STARKE AYRES®

GREEN BEAN

PRODUCTION GUIDELINE

GREEN BEAN

1. INTRODUCTION

Green beans are dicotyledonous plants, and members of the family, Fabaceae, forming part of the species *Phaseolus vulgaris*. The green bean originated from Peru, and spread to South and Central America by migrating Indian tribes. It was introduced to Europe by the Spanish explorers around the 16th century, and spread further throughout the world by Spanish and Portuguese traders. For a long time rare and expensive, this vegetable only became widespread in the 19th century. Nowadays the largest commercial producers of fresh green beans include the United States, China, Japan, Spain, Italy and France. Green beans are popular in many types of cuisines. Digestible, low in calories and filled with vitamins, green beans are ideal for health conscious weight watchers.

2. ADAPTABILITY

2.1 CLIMATIC REQUIREMENTS

Daytime temperatures between 24 – 27 °C
Minimum temperatures of 14 – 16 °C

2.2.1 SOIL REQUIREMENTS

Avoid soils that cap (tend to make a crust). These soils will damage young emerging seedlings which will result in a lower population. Cultivate green beans on soils that drain well such as sandy loam soils. Green beans do not grow well on waterlogged soils – these soils are conducive to damping off and other seedling related diseases.

Ideal soil analysis or soil status for green bean production is:

pH (H2O):	5.0 to 6.5 (Acid saturation above 15%)
P:	>20 mg/kg (Bray 1)
K:	>100 mg/kg (8%)
Ca:	200 – 2000 mg/kg (65%)
Mg:	>120 mg/kg (25%)
Na:	10 – 50 mg/kg (<3%)
Soil type:	Sandy loam to clay loam with clay content between 15 – 35%

2.3 PRODUCT TYPES CURRENTLY AVAILABLE IN SOUTH AFRICA

Green beans are used in the processing industry as well as the fresh market sector.

Processing types

Special green bean varieties have been developed for processing. These varieties have:

A standard diameter pod (8-10mm)
High yield
Concentrated flushes and pod set
High disease resistance.

Fresh market types:

For the fresh market, it is particularly important for the pods to maintain their quality after harvesting, with gel that stays soft for as long as possible. For this reason, fine and extra fine pods are popular on the fresh market, for they maintain a better eating quality that standard beans. Yield is however influenced by the finer pods and is generally lower than with processing type beans.

3. CULTIVATION PRACTICES

3.1 SOIL PREPARATION

Land should be deep ripped, to around 0.5m (depending on type of soil and presence of sub-soil layers) and then harrowed to ensure a fine tilth with no excessive clods. This is very important.

3.2 PLANTING PERIODS

Green beans are mostly planted in the spring and summer months. It is possible to produce green beans year round in frost-free areas.

3.3 PLANT POPULATION AND SPACING

Green beans can be planted at a rate of 250 000 up to 350 000 seeds per hectare. Row width, irrigation type, time of year etc, will determine the final decision. The average stand is usually between 250 000 - 280 000 seeds per hectare. Depending on grade, there are 3500 - 4000 seeds/kg. Seed rate therefore varies between 60 - 100kg/ha.

Row spacing can however vary from 45 cm between rows to 90 cm or more between rows. The most popular row spacing with smaller plantings and handpicked crops seems to be a double row spacing of 45 cm between the planted rows with a walkway of 75 - 90 cm for the pickers to walk in.

3.3.4 PLANTING DEPTH

Seed should be placed at a depth of 10 – 15 mm.

3.4 FERTILIZATION

The optimum pH level for green bean production is around 5.8.

3.4.3.1 NITROGEN (N)

Nitrogen fertilization should be based on the results of a proper soil analysis. A leaf analysis can be done on plants, where nitrogen composition of less than 2.5% would indicate a deficiency. Under normal conditions, a total nitrogen application of 100-120 kg N /ha applied in various splits is seen as the norm. 60% of the total nitrogen can be applied prior to planting and the remainder needs to be applied by week 4 after planting.

3.4.3.2 PHOSPHORUS (P)

Usually all the P is applied at planting. Under normal conditions a total phosphorous application of 30-65 kg/ha is adequate. Where the phosphorus status of the soil has been built up over several years, as little as 10kg P applied per hectare should be adequate. Soil analysis should be the basis of this decision however.

3.4.3.3 POTASSIUM (K)

Under normal conditions a potassium application of 50-95 kg/ha is adequate.

3.4.3.4 CALCIUM (Ca)

Ca analysis should be above 200mg/kg with a total percentage of 65% in the total CEC (Cation Exchange Capacity). Sufficient calcium will be available for a green bean crop when adhering to a recognised liming protocol. Should a deficiency arise an application of $CaNO_3$ can be done (equivalent of 35-55 kg Ca/ha applied).

3.5 IRRIGATION

As with the application of fertilizer the water requirements of the bean plant are crucial to achieving maximum yields. The greatest need for water is during the flowering and pod set stages. Depending on the prevailing climatic conditions during growth the water requirement of a bean crop can vary considerably, however, for planning purposes 650 - 750 mm of water may be needed.

The following can be used as practical guideline:

Emergence – Flowering:	25-35 mm water every 10 days.
Flowering – Picking stage:	25-35 mm water every 7-10 days.

The crop factors for green beans are 0,3 for the first 20% of the growing season, i.e. the first four to five weeks, 1.15 for the next 20% of growth, 0.4 for the last 20%.

3.6 OTHER CULTIVATION PRACTICES

3.6.1 WEED CONTROL

Weed control on any farm must be addressed with a holistic approach and begins with correct land preparation but encompasses the correct use of pre- and post-emergent herbicides, manual hoeing and crop rotation. Weeds need to be adequately controlled because they are efficient competitors with the crop for nutrients, moisture and sunlight. Some of them might be hosts of pests and diseases, or they might provide shelter for insect pests. It is very important that weeds be controlled in the early stages of crop development, because early competition can more seriously affect plant growth, and result in the lowering of crop yields.

4. HARVEST AND MARKETING

Green beans can be harvested manually or mechanically. The exact timing of the harvest depends greatly on the method of harvesting. Green beans for the fresh market are generally harvested by hand. Only pods that are physically ready are picked, meaning that a field may be picked as many as four times or more per season. Rapid transport and cooling of fresh market crops is important to maintain quality. Hydro cooling and pressure cooling techniques are preferred for immediate removal of field heat. Night and early morning harvesting is preferred. Picking usually start around 50 days after emergence. Depending on variety, picking can last from 10-25 days.

Processing beans are more likely to be mechanically harvested. The ideal is to combine at least three flushes into a single harvest. This means that some pods will be nearing an overdeveloped point, whereas others might still be small. Green beans used for processing is usually harvested mechanically by six-row self-propelled harvesters. Bulk handling at harvest time allows processors to maximise factory throughput and control pod quality parameters. The harvester snaps off stems, leaves and pods, and loads them into a trailed field bin holding 2-3 tonnes. When full, the bin hydraulically tips the beans into a truck ready for delivery. These trucks hold approximately 23 tonnes. Quality deteriorates rapidly after harvesting, and processing must begin as soon as possible after harvest. Long road hauls in hot weather are undesirable.

5. GRADING AND MARKETING

The introduction of fine and extra fine green bean cultivars, has created new local and export market opportunities. Fine beans are reported to comprise 90% or more of fresh market sales. Good quality, attractive packaging and presentation have proved popular. Pods should also be straight and preferably have a darker green colour. Presentation is important and buyers look for quality and evidence of good packing. There should be no insect or disease damage. Most consumers buy on looks, and taste is second priority.

6. POSTHARVEST

Beans should be harvested when the pods are bright green, fleshy and seeds are small and green. After that period, seed development reduces quality and the pod becomes pithy and tough and looses green colour. Beans should be well formed and straight, bright in colour with a fresh appearance, and tender but firm. They should easily snap when bent. Leaves, stems, broken beans, blossom remains, insect damage should not be present. Decreased quality during postharvest handling is usually often associated with water loss, chilling injury, and decay.

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6.1 STORAGE

Green beans have a short shelf-life and are not well suited for storage. At 5-7.5°C a shelf-life of 8-12 days is expected. Very good quality can be maintained for a few days at temperatures below 5°C but chilling injury will be induced. Some chilling may occur at the recommended storage temperature of 5°C after 7-8 days.