**The Purpose of this toolkit**

The purpose of this toolkit is to equip stakeholders across the food value chain with a cost-effective system for control of food quality and safety right from farm to fork. Materials and through production, storage, distribution, sale and serving to the final consumers. The long run will result in reduced loss and quantity of discarded product as opposed to end food product.

### Who should use the toolkit

This toolkit will be used by the value chain actors across the bean value chain—from farmers, processors, and food vendors to ensure that food products are safe for human consumption.

### How to use the toolkit

This toolkit will be used as a communication toolkit for all the food value chain actors across the bean value chain—from farmers, processors, and food vendors. This toolkit should enable readers identify problems or challenges, and draw up a strategy for addressing these challenges, using information assembled for this purpose.

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**Introduction to basics on beans production**

- Common beans are adapted to a wide range of soils in temperate and tropical regions, where soils are warm enough to allow seed germination.
- Beans grow in all soil types which are fertile, well drained with good aeration, and free from conditions that interfere with germination and plant emergence.
- Optimum average growing temperature for common beans is 20 to 28°C. Seed germination can be achieved in a temperature of 15°C to 34°C, with an average of 25°C.
- In case of weeds, use 
  -  a herbicide at least once, three weeks before ploughing.
- Beans require fairly deep fertile soils and should not be planted on rocky or very steep slopes.

**Weeding**

- Keep beans free of weeds for at least the first 4 to 6 weeks after planting to avoid avoiding at flowering stage to avoid flowering disorders.
- Beans can be grown in rows or as a mosaic, depending on the crop, the size of the field, and the type of machinery that will be used for mechanical harvesting.
- Inspect crops for any problems such as weeds and other pests, diseases, and mineral deficiencies for immediate action.

**Soil fertility management**

- If soils are poor, use organic or inorganic fertilizers.
- Recommendations should be based on soil nutrient content.
- Inorganic fertilizers such as NPK (50 kg/ha) can be used.
- Liquid/liquid fertilizers such as super growth (50 M/20 liters of water) can also be used.
- In case of mature soils, it should be applied before planting and incorporated into the soil at a rate of 5-10 kg/ha.

**Critical Control Points**

<table>
<thead>
<tr>
<th>Site selection</th>
<th>HAZARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy metals/chemicals/mycotoxins</td>
<td>DO NOT burn crop residues from the previous growing season.</td>
</tr>
<tr>
<td>Contaminated soils will greatly expose beans to heavy metals, chemical residues from other contaminants</td>
<td>DO NOT use excess herbicides.</td>
</tr>
<tr>
<td>Soil pH</td>
<td>DO NOT plough without following a systematic order as this might lead to soil erosion.</td>
</tr>
<tr>
<td>Choose well drained sandy soils as the seeds tend to get damaged</td>
<td>DO NOT plough roughly in order to avoid soil compaction.</td>
</tr>
<tr>
<td>A pH level below 6 is waterlogged and unbearable growing practices such as control of canal seepage and ground water inflows.</td>
<td>DO NOT select a waterlogged plot.</td>
</tr>
</tbody>
</table>

### DO's

- Choice well drained sandy soils as the seeds tend to get damaged.
- A pH level below 6 is waterlogged and unbearable growing practices such as control of canal seepage and ground water inflows.
- Remove all previous crop residues from the plot.
- Clear the land/plot properly i.e. when harvesting, all residues should be removed from the plot.
- DO select a waterlogged plot.
- DO follow a well established cultivation line, as this will reduce soil erosion.
- DO keep moisture by drying and if using inorganic fertilizers, follow instructions.
- DO mix fertilizers properly with soil before ploughing.
- DO rotate crop with rotations such as maize, cowpeas, Indus and black legumes.
- DO keep moisture by drying and if using inorganic fertilizers, follow instructions.
- DO use polybags when storing beans inside baskets.
- DO use clean/green soybean/maize polybags to store the beans.
- DO not use dirty water to rinse the utensils.

### Don'ts

- DO NOT burn crop residues from the previous growing season.
- DO NOT use excess herbicides.
- DO NOT plough without following a systematic order as this might lead to soil erosion.
- DO NOT plough roughly in order to avoid soil compaction.
- DO NOT select a waterlogged plot.
- DO NOT plant in rows too close to each other, which would promote disease/pathology.
- DO NOT use dirty water to rinse the utensils.
- DO NOT sell the beans while warm (23-30°C) as it can promote the growth of certain microorganisms.
- DO NOT serve the beans while warm (23-30°C) as it could promote the growth of certain microorganisms.

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**HACCP principles what is HACCP**

**Verification map for Dried Beans**

**Planting**

- Plant at onset of rains; for long season, planting can begin 3-4 weeks before to avoid too much rainfall during pod filling stage when it is most sensitive to lodging of pods and reduction in yields.
- Some early maturing bean varieties do not require too much water.
- Beans should be planted in rows to ease field operation e.g. weeding, harvesting, harvesting.
- Space beans at 50 cm on 10 cm inter- and intrametre respectively for bush beans and at 55 cm x 120 cm for climbing type. One seed should be planted per hole at a depth of about 2.5 cm and 5 cm in the furrow and seed drill and covered with a thin soil cover to prevent water logging and emergence.

**Harvesting and post-harvesting handling**

- Drop should be harvested when it reaches physiological maturity (yellow ripening stage) or when completely dry.
- Avoid harvesting when still wet as this will transfer disease pathogens to other unfertilized area within the farm.
- Avoid harvesting when it's too hot after mid day as beans will continue to dry afterwards.
- Avoid leaving the beans to over stay in field after maturity and start shattering in the field as this will lead to worm aways.
- After threshing, seeds are winnowed, dried and sorted for storage.

**Post harvest handling dry beans**

**Threshing**

- Thresh the beans when they are dry enough. Beans that are too dry or too wet can be easily damaged during threshing.

**Drying threshed beans**

- Threshold beans must be dried again and protected from rain, insects, animals and disease.
  1. Dry threshold on mats, plastic sheets or sack on a raised platform.
  2. Spread the grains thinly on the drying surface to allow air to pass through it.
  3. Turn the grains regularly to avoid overheating.
  4. Dry the grains for 1-3 sunny days.

**Drying in pods**

- Beans must be dried in the pod before being threshed. If you thresh immediately after harvesting, you will damage the grain because it is too moist to be threshed.
- Do not dry beans on the ground, as they can get dirty, or be eaten by animals.

**When drying beans follow these steps:**

1. Sort the seed pods and remove weeds and immature pods.
2. Arrange the pods evenly on the platform, mat, or crib, or air to circulate so that the beans do not get moldy.
3. Dry the beans from morning to evening for 2 sunny days.
4. Test the beans to see whether they are dry enough by breaking a few pods open and picking or pinching them with your fingers.

**Cooking and serving**

- Foreign matter (stones, awn spicles, husks), these are introduced due to inadequate handling.
- Heavy metals and chlorine which could be introduced on the beans.
- Chemical contamination from the preservation processes used.
- Insecticidal and fungicidal growth. If humidity and moisture content are not controlled intermediate from microorganisms. These introduce excesses and their residues resulting into foreign material contamination.

**Post harvest handling dry beans**

**Threshing**

- Thresh the beans when they are dry enough. Beans that are too dry or too wet can be easily damaged during threshing.

**Drying, threshing beans**

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**Drying in pods**

- Beans must be dried in the pod before being threshed. If you thresh immediately after harvesting, you will damage the grain because it is too moist to be threshed.
- Do not dry beans on the ground, as they can get dirty, or be eaten by animals.
- Have someone watch the beans while they dry. The beans can cover the beans if rains and these wash away animals.

**When drying beans follow these steps:**

1. Sort the seed pods and remove weeds and immature pods.
2. Arrange the pods evenly on the platform, mat, or crib, or air to circulate so that the beans do not get moldy.
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4. Test the beans to see whether they are dry enough by breaking a few pods open and picking or pinching them with your fingers.

**Grading**

1. Winnow to remove chaff, dust and other rubbish from the beans.
2. Remove shrivelled, diseased, broken beans and beans of various variety by sorting.
3. Sort on a platform cooker to make the work easier—no bending required and the wire meshing gets rid of some of the dirt mixed with the grain.

**Treatment And Storage**

- Completely Dry All Seeds And Containers Before Using Them To Store Grains.
- Before Putting Into Containers Dust The Grains With Insecticide Such As Skana Super AT 50G
- Do not store beans in cold places that are damp or in damp areas.
- Do not store beans in direct sunlight.
**PLOT SELECTION**

1. **Plot Selection**
   - Do's
   - Don't's

2. **Land Clearing**
   - Do’s
   - Don’ts

3. **Fouling**
   - Do’s
   - Don’ts

4. **Storage**
   - Do’s
   - Don’ts

5. **Crop Rotation**
   - Do’s
   - Don’ts

6. **Planting**
   - Do’s
   - Don’ts

7. **Waste Disposal**
   - Do’s
   - Don’ts

8. **Drying**
   - Do’s
   - Don’ts

9. **Cooking & Serving**
   - Do’s
   - Don’ts

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**STORAGE**

10. **Storage**
    - Do’s
    - Don’ts

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**COOKING & SERVING**

11. **Cooking and Serving**
    - Do’s
    - Don’ts

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**Drying**

12. **Drying of beans**
    - Do’s
    - Don’ts

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**Plot Selection**

- Do’s
  - Ensure the land selected is prepared according to the generally accepted procedures outlined in the toolkit.
  - Comments: ____________________________

- Don’ts
  - Is the storage facility in line with the generally accepted procedures outlined in the toolkit?
  - Comments: ____________________________

- Comments: ____________________________

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**Storage**

- Do’s
  - Are beans properly stored?
  - The moisture content of my beans is at 14%?

- Don’ts
  - Is the moisture content of my bean at 14%?
  - Comments: ____________________________

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**Cooking and Serving**

- Do’s
  - To have beans that provides nourishment and makes people healthy;
  - Comments: ____________________________

- Don’ts
  - To have beans that provides nourishment and makes people healthy;
  - Comments: ____________________________

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**Precooked Beans:**

- FUNDED BY
  - IN PARTNERSHIP WITH
  - FOR IMPROVED HEALTH, FOOD & NUTRITION SECURITY AND WEALTH CREATION.