



# Tips to Increase Maize Yields in Plateau of Odisha

July, 2015

**Authors:** Nabakishore Parida, Wasim Iftikar,  
Virender Kumar, R.K. Malik and Andrew McDonald

Funded by



BILL & MELINDA  
GATES foundation



Partners



# Cultivar

Select hybrids from different maturity classes which best fit your cropping system.

Hybrids are higher yielding than inbred varieties. The following maize hybrids of different maturity class are found suitable for plateau of Odisha:

- Short duration hybrids of 85-90 days can yield 5.0–5.5 t/ha. High-performing hybrids in this category include DKC 7074 from Monsanto and P3441 from Pioneer. These hybrids are particularly suited for fields where a second crop will be established after maize.
- Medium duration hybrids of 110 days can yield 6.0 t/ha. High-performing hybrids in this category include DKC 9133 and Hishell from Monsanto, 30R77 from Pioneer, NK 6240 and NMH 713 from Syngenta. These hybrids are suited for double-cropped systems when timely maize planting is achieved with the start of the rains.
- Long duration hybrids of 125 days can yield 6.5 to 7.5 t/ha. High-performing hybrids of this category include DKC 9126 and DKC 9125 from Monsanto and

Pioneer P3501. These hybrids are particularly suited for fields where a second crop will not be cultivated after maize harvest.



# Field Preparation

The method of field preparation will depend on the tillage method and will vary for conventional and conservation agriculture-based systems.

**Conventional tillage (CT):** For conventional tillage systems, the field should be sufficiently ploughed to reduce clods and eliminate weeds. Apply 5-10 t/ha of organic manure (FYM or compost) if available at the time of land preparation.

**Zero/strip-tillage:** For zero- or strip-tillage systems, existing weeds should be killed by a non-selective herbicide such as glyphosate (1 kg a.i.\*/ha; product dose

2.5 l/ha) or paraquat (0.5 kg a.i./ha; product dose 2.0 l/ha). In situations where the weed infestation is low or patchy, the herbicide may be applied as a spot treatment at 1% spray solution for glyphosate and 0.5% for paraquat. Both of these herbicides should be applied between 7 and 2 days prior to sowing. Apply glyphosate when weeds are actively growing and not under stress. If weeds are under moisture stress, a light irrigation should be given.

\*a.i.: active ingredient of the formulation





Well pulverized field prepared by conventional tillage

### Key Check 1

- Use clean water and a plastic container to make a spray solution as these herbicides bind with suspended soil particles and metal surfaces (e.g. iron bucket).
- Use a multiple nozzle boom fitted with flat fan nozzles.

**Don't** apply paraquat if perennial weeds are present. In such situations, apply glyphosate.



Strip tillage plots. Weeds are killed by non-selective herbicides.

## Crop Establishment

Establish the crop according to optimum plant population levels and making better use of nutrients by banding the fertilizers.

- Sow the crop in lines either with a seed drill/planter or by hand using a spacing of 60 cm between rows and 20 cm between plants-to-plant for achieving final populations between 65,000 and 75,000 per hectare.
- Sow seeds 4-5 cm deep.
- If available, use a seed drill with an inclined plate seed metering system for precise planting and basal fertilizer application.
- In case of poor germination, do gap filling.





Make a line using a rope



Place seeds at desired distance



Sow in lines using a seed drill machine



Inclined plate seed metering



Maize established with 4 WT planter



Maize plot under strip tillage

## Key Check 2

- Maintain the plant population between 65,000 and 75,000 plants per hectare.
- Plant maize in lines either by machine or by hand with a seeding depth of 4-5 cm.



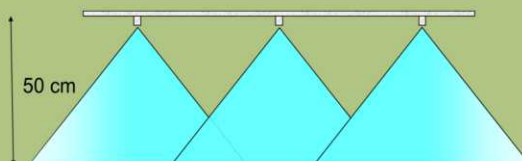
# Weed Control

Weeds compete with maize crops for light, water and nutrients, resulting in losses in yield and productivity. Therefore, for high yields, perform timely and effective weed control.

- Under conventional agriculture in Mayurbhanj, farmers plough just prior to crop establishment. This system is not very effective in killing weeds because soil moisture allows weeds to re-grow after tillage. A summer ploughing could kill weeds more effectively because a dry period follows tillage, desiccating the uprooted weeds. If weed pressure is high and tillage is delayed until the rainy season starts, apply glyphosate (1-2 days prior to tillage) and then till. This has proven more effective at killing weeds than tillage alone.
- For conservation agriculture-based systems (zero tillage or strip tillage), kill existing weeds by applying non-selective herbicides (glyphosate or paraquat). See Field Preparation section for more details.
- After crop establishment, control weeds manually, mechanically or chemically during the early stages of crop growth (before 25 days).
- Chemical weed control:**
  - Use a pre-emergence herbicide like Atrazine @ 500-625 g ai/ha (1.0-1.25 kg/ha product dose) 0-3 days after sowing or as an early post-emergence 10-15 days after sowing using 300-500 liters of water/ha. Apply when there is sufficient soil moisture.
  - Use a multiple nozzle boom fitted with flat fan nozzles for herbicide spraying (see figure below).
  - Follow safety precautions while spraying. These include:
    - Wear gloves when handling chemicals
    - Wear protective clothing (e.g. made from washed plastic fertilizer bags), gloves, boots while spraying
- Weeding:** Weeding can be done manually or mechanically using a power weeder (see figure below).

## Key Check 3

- Apply atrazine when soil surface has enough moisture.



Multiple nozzle boom. Keep boom height 50 cm from the target while spraying for uniform application.

**Don't** use cone type nozzles for herbicide spraying. Either use the flat fan with a multiple nozzle boom or the cut/flood type with a single nozzle boom.



Type of nozzle tips: Flat fan, cut/flood jet and cone type.



Mechanical weeding using power weeder

# Nutrient Management

Manures and fertilizers applied in the right amounts and at the right times increase yield and maintain soil productivity.

- Apply 5-10 t/ha organic manure (FYM or compost) during land preparation if available.
- Apply 5 q/ha of PMS (paper mill sludge) mixed with FYM or compost in furrows at the time of sowing.
- To complement nutrients supplied by organics, apply fertilizers at the rate of 150:100:80 (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) kg/ha for high yields.
- Apply N in 3 splits: at basal, 20-25 DAS and 45-50 DAS (before tasseling). Apply all P<sub>2</sub>O<sub>5</sub> as basal and split K<sub>2</sub>O with 50% at basal and the remaining half at 45-50 DAS (before tasseling).



Response of N, P, and K fertilizer in plateau of Odisha.

## Key Check 4

Fertilizers are critical for achieving good yields in plateau of Odisha.

- Phosphorous fertilizer is the most critical. Preferably, apply P<sub>2</sub>O<sub>5</sub> at 100 kg/ha. Otherwise 60 kg/ha.
- Nitrogen is another critical element. Apply N at 120-160 kg/ha.

**Don't** forget to apply phosphorous fertilizers.