Bean (*Phaseolus vulgaris*) is considered as one of the most important legumes worldwide, which is a source of nutrients to many people. It is a staple food crop in Kenya, which rates second after maize.
The crop is grown in almost all regions in Kenya. However, Eastern, Nyanza, Central, Western and Rift valley are the major bean growing provinces.

Bean crops grow with very minimum care and adds Nitrogen to the soil.

VARIETIES
A wide range of bean varieties are grown in Kenya. These include the following;

- Rose Coco
- Mwitemania
- Wairimu
- Mwezi Moja
- Canadian W
- KK 15

ECOLOGICAL REQUIREMENTS

- *Soil*– bean crop thrives in a well-drained soil which is rich in organic matter, weed free and has an optimum PH of 6.5-7.5. Growth is poor in waterlogged soils.
- *Altitude*– the crop does well at an optimum altitude range of up to between 1000-2100M ASL. It however tends to grow and mature faster in low altitude zones.
- *Rainfall*– a well distributed annual rainfall of between 800-2000mm is suitable for the rain fed production. Irrigation should be done if rainfall is inadequate. Too much rain or long dry spells are not conducive and reduces yields. Excessive rainfall during flowering causes flower abortion and increased disease incidences. Dry weather conditions are needed during harvesting.
- *Temperature*– beans grow in temperatures ranging from 15-33 degree centigrade. However, an optimum growing temperature of 20-25 degrees centigrade is essential. Relatively high temperatures affect flowering and pod setting processes. The crop is very sensitive to frost.

PLANTING
Propagation is by seeds.

It is advisable to use certified seeds or those that are disease free. Wrinkled, damaged and diseased seeds should not be planted.

Planting should be done at the onset of the rains if production is rain fed. Delay in sowing may lead to crop failure or reduced yield.

Seeds are planted at a spacing of 40*15cm (2seeds per hill) or 30*15cm (1seed per hill), at a depth of 1-2 inches.

The crop can be intercropped with others like maize.

Seeds germinate within 4-7days, depending on the variety and environmental factors.

NB; Do not plant beans where soil Nitrogen is too high or where green manure crops were grown. This is because, the crops will produce green foliage with very few beans.

PESTS & DISEASE MANAGEMENT

Pests

- *Cutworms*– these are brown or black caterpillars usually found in the soil, which cut the stem of younger plants below the soil surface.

Dress seeds with SHIELD 600FS 3ml/kg

DRENCH soil with PROFILE 440EC 60ml/20l or PENTAGON 50EC 20ml/20l

- *Bean fly*– the larva tunnels into the plant stem damaging the vascular tissue, causing reduced plant vigour and petiole droop in older crops. Severe infestations can lead to death of seedling. Crops are at a greater risk for 3-4weeks after emergence, however, later on, crops can be attacked.

Do seed dressing with SHIELD 600FS 3ml/kg

Drench soil with EMERALD 200SL 20ml/20l or PROFILE 440EC 60ml/20l

Spray KINGCODE ELITE 50EC 10ml/20l or LEXUS 247SC 8ml/20l to kill the adults.

- *Red spider mites*– these are tiny reddish yellow pests found on the undersides of the leaves. Their feeding leads to formation of yellow stipples on leaf surfaces they form webs in cases of heavy infestations.

Spray ALONZE 50EC 5ml/20l or BAZOOKA 18EC 10ml/20l

- *Aphids*- these are soft bodied, green, black or brown insects which suck plant sap. Infested leaves curl and crinkle. They also attack the pods. As they feed, they excrete honeydew which encourages the development of sooty mold which reduces photosynthetic area.

Spray KINGCODE ELITE 50EC 10ml/20l or PENTAGON 50EC 10ml/20l or LEXUS 247SC 8ml/20l

Spray JAMBO CLEAN 100ml/20l to get rid of the sooty mold.

- *Leaf miners*– the larva (caterpillar) mines under the leaf surface, resulting into development of mines / winding trails. Heavy infestations lead to death of the leaves.

Spray ALONZE 50EC 3m/20l or ESCORT 19EC 10ml/20l or EPITOME ELITE 500SP 10g/20l

- *Pod borer*– African bollworm is the most common borer which feeds on leaves, flowers and pods thus damaging them. It bores holes on pods and feed on the seeds, with its head inside the pod and the rest of the body outside.

Spray KINGCODE ELITE 50EC 10ml/20l or BACIGUARD 16WD 15g/20l or PENTAGON 50EC 10ml/20l

- *Whiteflies*– these are white insects which suck plant sap. Infested leaves curl, become distorted and eventually drop. They secrete honeydew as they feed which facilitates the development of sooty mold on the leaves affecting photosynthesis.

Spray TAURUS 500SP 10g/20l or LEXUS 247SC 8ml/20l or PROFILE 440EC 30ml/20l

Spray JAMBO CLEAN 100ml/20l to clean the sooty mold.

- *Thrips*– they feed on leaves and flowers by sucking the sap. Heavy infestations lead to flower and flower buds abortion. Leaves fall off.

Spray ALONZE 50EC 5ml/20l or DEFENDER 25EC 40ml/20l or PROFILE 440EC 30ml/20l

Diseases

- *Bean rust*– infection leads to formation of reddish brown pustules on leaves, pods and stems. Heavy infections cause plant death.

Spray MILESTONE 250SC 10ml/20l or DUCASSE 250EW 20ml/20l or RANSOM 600WP 15g/20l

- *Downy mildew*- infection begins on the underside of the leaf which leads to formation of whitish or grey mass of fungal growth. The upper side of the leaf becomes chlorotic. Pods develop whitish patches.

Spray GEARLOCK TURBO 250WP 25g/20lor FORTRESS GOLD 720WP 40g/20l or TOWER 720WP 50g/20l

- *Anthracnose*– infection causes development of brown to black sunken lesions on pods, stems and seeds. Attacked leaves have black spots.

Spray RANSOM 600WP 15g/20l or ABSOLUTE 375SC 10ml/20l or DUCASSE 250EW 20ml/20l

- *Bacterial blight*– symptoms begin as small brown blotches on the leaves which enlarge as infection continues eventually causing the leaves to fall off and subsequent death of the plant follows.

Spray GREENCOP 500WP 50g/20l or COLONIZER 440WP 50g/20l or TRINITY GOLD 425WP 50g/20l

- *Fusarium wilt*– plants show sudden yellowing of leaves which eventually fall off, resulting into withering of the plant. The vascular tissues are discoloured.

Drench soil with GREENCOP 500WP 100g/20l

Spray COLONIZER 440WP 50g/20l or TRINITY GOLD 425WP 50g/20l

NUTRITION

For optimal production, it is important to ensure that the crop is supplied with sufficient nutrients, both macro and micro nutrient elements. This is because, if deprived of such nutrients, the crop becomes weak and very susceptible to attack by pathogens. This subsequently leads to reduced yield.

During planting, application of DAP is recommended. Considering the amount of organic matter in the soil, manure can also be applied. In order to improve on nutrient uptake by the plants as well as stimulating their growth, the fertilizer and/or manure should be mixed with HUMIPOWER at the rate of 1kg Humipower into 1 ton manure or 50kg basal fertilizer.

4-5 weeks after germination, top dressing should be done. CAN is used, which should also be mixed with HUMIPOWER.

However, these basal fertilizers should be supplemented with foliar fertilizers because they have a wide range of nutrient elements which are very vital to the plants.

These foliar feeds include;

- **OPTIMIZER 10ml/20l**– this is a stress manager, helps in boosting plant's immunity, prevents flower abortion among other benefits and can be sprayed at any stage of the crop development. It contains both macro and micro nutrient elements.
- **GATIT SERIES 50g/20l** – this takes care of the crop at the different stages of growth and development, e.g., Gatit Super Start (early crop development), Gatit Super Flowers & Fruits (for flowering and fruiting/pod development stages).

WEED CONTROL

Weeding should be done in order to avoid losses attributed to weed infestation. This is because they compete with the crop for nutrients, water, space, among others, as well as harbouring pests and diseases.

- **CLAMPDOWN 480SL 200ml/20**l is used to kill all types of weeds during land preparation. This helps in reducing the development of weeds, even throughout the crop season.
- **HOTLINE 450SC 50ml/20l** is a selective herbicide used to kill weeds in bean garden before the crop emergences.

After emergence and before flowering, weeding is essential.

NOTE; whenever doing any foliar spray, the product (insecticide, fungicide, foliar feed or herbicide) should be mixed with INTEGRA 3ml/20l. This is a sticker, spreader, wetter and penetrant, which improves the efficacy of the product.

MATURITY, HARVEST & POST-HARVEST HANDLING

Depending on the various varieties, beans are ready for harvesting 70-120 days after sowing. Others take shorter periods. At maturity, the plants have matured and leaves turned yellowish to brown or fallen.

Beans can be harvested green or when dry.

Pods are harvested when completely dry. However, if they have withered but are still moist, they can be picked and sun dried. Plants can also be uprooted if most of the pods are ready for harvesting.

Pods that are completely dry split open, exposing the dried beans.

Dry beans are stored in treated gunny or PICS bags which help to prevent major damages caused by storage pests. It is advisable to incorporate the seeds with an insecticide, e.g. Actellic super to prevent damages while in the store by pests. Bags should be placed on pallets, not directly on the floor.

Green beans can be refrigerated for 8-10 days.

Dried beans can be stored in a cool, dry place for up to a year or more.