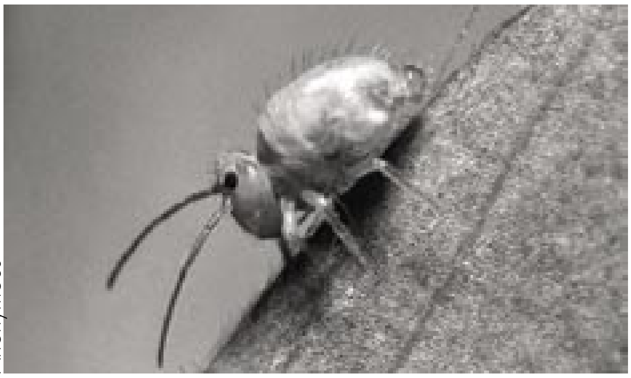
Lucerne flea damage on leaves

Lucerne flea (*Sminthurus viridis*)

Lucerne flea is a sporadic pest and causes characteristic small round holes in the leaves as they feed on the leaf tissue.

The adults and nymphs feed on the soft parts of the leaves during the day and night. Very young nymphs eat isolated holes in one epidermis through to the other epidermis, leaving small membranous windows in leaves. Adults and larger nymphs can completely eat out whole sections of leaves leaving only the veins and outer epidermis. Severe infestations can reduce plant growth and increase the potential for disease infection. Crops should be monitored as they emerge and lucerne flea should be controlled at the first signs of tissue damage.

Lucerne flea (*Sminthurus viridis*)



Anonymous

Cutworms (*Agrotis spp.*)

Cutworms feed on the leaves and stems of young plants. Most damage is caused by older caterpillars, which may cut off and eat leaves, cut down plants and eat the top growth or cause plants to wilt and die by cutting off or eating partly through the stems near ground level.

They usually feed in the evening and night and hide in the soil during the day. Damage can be serious if cutworms are in the soil at sowing or outbreaks occur soon after. Inspect damaged crops in the late evening for the presence of caterpillars. Band spraying over the row when the caterpillars are feeding is the most effective method of pesticide application. Spot treatment of affected patches may be all that is needed. The likelihood of infestation can be reduced by clean fallowing and eliminating weeds from around the paddock perimeter for at least one month prior to sowing.

Cutworm (*Agrotis infusa*)

Lowan Turton

Aphids

Although several species may infest faba beans the cowpea aphid *(Aphis craccivora)* is the most common. Aphids damage plants by direct feeding, generally causing minimal damage unless they are in high numbers. Direct feeding damage is seen in hot spots, where the insects are concentrated at the growing tips of one or more plants, causing wilting, stunting and sometimes tip death.

The main concern with aphids is their capacity to act as vectors, carrying and transfering virus diseases during feeding/sucking.

Natural control agents like weather, ladybird larvae, larvae of hover flies, lacewings and tiny parasitic wasps often kill out the infestation.

Cowpea aphids (*Aphis craccivora*)

Lowan Turton

Grey residues or cast of the aphids may be seen on the plants.

Severe aphid infestations can be controlled by spraying with insecticide, but this generally has no effect on virus transmission, which would have occurred when the aphids commenced feeding in the crop.

Thrips

Several species can damage faba bean crops, but little is known of their economic impact. Of these, onion thrips (*Thrips tabaci*), plague thrips (*T. imaginis*) and tomato thrips (*Frankliniella schultzei*) could be important.

Thrips feed on the flower buds, flowers and small pods, which are shed on being damaged.

Damaged leaves and older pods are marked with silvery brown blotches. The pods may also be distorted and hold few seeds. Crops should be examined from flower bud formation until flowering ends. Hit the growing points and recently opened flowers onto your hand (or white paper) to dislodge the thrips. The limited information available suggests that they should be controlled if 4 to 6 thrips are found per flower.

Thrips

Lowan Turton

Native budworm (*Helicoverpa punctigera*) and corn earworm (*Helicoverpa armigera*)

Two species of helicoverpa can cause damage to pods and the developing seed. The more important of the two is the native budworm, although the corn earworm is becoming increasingly important around irrigation and cotton growing areas.

Infestation of faba beans in advanced stages, particularly during podding, is common and will affect both yield and seed quality. The native budworm moths migrate into NSW from inland Australia in spring, whereas the corn earworm moths hatch in the local area from over-wintering pupae in legume-based pastures or previous crop stubbles, especially cotton, and late planted maize, sorghum and sunflower.

The female moths will lay eggs on leaves, stems, flowers or pods. The young larvae graze on the leaves, flowers, buds, stems and small pods. Older larvae (greater than 10mm) chew through pod walls and feed on the developing seed.

Crops should be inspected at least twice a week from flowering. One approach is to sample each of 10 widely separated sites, by laying a 0.5m^2 piece of white fertiliser bag between the rows. Beat the plants on each side over the bag and count the number of 4–9 mm long larvae which fall.

Native budworm larva (*Helicoverpa punctigera*)

Eric Armstrong

Spraying with insecticide is indicated when the average number of small larvae (less than 10 mm) exceeds 2–4 /m^2, but if human consumption is sought, a lower threshold of 1/m^2 would be advisable. Any insecticidal spray program should be conducted in accordance with your local Helicoverpa Resistance Management Strategy to avoid possible spray failures and the build up of resistance in the local corn earworm populations. One well-timed spray is usually sufficient, but check the crop for about a week after spraying for caterpillars emerging from the pods and, if necessary, respray.

HARVESTING

Having invested so much in time, decision making, effort and money in growing the crop, it is vital to pay attention to this operation, as it will impact on yield and quality.

Following the completion of podding, the faba bean crop turns rapidly from:

1. a pleasing green, well podded and luxuriant crop,
2. through a ragged mosaic of yellow, brown then black foliage,
3. followed by leaf drop to become a field of greenish 'sticks' bearing blackening pods, and
4. finally a black field of very dry stems and pods.

Timing

The crop should be harvested when most stems are defoliated, but still have some green in them. The odd tuft of green leaf may be seen at the top of a small percentage of plants when looking across the paddock. At this stage, seed will be bright and light, with moisture content above 12% (maximum delivery moisture 14%)

Faba beans being harvested in southern NSW

Di Carpenter

and, provided the header is properly set up, physical damage to the seed will be minimised.

In most cases, the bean crop will be ready to harvest at about the same time or earlier than barley. If storing faba beans on farm at moisture contents above 12%, silo aeration should be considered to avoid silo heating and quality downgrading.

Waiting until the crop is completely dry will increase shattering loss before the header front, and mechanical damage through the drum as the seeds, being very dry, will be brittle.

Peter Matthews

A crop of faba beans being windrowed in the Temora district

Windrowing

Faba bean crops can be windrowed, a common practice in south eastern Australia.

Although requiring a separate operation and equipment, windrowing faba bean crops may have advantages:

- Crop maturity is more uniform, and shattering of lower, over-mature pods minimised.
- Harvesting is not delayed by late-maturing weeds.
- Staining of seed by green weed trash can be avoided.
- Heat build-up during storage by green weed trash is avoided.
- A lower cutting height using windrowers enables lower pods to be harvested.
- Losses in tall crops due to vibration and pod shattering ahead of the cutter bar are reduced.
- Tall, bulky crops can sometimes be windrowed before the crop can lodge, speeding up harvest. Tall, bulky crops are very difficult to feed into the header, due to the large amount of material.
- Harvest time can be advanced a few days, depending on time of windrowing and seasonal conditions.
- Header operation may be more efficient at picking up windrows than direct harvesting.

Disadvantages of windrowing are:

- An extra paddock operation and cost is involved.
- Incorrect timing can cause yield loss through premature crop senescence and unfilled grain.
- Heavy rain on windrowed beans may downgrade quality.

The earliest the crop should be windrowed is when the seed in the top pods is physiologically mature (indicated by blackening of the seed hilum). Further information on windrow timing can be found in *Pulse Point 9 Windrowing faba beans.*

Header type and set-up

Open front headers are best for harvesting faba beans as most of the crop has to go through the machine. Rotary combines are gentler on the seed than concave, drum and straw-walker machines.

Mature faba bean seed, showing the black hilum

Di Carpenter

Be as gentle with the seed as possible during harvesting. This means wide concave clearances (15–35 mm) and slow drum speeds (400–600 rpm). Use maximum airflow to get a clean sample. The reel should only touch the top part of the crop, its speed adjusted to match the ground speed of the machine so as to reduce shattering of pods. Minimise the amount of repeat threshing by adjusting sieves.

Faba beans can be handled in bulk when marketing for human consumption. This should be done gently to minimise cracking of seed. Belt conveyors are preferable to augers, but where the latter must be used, choose larger diameter types with greater flight-to-barrel clearance.

Care is needed during bulk handling of faba beans to avoid grain damage

Di Carpenter

FINANCIAL RETURNS

The reward for growing faba bean needs to be considered in two contexts: firstly that of the single crop; and secondly that of the system, or rotation, involving faba bean. Various rotations or systems are possible, and will depend on the farming system. Growers need to look at long-term financial outcomes on an individual basis over a number of years.

The annual crop of faba bean

Budgets based on average yields, conservative prices and common costs are developed by NSW Agriculture economists. They are updated yearly and are available on the NSW Agriculture web site.

Seed yields of faba beans vary with season, crop management and disease pressure. Highest yields have approached 6 t/ha, but most yield in the range 2 to 4 t/ha.

On-farm prices for faba bean have ranged from around AUD$200 per tonne to over $300. Base level prices are set by the stockfeed market and are influenced by factors like the parity of the AU$ against the US$ and economic considerations in the stockfeed market. The higher prices are for beans destined for human consumption.

Annual profitability can be gauged by analysing crop gross margin, which is the difference between gross return and costs (Table 4). These figures are indicative only, and growers should adjust them to reflect their circumstances, expectations and prices.

ROTATION BENEFITS

Cereal systems

Faba bean is an efficient rotation crop in wheat systems because it:

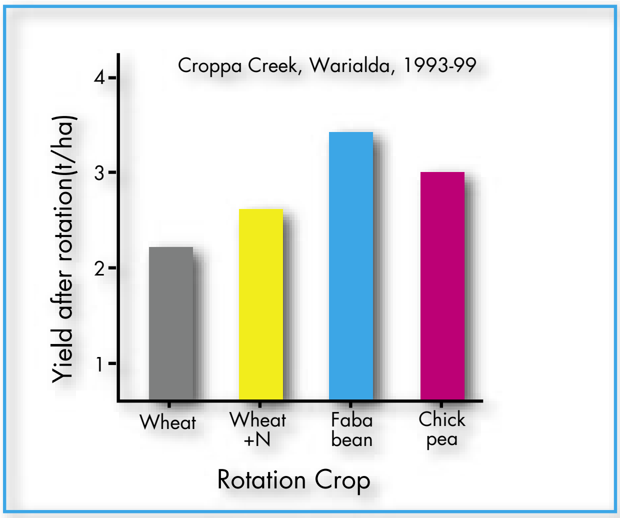
- Increases yield (up 1–1.5 t/ha), and grain protein (up 0.7–1%) in the next wheat crop.
- Has a high level of N fixation.
- Reduces the incidence of diseases like crown rot and cereal nematodes in the next wheat crop.
- Provides alternative grass weed management options in the rotation.

Results from research in northern NSW involving wheat, faba bean and chickpea rotations are illustrated in Figure 4, showing the superior performance of faba beans as a break crop for cereal rotations.

Cotton systems

Collaborative research by the Australian Cotton Research Institute at Narrabri of 35 irrigated faba bean crops has shown that they fixed up to 350 kg N/ha, removed up to 160 kg N/ha in harvested seed and contributed up to 270 kg fixed N/ha to the soil after harvest. The study showed that most faba bean crops fixed almost 3 times as much N as was removed in grain, and the amount of N below the ground accounted for about 40% of the maximum amount of N in the crop, or about 100 kg N/ha.

Figure 4: Average yields of wheat following wheat, with and without nitrogen fertiliser, and following faba bean and chickpea at Croppa Creek in northern NSW.



Source: H. Marcellos, W. Felton (2000). GRDC project DAN 23.

Nitrogen fixation

It is important that faba bean be grown to maximise N fixation, so that:

- growth and yield potential will be highest, and
- the benefits to soil N from N fixation will also be greatest.

The highest levels of N fixation will be achieved by faba bean crops when:

- levels of available soil N (soil nitrate-N) at sowing are low. N fixation is highest when levels of soil nitrate-N in the top 90 cm are less than about 50 kg N/ha at sowing.
- the N demand by the faba bean plant for growth is high.

As a general rule, the higher the yield and grain protein of the previous cereal crop, and the shorter the fallow, the lower will be the level of soil nitrate at the time faba bean is to be sown.

The nature of N benefits from faba bean

These benefits are of two types:

- the N dynamics (N balance) of the legume crop itself, and
- the nature and size of the benefit for the next crop.

N balance of the faba bean crop refers to the difference between the amount of N fixed by the crop, and that removed in the seed at harvest. For example, in Table 5 a well-grown faba bean crop producing 6 t/ha of dry matter above ground will fix about 120 kg N/ha, provided levels of soil nitrate-N in the root zone at sowing are less than about 50 kg N/ha. There would be a gain to the soil of 25 kg N/ha once the grain was harvested.

Table 4: Comparisons of gross margins (GM:$/ha) for dryland wheat (short fallow) and dryland faba beans for the different regions of NSW.

	Faba bean				Wheat				
Region	Yield (t/ha)	Income ($/ha)	Costs ($/ha)	GM ($/ha)	Yield (t/ha)	Quality[1]	Income ($/ha)	Costs ($/ha)	GM ($/ha)
North east	2.5	550	276	274	2.5	AH12	455	219	236
North west	1.8	396	249	147	1.7	PH13	365	132	233
Central east	2.0	440	329	111	2.5	AH	450	216	234
Central west	1.6	352	282	70	1.6	AH	288	171	117
Southern	2.2	515	395	120	3.3	AH	640	286	354
Southern (irrigation)	4.25	935	582	353	4.75	ASW	784	466	318

1 Quality: ASW = Australian Standard White; PH 13 = Prime Hard; AH 12 = Australian Hard.

Source: NSW Agriculture's Farm Budgets for 2002.

Table 5: Working out the N balance for a faba bean crop.

Item		Our crop	Your crop
A.Crop biomass	kg/ha	6000	
B.Crop N @ 2.2%N	kg/ha	132	
C.Add 30% of crop N to allow for roots	kg/ha	40	
D.Total crop + root N	kg/ha	172	
E. Proportion of crop N from fixation.	%	70	
F.Total N fixed	D x E/100, kg/ha	120	
G. Seed yield	kg/ha	2500	
H. N harvested	(Yield x 3.8%)	95	
N balance , or new N. (F–H)	kg/ha	+25	

The **N benefit** refers to how much extra soil nitrate-N will be available to the following wheat crop at the time it is sown. On average in research trials in northern NSW, about 30–40 kg more soil nitrate-N/ha was available to the next wheat crop as compared with a wheat-to-wheat system.

LIVESTOCK FEEDING

Faba beans are palatable, digestible and non-toxic when incorporated into rations for livestock and poultry. They are excellent sources of protein and energy, but have lower levels of the sulfur-containing amino acids, methionine and cysteine, than wheat.

The extent of inclusion of pulses in stockfeed is dependant on which, and how much, anti-nutritional factors they contain.

These factors may interfere with the digestion and utilisation of nutrients in the feed. Research has set various restrictions on the inclusion of raw pulses in the diets of animals.

General nutrient composition of pulses and soybean meal is given in Table 6. Detailed information for Australian faba bean varieties is shown in Table 7.

Table 6: Nutrient composition of pulses

Pulse	Fibre (%)	Protein (MJ/kg)	Energy (%)	Lysine	Methionine
Soybean	6.0	46.0	14.5	2.89	0.56
Lupin (narrow-leaf)	13.0	29.0	14.5	1.35	0.15
Chickpea (desi)	17.0	22.5	15.3	1.20	0.16
Faba bean	8.0	23.0	13.7	1.53	0.18
Field pea	6.0	23.0	14.1	1.60	0.20

Source: Ellen Howard (personal communication). Note: These are average values and significant variation does occur depending on factors such as varieties, agronomic practices and climatic conditions

Table 7: Variation in composition of Australian faba bean varieties

Variety	Protein	Total Starch (%, dry basis)	Cysteic acid	Lysine	Methionine
Aquadulce	29.7	35.6	0.30	1.48	0.17
Ascot VF	28.3	37.4	0.28	1.57	0.18
Barkool	24.7	36.9	0.28	1.50	0.18
Fiesta VF	28.3	39.2	0.25	1.61	0.18
Fiord	28.0	37.2	0.31	1.50	0.19
Icarus	27.7	37.4	0.30	1.50	0.18

Source: P. Burridge (1999). GRDC Project DAW440B.

Faba beans for pigs

NSW Agriculture piggery officers coordinated feeding demonstration trials at four locations throughout the State during the mid-1980s to compare faba beans, field peas, chickpeas, lupins and soybean meal in grower diets for pigs.

There were no differences between the pulses and soybean meal in terms of daily rate of weight gain, backfat levels, feed conversion or dressing percentages. The inclusion of pulses at 20 per cent of the diet gave performance similar to 10 per cent soybean meal, provided the diets were balanced for amino acid content.

Similar results were obtained in South Australia with growing boars fed wheat-based diets equalised for digestible energy and total lysine, in which supplementary protein was provided either by Fiord faba beans or White Brunswick field pea. Pigs grew equally well whether supplemented with faba beans or field pea.

It was concluded at that time that there was a cost advantage to be obtained in preparing feed rations including pulses provided that they could be purchased for half the price of soybean meal less $10. This costing can now be determined using computer programs.

Faba beans for poultry
Canadian research has shown that diets for laying hens and growing turkeys containing 20 and 25 per cent ground faba bean resulted in production performance equal to that from standard diets.

Faba beans for cattle
In rations for dairy cattle, faba beans may replace soybean or other protein meals. Except for coarse grinding, faba beans require no further processing. Faba beans can make up to 35 per cent of dairy concentrates.

Faba beans are an alternative to lupins in beef cattle feeding, and are relatively safe to feed compared with cereal grains due to their lower starch levels. They should be introduced to cattle slowly and with caution, as with any grain, to avoid the risk of poisoning due to a change in diet.

Faba beans for sheep
Faba beans are rarely used for sheep, but could be fed unprocessed in the field in much the same way as lupins, bearing in mind that lupins contain higher protein levels.

Pulses and the feed grain market
Australia's feed grain usage has increased significantly in recent years, from about 6 million tonnes nationally around 1990 to about 8 million in the mid-1990s, to match demand from intensive industries and beef cattle feed lots. Globally, feed grain usage also continues to increase, with the United States and China leading the way.

About 1 million tonnes of pulses (mainly lupins) was used in the domestic feed grain market in Australia during the mid 1990s.

Considerable potential exists for greater use of pulses in compounded stockfeed as pig, poultry and beef feedlot industries expand, and the quantity and/or location of Australian protein ingredient production remains inadequate for total feed demand. It will depend on cost-competitive replacement of imported soybean meal and domestic canola meal.

FABA BEAN MARKETING

Presently only half of the faba beans produced in Australia make human consumption grades, with the remainder going into the stockfeed market. To meet human consumption standards beans must have acceptable colour and minimal blemishes on seed coats (see Tables 8 and 9). This can be achieved by management which limits damage by insects and diseases, avoids late plantings and implements early harvest.

Export marketing
Over recent years faba beans have been mainly exported to Egypt and Saudi Arabia for human consumption as dry beans. Saudi Arabia also has a premium market available due to their canning operations. Smaller quantities have been exported to Jordan, Yemen, Malaysia, Taiwan, Indonesia, Spain and United Arab Emirates. The largest exporter of faba beans is Australia; others include China, United Kingdom, Turkey, France, Ethiopia and Netherlands.

Segregation
Different markets require different sizes of faba beans. As an example, Saudi Arabia requires small beans, similar to Fiord, and Egypt a medium size bean. Australian faba beans are now being segregated on size to meet varying market requirements.

Contracting
Faba beans are generally marketed from harvest when quality and quantity are known. Storage is not normally used as a marketing tool to sell into human consumption markets as seed coats discolour over time. It is advisable to keep in contact with traders and advise of likely quantities for sale during the growing season. Full receival standards are available from grain traders or the Pulse Australia web site. Current delivery standards are shown in Tables 8 and 9 for the two commonly delivered grades in Australia.

Faba beans being fed to sheep in southern NSW


Peter Matthews

Table 8: Minimum receival standard for farmer dressed faba beans No 1 Grade (CSP–4.2.1)
(Source: NACMA Standards 2001)

Parameter	Requirements	Comments / Variations
Physical Characteristics	The faba beans shall be sound, dry and fresh and light to medium brown or pale green in colour	
Purity	97% minimum by weight	Whole faba beans, defective faba beans and seed coats
Moisture	14% maximum	
Defective Seeds	Total 8% maximum by weight including 5% maximum broken etc and 3% maximum poor colour	Faba beans not of the specified variety. Faba bean cotyledons seed that are broken, heat damaged, hail damaged, insect damaged, shrivelled, split, chipped, sprouted and/or affected by mould (field or storage). Includes pods that contain faba bean, whether broken or unbroken and loose seed coat.
Poor Colour	3% maximum by weight	Faba beans with excessive discolouration of the seed coat as per the Pulse Australia faba bean Photographic Charts. Includes ascochyta lesions.
Screen Size	3.75 mm slotted	Faba bean seed material defective if passes through this screen.
Foreign Material	3% maximum by weight	Includes unmillable material and all vegetable matter other than faba bean seed material. This includes stalks and plant material that may be connected with the plant.
Unmillable Material	0.5% maximum by weight	Includes soil, stones, metals and non-vegetable matter.
Snails	Two (2) maximum	Whole or part , dead or alive, per 200g sample
Ryegrass Ergot	Two (2) cm maximum	Pieces laid end to end per 200 g sample
Field Insects	Fifteen (15) maximum	Dead or alive per 200 g sample
Foreign Seeds		See appendix page 4/56 National Agricultural Commodities Marketing Association Inc. (NACMA). Agricultural Commodities: A reference series on the grain industry. Number 4 Pulses, October 2001.
Objectionable Material	Nil tolerance	See appendix page 4/56 National Agricultural Commodities Marketing Association Inc. (NACMA). Agricultural Commodities: A reference series on the grain industry. Number 4 Pulses, October 2001.

Note: Western Australian adjustments: Foreign seeds: No more than the following per 200 g sample
Five (5) Double gees
Five (5) Pulses (including lupins and Icarus faba beans)

Table 9: Minimum receival standard for farmer dressed faba beans No 2 Grade CSP–4.3.1
(Source: NACMA Standards 2001)

Parameter	Requirements	Comments / Variations
Physical Characteristics	The faba beans shall be sound, dry and fresh and light to medium brown or pale green in colour	
Purity	97% minimum by weight	Whole faba beans, defective faba beans and seed coats
Moisture	14% maximum	Faba beans with excessive discolouration of the seed coat as per the Pulse Australia faba bean Photographic Charts. Includes ascochyta lesions.
Defective Seeds	10% maximum by weight including poor colour	Faba beans not of the specified variety. Faba bean cotyledons seed that are broken, heat damaged, hail damaged, insect damaged, shrivelled, split, chipped, sprouted and/or affected by mould (field or storage). Includes pods that contain faba bean, whether broken or unbroken and loose seed coat.
Poor Colour	7% maximum by weight	
Screen Size	3.75 mm slotted	Faba bean seed material defective if passes through this screen.
Foreign Material	3% maximum by weight	Includes unmillable material and all vegetable matter other than faba bean seed material. This includes stalks and plant material that may be connected with the plant.
Unmillable Material	0.5 % maximum by weight	Includes soil, stones, metals and non-vegetable matter
Snails	Two (2) maximum	Whole or part , dead or alive, per 200g sample
Ryegrass Ergot	Two (2) cm maximum	Pieces laid end to end per 200 g sample
Field Insects	Fifteen (15) maximum	Dead or alive per 200 g sample
Foreign seeds		See appendix page 4/56 NACMA Commodity Standards (annual)
Objectionable Material	Nil tolerance	See appendix page 4/56 NACMA Commodity Standards (annual)

Note: Western Australian adjustments: Foreign seeds: No more than the following per 200 g sample
Five (5) Double gees
Five (5) Pulses (including lupins and Icarus faba beans)

Processing and utilisation of faba beans
In most countries, humans consume faba beans as dishes prepared from dry beans. Faba beans are consumed as medamis (stewed beans), falafel (deep fried bean/vegetable mix), bussara (bean paste) and nabet soup (boiled germinated beans).

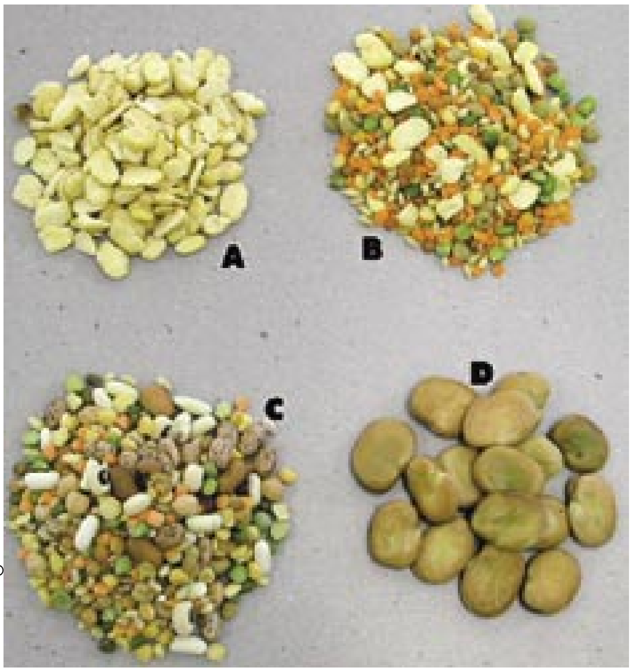
Faba beans can be dehulled, split and ground into flour. The flour is often used as a source of vegetable protein in meat extenders. Faba beans can also be processed into protein-rich and starch-rich fractions. Starch extracted from faba beans is used to make vermicelli, noodles, dumplings and steamed bread.

FABA BEANS IN HUMAN DIETS

Pulses have a long history as human foods in many societies. Chickpeas, faba beans and lentils are important foods in the Middle East. Chickpea, lentil and summer growing pulses are staples in south and south-eastern Asia.

In Australia and other developed countries, their value in human diets is becoming increasingly identified with their potential to improve human health and reduce the risk of chronic degenerative diseases like coronary heart disease, bowel cancer, diabetes, obesity, constipation and diverticular disease.

Faba retail products–A: Faba bean splits; B: Soup mix containing faba bean splits; C: Soup mix; D: Whole faba bean.



Michel Dignand

The role of diet in the prevention and management of these problems is most important, and health authorities recommend that people increase their consumption of complex carbohydrates (starch and fibre) and reduce the intake of total and saturated fats.

The Australian consumer needs to be made more aware of these diet and health issues, and to be given a better understanding of the various pulses and how they may be used. A number of pulse products can be found on the shelves in major Australian supermarkets, and in large cities in small markets which cater for ethnic communities.

Cookbooks are also available: GRDC has published *Passion for Pulses* containing 150 recipes from around the world. The Victorian Department of Agriculture and Rural Affairs has produced *Creative Cooking with Peas, Beans and Lentils*, which describes the pulses, cooking methods and 20 recipes.

FURTHER INFORMATION

For more information on faba bean production consult your local district agronomist.

NSW Agriculture publishes topical information on faba beans in Agnotes and *Pulse Points*, copies of which are available on the Department's worldwide web site or from district offices.

The following publications may also be useful:

Carpenter D, *Pulse Points*, NSW Agriculture, Wagga Wagga.

Grain Legume Handbook Committee, updated 2002 , *Grain Legume Handbook*, Finsbury Press, South Australia.

Hertel K. & Roberts K., annual publication *Insect and Mite Control in Field Crops*, NSW Agriculture, Orange.

McRae F.J. annual publication, *Winter Crop Variety Sowing Guide*, NSW Agriculture, Orange

Moore, K., Nikandrow A., Carter J., Ramsey, M. & Mayfield, *A Field Guide to Faba Bean Disorders in Australia*, GRDC.

Mullen, C.L., Dellow, J.J. & Francis R.J. annual publication *Weed Control in Winter Crops*, NSW Agriculture, Wagga Wagga.

Powell, C. annual publication, *Winter Crop Variety Experiments*, NSW Agriculture, Wagga Wagga.

National Agricultural Commodities Marketing Association Inc. (NACMA). *Agricultural Commodities: A reference series on the grain industry. Number 4 Pulses*, October 2001.

Wurst, M., Hawthorne, W., Nikandrow, A. and Ramsey, M. *Winter Pulse Disorders: the Ute Guide*, PIRSA, South Australia.

World Wide Web sites for faba beans:

NSWAgriculture: www.agric.nsw.gov.au

Pulse Australia: www.pulseaus.com.au

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