18. Beans

**Background**
Phaseolus Bean (*Phaseolus vulgaris* L) is one of the main leguminous crops grown as vegetable in Bhutan but it is regarded as a vegetable when it's immature and tender pods are eaten. Phaseolus beans are often called as kidney beans or common beans and they are widely distributed and have the broadest range of genetic diversity. They are cultivated under different cropping systems from monocrop of bush bean (commonly called as French bean) to complex association of indeterminate or climbing beans with maize. Bean varieties are broadly divided into dwarf (determinate) in which the terminal meristem is reproductive and climbing (indeterminate) in which the terminal bud is vegetative. Varieties: Grey Pole, White Pole, Borloto(Bush)

**Climate**
Common beans grow under a wide range of climatic conditions. However the best pod setting is obtain when day temperature is between 15 and 30°C.

**Table: Growing season for beans**

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<th>Altitude (m)</th>
<th>Jan</th>
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<td>High altitude (Above 1800m)</td>
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<td>Low altitude (Below 1000m)</td>
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**Soil and Field Preparation**
A well prepared, well drained, loose, friable loamy soil with pH ranging from 5.5 to 6.8 is best suited for growing beans.

**Seed Rate**
Seed rate for beans is usually 12 kgs per acre. However, seed rates are different for bush beans and climbing beans. About 8-10 kg of good quality bush bean seed, with minimum germination of 75%, is necessary for one acre whereas for pole bean 4-5 kg seed is adequate for one acre.

**Spacing**
There is a slight difference in the spacing between bush bean and pole bean. In case of bush bean, seeds should be sown in rows 50 cm apart and the plant to plant spacing should be 25-30 cm where as in the case of pole bean, seeds should be sown in rows 80 cm apart and the plant to plant spacing should be 30-40 cm. Pole beans require external support during plant growth which is provided in the form of stakes.

**Cultural Operations**
Two to three weeding cum hoeing is necessary depending upon the weed pressure. The crop should be maintained weed free till the stage of appearance of flower buds after which the crop should not be disturbed.

**Nutrient Management**
In one acre, it is advised to apply at least 8 Mt of well decomposed farm yard manures (FYM) or fully matured compost. In addition, for a good crop, apply 10 kg N and 30 kg P2O5 per acre before the final land preparation.

**Water management**
Beans are shallow rooted crops and are sensitive to excess soil moisture. Therefore, the water requirement is very low. Applying irrigation immediately after sowing adversely affects germination and therefore should be avoided. Irrigation should be made available prior to blooming, flowering and pod development stage as these are the critical stages of their growth.

**Plant Protection**
A good crop rotation will help prevent and minimize pest and disease occurrences. A bean crop should not follow crops which belong to Leguminosae family. It should be rotated with crops from different family such as tomatoes, cabbage, carrot and pumpkin. Beans should be protected against thrips and aphids, pod borer, powdery mildew, rust and anthracnose.

**Harvesting**
On average beans usually take around 60 days to reach the Harvesting stage. Always pick beans when they are tender with an appropriate size to consume as vegetable. To determine when to harvest, examine by opening several pods. As the pods attain marketing stage, hand picking of pods should be carried out at 7 to 10 days interval. By harvesting pods frequently, it will provide a continual production all season. Depending upon the variety and the level of crop management, the yield of the beans may range between 2 to 4 tons per acre. Pole beans give a higher yield over a longer harvest period than do bush beans.

**Seed Production**
It is important that adjacent cultivars should be at least 20-50 m apart with the distance increased to at least 100-150 m for basic seed production. Harvesting normally commences when the majority of pods have dried and become parchment-like. Cut the crop when the earliest pods have dried to the parchment stage and the foliage is starting to dry off, characterized by a reduction in the intensity of green in the leaves and haulm. Sample pods should contain fully developed seeds which are firm, taste starchy and are readily detachable from their pods. Thresh or pound the dried plants for extraction of seeds and dry up the seeds maintaining about 10% of moisture content. Pack the dried seeds in small air tight plastic bags and store in the gene bank for future use.