

Technical Bulletin #05:

Crop Farming Basic Practices

Success in farming is determined by the work put into it – more specifically, the hours spent in the field managing the crop until final harvest. There is an important distinction, however, between general effort and a dedication to the process of growing the crop. Hard work is not enough to have a successful harvest. The hard work needs to be a planned, directed effort in which all basic production practices are completed at the appropriate time. Unfortunately, there are many cases where crops do not fulfill their yield potential because at some stage, basic practices were neglected. This could have been at any stage, from site selection through to seedling production, plant growth or harvest.

This bulletin outlines the basic practices and gives an idea of when these tasks should be fulfilled in relation to transplant date. The actual timing for the basic practices may vary somewhat. For example, it may not be possible to prepare the land 30-45 days before transplant when the farmer is trying to squeeze in a rainy season crop after the rice harvest.

1. Crop and market selection (Days before transplant (DBT): 100 – 60)

Careful crop and market research should be performed. Information gathered should include:

- Preferred varieties, sizes and desired volumes
- Wholesale prices and retail prices
- Cropping dates
- Market demand windows
- Buyer options & purchase agreements on offer
- Transport options & costs

Production plans for the crops should be revised. Assess production costs to make sure enough funds are available and verify planned product volumes, quality, harvesting times, and delivery locations/logistics for buyers.

2. Evaluation of field and its surroundings (DBT: 50 – 45)

- Find a water source that is safe for use on crops. Determine its volume capacity to ensure that there is enough water available to provide until harvest completion, even at times of low or high water demand.
- Assess potential flooding zones.
- Perform a careful pest and disease evaluation in the surroundings especially in the weeds and surrounding crops. Soil samples can also be taken to look for key soil pests such as white grubs.
- Identify the weeds in that area that could be a problem for the crop.
- If possible, get a soil test done. Test for pH, Organic matter, macronutrients.
- Assess the soil's physical characteristics (level of compaction, amount of stones, texture, and structure).

3. Soil preparation (DBT: 45 -30)

Soil preparation should be performed using clean equipment to avoid introducing pests and diseases from other sites. If paddy fields are used, care must be taken not to break the hard pan (20-50 centimeters deep) that is needed to retain water for the rice crop. This hard pan can limit vegetable

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root growth, which is why raised beds are so important. The basic land preparation practices are:

- i. Sub-soiling or deep tilling is necessary for compacted land, often where livestock has grazed. This should be done to a depth of 50-75 centimeters. As mentioned above, this is not appropriate for paddy fields.
- ii. Plow to a depth of about 30 centimeters. Make sure that you don't plough when it is too wet or too dry. More than one pass will be needed to break the large clods.
- iii. Raised beds should be prepared, ideally to a height of 30 centimeters. The width of the bed depends on planting density and layout, but is often 100 centimeters wide for vegetable crops when there are 2 rows per bed.

Weed control is one of the main reasons for land preparation activities. If the predominant weed is Nut grass (Cyperaceous), soil preparation must be performed 45 days before planting or transplanting and an herbicide such as glyphosate should be applied once or maybe twice.

4. Irrigation installment and assessment (DBT: 40 – 20)

Water is the most important tool in root development. If the plant doesn't develop a good root system it will not be able to sustain high levels of production. The crop needs a steady supply of water and the irrigation system should be able to provide this throughout the cropping cycle. Check the water pump and all the irrigation system components, check for leaks and repair them, also check the pump engine to be sure it will work well during the whole crop cycle. This time should also be used to reinforce the irrigation channels and close any breaches.

Some farmers may install drip irrigation systems. The drip lines should be connected to the delivery pipes once the raised beds have been prepared. The filters and pumps should be checked to ensure that they are working properly. While drip irrigation systems are more expensive and need to be well managed, they do give the farmer excellent control over the application of water and also, in some circumstances, fertilizers and pesticides. An injector system is needed if fertilizers and pesticides are going to be applied through the drip system.

5. Planting of live barriers (DBT: 40 – 25)

Live barriers are used as a wind break and as a means of reducing the amount of pests coming into the crop. For the barriers to work they must be taller than the crop, must be a different type of plant than the crop (grasses are normally used, but corn, sorghum or sugar cane can also be used), and must form a dense barrier without breaks. Plant the barrier 3 - 6 weeks before transplanting to give it sufficient time to reach a height of 30-40 centimeters. There should be 2 - 3 rows of plants in the barrier to prevent there being any gaps. Planting in a zigzag pattern will help this. The barrier may need some form of irrigation until the plants establish themselves.

6. Seedling production (DBT: 45 – 12)

Only high quality seedlings will give the crop the vigorous early growth needed for high yielding crops. The ideal characteristics of a seedling ready for transplant are:

- Compact height (tall seedlings are more vulnerable to falling over or breaking under windy conditions or regular handling during transplant).
- Good root system (make sure that the soil in the nursery is loose enough so that there is no root damage when the seedlings are removed for transplanting).
- Dark green in color.
- Strong stem (this helps stop breakages).
- Pests/disease free.

To obtain high quality seedlings the following recommendations should be followed:

- Use certified seeds produced by specialized seed companies. Seeds that have been saved by the farmer may perpetuate pest or disease problems from previous crops and so should not be used. Farmer-saved seeds may also have greater genetic variability that can reduce potential yields of the crop.



- The required quantity of seeds should be estimated based on the planned field population and the percentage of germination of the seed batch (given by the seed company). An extra 10% should also be added to make up for the losses that are incurred during seedling production and transplant. These extra seedlings can be used to replace the seedlings that die during the first 5 days after being transplanted.

Seedling care in the nursery is a daily activity – watering, for example, may need to be done a couple times a day to keep the soil moist. If seed trays are not available, the nursery should be made on raised beds with well-prepared soil that is loose and free of stones. Fertilizers can be applied to give a boost to early growth. Use a complete fertilizer that adds nitrogen, phosphorus and potassium. Don't add too much as this will produce seedlings that are too tall. Two grams of 20-20-20 per liter of water, applied weekly as a general watering is sufficient. Pest and disease control is difficult in nurseries and the best recommendation is to protect the seedlings using insect-proof netting. It is also important that the seedlings are not wet at night – this promotes the development of diseases. For this reason, watering of the nursery should not be done after 3:00 pm.

7. Weed control of the field and field borders (DBT: 20 – 10)

The elimination of weeds around the field is very important because this is where the pests hide while they wait for the new crop. The weeds also carry diseases that can affect the crop (many of these diseases are carried to the crop by insects). All weeds within 10 meters of the field should be removed. The field should also be cleared of weeds before transplant. The best way to do this is to irrigate the field a few weeks before the transplant date to pre-germinate the weeds. The weeds will begin to emerge in response to the irrigation and they can be easily removed.

If you are planting vegetables, when removing weeds, concentrate on the broad leaf weeds - these plants are most similar to the crop plants and so are more likely to share the same pests and diseases. Grasses are less of a problem (which is why they are used as live barriers).

8. Transplant (DBT: 0)

The seedlings should be removed and planted on the same day. Separate the seedlings by size when removing them from the nursery. They can be put into 3 groups – 'large', 'medium' and 'small'. The reason for doing this is so that small seedlings are not planted next to large seedlings. The large seedlings would out-compete the small seedlings and you would lose most of the production from the small plant.

Make sure not to damage the roots when removing the seedlings from the nursery. Carry the seedlings to the field in a tray or box so that they are not damaged. Make sure that the seedlings are kept out of the sun as much as possible. The field should be very well irrigated before transplant. The transplant process is as follows:

- i. Make planting holes using a marker stick (this is a straight stick that has the planting distances marked out on it).
- ii. Add a 100 - 150 cc of starter solution to each planting hole (the starter solution is water with a little bit of fertilizer added. DAP [18-46-0] is often used for this – 2.5 kg per 200L drum of water). The starter solution helps the seedling establish itself quickly.
- iii. Transplant the seedling into the planting hole and press the soil down around it so that there are no air pockets.

9. Integrated Pest Management (Days after transplant (DAT): 0 to crop end)

Pests and diseases can destroy the chance of a high yielding and profitable crop. Plans to protect the crop should be in place long before transplant and it is important that there is not an over-reliance on pesticides. Integrated Pest Management (IPM) is a collection of crop protection activities – many of them directed at preventing problems rather than reacting to problems. The main elements of an IPM program are:

- **Produce a healthy crop:** The healthier the plant, the less probable it is that pests or diseases will harm it. Plants have their own natural system of defense that works better when the plant has a good root system, a good nutrition/irrigation program, and is not under stress due to causes such as weed pressure or flooding.



- **Prevention:** It is important to know what the historical problems of the site are [e.g. flooding, soil pests, soil disease, etc.]. When was the last time the site had a crop from the same plant family as the one you intend to grow? What sort of resistance or tolerance to diseases/pests do the seeds you are planning on buying have? Live barriers are an important preventative measure.
- **Hygiene in the field:** Sanitation or field hygiene is directed at removing or minimizing sources of pests or diseases. Keep the surrounding areas free of weeds. The weeding between rows should be done regularly and any fallen, damaged, or diseased fruit should be removed and buried or burned.
- **Scouting & monitoring:** The majority of insect pests are small. If you don't look for them, you won't find them until it's too late. Do not wait until a plant is damaged or diseased before taking action to control the problem. First of all, you need to know what you are looking for – identifying pests and diseases correctly will save you a lot of money. Scout for problems at least twice a week.
- **Integrated control interventions:** Don't just rely on pesticides – use non-chemical control methods such as trapping and hand picking to lower pest numbers.

10. Cultural practices (DAT: 0 to crop end)

Cultural practices represent the general care that is given to the crop during its growth. A neglected crop never does well. Below are some of the more common or important cultural practices.

- A tutoring or staking system if the crop requires it. The stakes should be disinfected. This task should be performed 15 days before the planting or transplant.
- Eliminate plants showing viral symptoms.
- Weed the crop and surroundings.
- Prune the plants as required. This is done to influence the shape of the plant or to remove diseased, old or non-productive plant parts.
- Pick up and appropriately dispose of damaged fruit.
- Perform harvesting and crop harvesting correctly and appropriately.

11 Crop elimination (DAT: crop end)

This should be performed as soon as possible after harvest to break the pest and disease cycles from one crop to the next. The surrounding weeds should also be targeted as the pests and diseases will start moving off the crop and into the weeds.



| BASIC PRACTICES (in chronological order) | | Days Before transplant |
|--|---|---|
| 1. | Crop and Market Selection | -100 to -60 |
| 2. | Evaluation of Field & its Surroundings | -50 to -45 |
| 3. | Soil Preparation | -45 to -30 |
| 4. | Irrigation Installation & Assessment | -40 to -25 |
| 5. | Planting of Live Barriers | -40 to -25 |
| 6. | Seedling Production | -45 to -12 |
| 7. | Weed Control of the Field & its Borders | -20 to -10 |
| 8. | TRANSPLANT | |
| 9. | Integrated Pest Management | 0 to crop end |
| 10. | Cultural Practices | 0 to crop end |
| 11. | CROP ELIMINATION | |