

# Beans (*Phaseolus vulgaris* L.)

## Under Temperate Conditions

### French Beans (*Phaseolus vulgaris* L.)

French: Haricots verts; Spanish: Judias; Italian: Fagiolini; German: Grüne Bohnen

#### Crop data

Harvested part: young immature pods, used fresh or for processing or freezing.

Plant density: 10-35/m<sup>2</sup>.

Yields 9-20 t/ha, depending mainly on variety and method of harvesting (manual or mechanized).

Temperature requirements rather high: optimum for growth, flowering and setting is near 20 °C (zero growth below about 10 °C); bush varieties tolerate low temperatures better than climbing varieties.

The crop is adaptable to different physical characteristics of the soil but is very intolerant of salinity in soil and water (salts exceeding 1.5 g/l in the water reduce the yield by about 50 %; a concentration of 0.25 g Cl/l reduces the yield by 25 %). The crop is also very sensitive to pH < 6.0; in acid soils deficiencies of Mg and Mn can often occur.

#### Fertilizer recommendations

In normal soil conditions, the crop benefits from a nitrogen supply resulting from a symbiotic association with Rhizobium. For out-of-season and greenhouse crops and generally when soil and weather conditions are sub-optimal, direct applications of fertilizer N are needed; normally at rates of 40-50 kg/ha N in ammonium and/or nitrate form, before sowing and some weeks after emergence, thus meeting the requirements of the plant and permitting satisfactory symbiotic activity.

For P, the rates range from 50 to 100 kg/ha P<sub>2</sub>O<sub>5</sub>, according to soil status, distributed at sowing.

K may be applied at rates up to 120-150 kg/ha K<sub>2</sub>O; the K:N ratio should preferably be about 3:1.

Fertilizers should be well mixed into the soil, bearing in mind the plant's sensitivity to high salt concentration.

The crop is sensitive to excess of B and to deficiencies of Cu, Mo and particularly Zn. Problems with micronutrients are less liable to occur in garden crops than in large-scale field crops on account of the higher organic matter content of the soil.

## Under Tropical/Subtropical Conditions

## Beans (*Phaseolus vulgaris* L.)

### Crop data

Directly seeded. Harvested: 40 - 60 (bush) and 50 - 70 (pole) days after seeding. Plant density: 100 000 to 330 000 plants/ha (bush beans); 20 000 - 35 000 plants/ha (pole beans). Preferably grown in sandy loam, friable soils free of nematodes and fungus diseases.

The crop is adapted to a wide range of environmental conditions from sea-level to highlands, preferably with temperatures in range 20 - 25 °C.

Target marketable yields in intensive commercial production = 3.5 - 8.5 t/ha.

### Nutrient demand/uptake/removal

Nutrient uptake/removal - Macronutrients (optimum fertility conditions)					
Yield t/ha	kg/ha				
	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	MgO	CaO
13	129	21	68	17	50
Source: various					

### Plant analysis data

Plant analysis data - Macronutrients (optimum fertility conditions)							
Plant part	Growth stage	% of dry matter					
		N	P	K	Mg	Ca	S
Young mature leaf	Early flower	3.2	0.4	2.4	0.5	1.9	0.2
Source: various							

Plant analysis data - Micronutrients (optimum fertility conditions)							
Plant part	Growth stage	ppm dry matter					
		Fe	Mn	Zn	Cu	B	Mo
Young mature leaf	Early flower	137	92	23	11	26	1
Source: various							

### Fertilizer recommendations

Both bush and pole types are very sensitive to salinity. Well decomposed organic manure should be used. Application of N early in growth is important in order to promote growth before effective atmospheric N fixation by nodule bacteria. The crop is sensitive to Mg deficiency (dolomitic lime to be applied).

### Preferred nutrient forms

In loam soils the preferred N source is ammonium, to increase pod yields and N-fixing nodule formation.

### Present fertilizer practices

Senegal (Camberene)

In light sandy soils in a semi-arid area apply 5 t/ha organic manure, 110 kg/ha N, 160 kg/ha P<sub>2</sub>O<sub>5</sub>, and 80 kg/ha K<sub>2</sub>O. Before planting, broadcast all the organic manure, 40 % of the P<sub>2</sub>O<sub>5</sub> and 25 % of the K<sub>2</sub>O. At fifteen, thirty and forty days after planting, band 25 % of the N, 20 % of the P<sub>2</sub>O<sub>5</sub> and 25 % of the K<sub>2</sub>O.

### **Brazil (Minas Gerais)**

General recommendations are, firstly, 60 kg/ha N, 200 kg/ha P<sub>2</sub>O<sub>5</sub> and 90 kg/ha K<sub>2</sub>O incorporated in the soil at planting and, secondly, 60 kg/ha N broadcast in two applications 15 and 30 days after planting.

### **Philippines (Los Banos)**

Apply 100 kg/ha N, 200 kg/ha P<sub>2</sub>O<sub>5</sub> and 100 kg/ha K<sub>2</sub>O. All of the fertilizer is applied at planting in bands 8 cm to the side and 3 cm below the seed.

### **Further reading**

MUNNS, D.N.; FOX, R.L.: Comparative lime requirements of tropical and temperate legumes. *Plant Soil* 46, 533-548 (1977)

PECK, N.H.; MACDONALD, G.E.; GARDNER, A.V.: Snap bean plant responses to sources and rates of nitrogen and potassium fertilizers. *HortScience* 24, 619-623 (1989)