

Establishing high-yielding faba bean

Exploiting high yield potential in north-west Europe



Tim O' Donovan and Denis Dunne

Faba bean (*Vicia faba* L.) is also known as field bean or broad bean. Faba bean is especially well adapted to relatively heavy soils and cool conditions. The faba bean is therefore the grain legume of choice over much of northern Europe. Unlike cereals, the root system is not fibrous so faba bean is not well adapted to compacted soils. The yields of Irish faba bean crops are exceptionally high, often up to 8 tonnes/ha. This is about twice the average yield in Germany and France. This note describes some of the key practices used in the establishment of these exceptionally high yielding crops. These high yields are due to the Irish climate which is ideal for crop growth. Understanding the crop management practices used to exploit this high potential helps in improving production in Ireland and is relevant further afield.

Outcome

Successful establishment of the crop supported by adequate soil water throughout the growing period provides the foundation of exceptionally high yields.



Faba bean plant just before it begins to flower.
Photograph: Denis Dunne

Applicability

Theme: Establishing faba bean

For: All faba bean growers

Where: Where faba bean is grown

Timing: Autumn or early spring

Equipment: Suitable for inversion and non-inversion tillage systems

Follow-up: Protection of the established crop

Impact: Foundation for high yield

Principles

The overall purpose of managing establishment is to produce a fully functioning crop canopy with full ground cover by early May. This enables maximum use of sunlight during the long relatively cool summer day of north-western Europe. The overall outcome is a result of the interaction between cultivar (genetics, G), environment (E) and management (M): $G \times E \times M$. Selecting a cultivar that is well adapted to the environment (location) is essential to optimise $G \times E$. With a well-adapted cultivar grown on a good site, success depends on optimising M: starting with an optimum sowing date, seeding rate, seeding technique and conditions, and follow-up protection of the emerging plant stand.

Site

Faba bean is the grain legume of choice on heavy water-retentive soils of northern and north-western Europe. The exceptionally high yields in Ireland come from a combination of early establishment (including autumn sowing), large amounts of light from long summer days over a long period. This favourable combination depends on the presence of a full canopy between mid-April and mid-September with

relatively cool weather and little heat stress. Complementing this, the deep rooting of faba bean provides access to water reserves. Ideal sites are also characterised by a soil pH between 6.5 and 7.0, good levels of base nutrients phosphorus, potassium and magnesium, and an absence of serious soil compaction.

Lime and base fertiliser applications (phosphorus and potassium) can be made to the crops but these do not fully compensate for low nutrient levels.



Faba bean in mid-June. Photograph: Seedtech

Sowing date

Sowing under suitable conditions from late February onwards gives rapid germination followed by the quick establishment of a good root system. Slow germination and slow early growth under cold conditions leaves the germinating seed and young seedlings vulnerable to rotting and to attacks from birds, especially crows (species of the genus *Corvus*). The birds are attracted by the reserves remaining in the seed cotyledons. Weed control is also difficult.

Autumn sowing is an option in regions with relatively mild winters, such as Ireland. For such autumn sowing, the aim is to get rapid establishment in warm soils to the point of having young plants that are resistant to pest attack but which are still in the juvenile stage with tolerance of cold conditions throughout the winter. This is generally achieved in Ireland by sowing in October.

Seeding rate

The optimum seeding rate depends on the target plant population, seed size, and expected rate of establishment (number of plants established in relation to the number of seeds sown). The target plant population depends on how the cultivar responds to variation in plant population, the cost of seed, and the expected selling price of the harvested crop.

Research in Ireland has identified 30-35 plants/m² as the optimum in most situations for commercial crop production and for on-farm seed multiplication. This requires the sowing of 35-40 seeds/m² where 90% germination and 5% field losses are expected. Seed quality is important. Seed damage due to rough seed harvesting and handling affects grain legume species such as faba bean and pea more than cereals. This means that seed germination quality and vigour are important.



Faba bean emerging. Photograph: Seedtech

The following formula calculates the seeding rate in kg seed/ha:

$$\frac{\text{Weight of 1,000 seeds in grams} \times \text{Target plant population in plants/m}^2}{\text{Percent establishment}}$$

Typically, seeding rates range from 200 to 300 kg/ha depending on seed size and the expected establishment rate. A good establishment rate is 85% (90% germination and 5% field losses).

Seeding technique and conditions

For seeding itself there are several options and parameters to be considered. These include the use of conventional drilling in tilled soil or the use of slot seeding in untilled or lightly tilled soil. Combined drilling of seed and a high-phosphorus fertiliser is also practiced by growers of these high-yielding crops in Ireland.

Seeding technique and conditions

- Faba bean needs water in summer for maximum yield. It grows well in cool climates and on soils with good water retention characteristics.
- Soil compaction reduces yield by up to 40%, so good soil care and seedbed preparation is important.

- The optimum plant population is 30–35 plants/m².
- Sowing 70–100 mm deep protects the seed and seedlings from birds and herbicides.
- The optimum soil pH is 6.5–7.0 and practice indicates that faba bean responds to high available soil P and K levels.

Further information

Seedtech 2020. The spring bean agronomy guide, website: www.seedtech.ie/en/agronomy/spring_bean

Teagasc 2020. Field beans, website: www.teagasc.ie/crops/crops/research/research-programme/cropquest/field-beans/

Sources

Information in this practice note was sourced by Tim O'Donovan from trials and from experience.

About this practice note and Legumes Translated

Authors: Tim O' Donovan and Denis Dunne

Publisher: Seed Technology Ireland Limited (Seedtech)

Production: Donau Soja

Permalink: www.zenodo.org/record/4486771

Copyright: © The Authors, 2021. Reproduction and dissemination is permitted for non-commercial purposes provided the authors and source are fully acknowledged.

This practice note was prepared within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634.

Citation: O' Donovan, T. and Dunne, D., 2021. Establishing high-yielding faba bean. Legumes Translated Practice Note 8. www.legumestranslated.eu

The content is solely the responsibility of the authors. No warranties, expressed or implied, are made with respect to the information provided. Information relating to the use of plant protection products (pesticides) must be checked against the product label or other sources of product registration information.

