

FIELD PREPARATION

Field preparation is important to ensure the paddy field is ready for planting. The most important step of field preparation is soil preparation (tillage) and soil quality maintenance.

SOIL PREPARATION

Soil preparation aims to change the physical properties of soil so that hard soil becomes flat and muddy then the plant will grow well. Good soil preparation can control weeds, recycles plant nutrient, and provides a soft soil mass for transplanting and a suitable soil surface for direct seeding. Initial land preparation begins after the last harvest or during the fallow period. This is important for effective weed control and for enriching the soil. Field preparation generally will take 3-4 weeks to prepare the field before planting.

Soil preparation involves plowing, harrowing, and puddling then leveling the field. Puddling is not necessarily in upland paddy fields because of the limiting resource of water.

1. Plowing

Plowing is primary tillage that involve cutting, digging up, mixing and inverting the soil partially or completely. The purpose of plowing is increasing the water-holding capacity of the soil, improving soil aeration, and obtaining deep bed of good texture.

2. Harrowing and Puddling

Harrowing is secondary tillage, to break the soil clods into smaller masses for smoothening, incorporating plant residue, cutting the weeds and mixing the materials with the soil. Harrowing aims to destroy grasses and seeds in the fields, break the big clods and make the **field surface uniform**, cut the crop residues and mix them with the topsoil of the field and improve soil aeration.

Puddling is the preparation activity that mix the soil with the water. It is done in paddy fields with standing water of 5-10 cm deep after initial plowing. Usually, this activity develops hard pans and reduce water loss in lowland paddy fields. Puddling aims to extinguish the weed by decomposition, reduce leaching of water or decrease percolation of water, and facilitate transplantation of paddy seedlings by making the soil softer.

3. Leveling the Field

Land leveling is expected to bring permanent improvement in the value of the land. Leveling work is carried out to modify the land's existing contours for an efficient agricultural production system. Leveling aims to perfect land leveling for efficient weed and water management practices, improve better crop stands and establishment, promote efficient application of irrigation water or increase conservation of rainwater, improve surface drainage, and minimize soil erosion.

Field preparation is carried out according to agroecosystem conditions and water requirements. It is divided into:

1. Wetland Preparation

Wetland preparation is a common practice in lowland paddy fields. In this method, the soil is tilled under flooded conditions. It helps weed control growth and facilitates nutrients in the soil. Wetland preparation requires sufficient water and effective irrigation system, loamy to clay soil, and bunds surrounding the field that enable flooding, all steps of field preparation (plowing, harrowing, puddling and water levelling). The step of wetland preparation as perfect field preparation are :

- a. Irrigating the field 2 or 5 days before plowing.
- b. Plowing.
- c. Repairing or constructing bunds. Bunds enable the field to hold water.
- d. Flooding the field. Keep the surface of the field covered with water for 2-5 days before secondary tillage.
- e. Apply compost or manure @ 3t/ha.
- f. Harrowing and puddling. Keep water to a depth of 2.5 cm at the time of puddling.
- g. Leveling of the field.
- h. Transplanting the paddy.



Figure 1. Wetland Preparation

(Primary tillage with rotary plow – Repairing bunds – Organic application – Secondary tillage – Leveling field – and manual transplanting) (Source: Susanti and Hikmah documentation, ICRR)

2. Dry and Wetland Preparation.

This method was a combination of dry-plowing followed by wet-harrowing and leveling the field. Dry wet preparation has several advantages, there are:

- a. Tillage in dry conditions using machines such as wheel tractor provides deeper tillage results.
- b. The land preparation time is shorter, thus accelerating the cultivation process and increasing the annual planting index.
- c. Saves the amount of water used for tillage when compared to complete tillage (or tillage in stagnant water and using hand tractor).

The stage of land preparation with dry and wet preparation are as follow:

- a. Primary tillage. Dry tillage using a wheel tractor with a disk plow. Plowing is conducted in dry conditions without standing freshwater in the field.
- b. Irrigating the field 2 - 3 days before secondary tillage.
- c. Repairing or constructing bunds.
- d. Apply compost or manure @ 3t/ha.
- e. Rotary plows can be carried out in wet conditions.
- f. Leveling of the field.
- g. Transplanting the paddy.

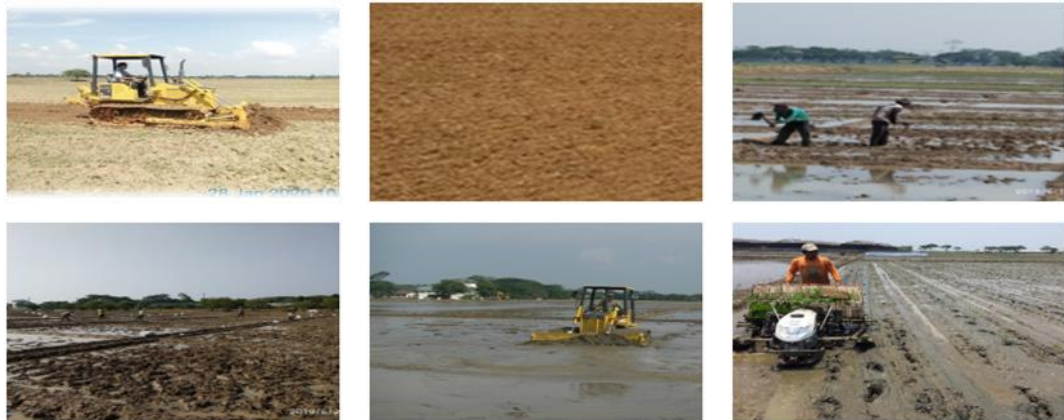


Figure 2. Dry and Wetland Preparation

(Primary tillage in dry condition – Soil condition after primary tillage – Repairing bunds - Organic application – Secondary tillage and Leveling field – Transplant with machine) (Source: Susanti and Hikmah documentation, ICRR)

3. Dryland Preparation

Dry preparation is a common practice in the upland paddy fields. This preparation can also be done in lowlands where wetland preparation is not an option. In this method, the field preparation is conducted without standing freshwater. This preparation can be available if the farmers don't have access to irrigation, water supply, and labor. It requires equipment and machine are for tillage, controllable weeds, and short field preparation time, therefore the farmers can apply Largo Super technology. The steps of dryland preparation are:

- a. Apply bio decomposers before tillage.
- b. Primary tillage is done at the beginning of the rainy season or after the first rain. Plow the field with the 4-wheel tractor or 2-wheel tractor that being attached with disc plow or rotavator. Plowing aims not only to reach soil depth but also to destroy weeds by burying or exposing the roots. In another case, primary tillage can be done by rotary tillage. Remember in dryland that is acidic, soil management must be careful because it can increase soil acidity if aluminum is exposed.
- c. Apply organic matter (biochar or manure or compost).
- d. Secondary tillage can be done after rain continuously smooth the clods of soil.
- e. Leveling of the field and planting the crop or direct seeding immediately.

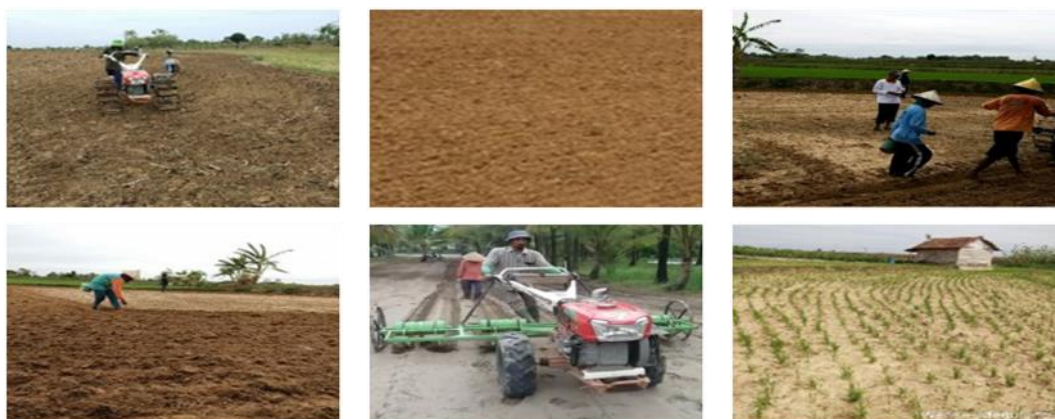


Figure 3. Dryland Preparation

(primary tillage – soil condition after primary tillage – secondary tillage and organic application – manual direct seeding – direct seeding by machine – the plant condition after emergence) (Source: Hikmah and ICRR document)

SOIL QUALITY MAINTENANCE

Without soil maintenance, continuous tillage will cause the decrease of soil quality. It is marked by a decrease in the level of fertility and soil health which result lower crop production. The application of organic and inorganic material wisely, especially fertilizers, pesticides, herbicides, etc is the best way to restore soil quality.

Why is it necessary to add organic matter to the soil? Organic matter is important for the soil because it is proven to be able to improve the physical, chemical, and biological properties of the soil. Organic matter is useful for improving soil structure, increasing soil porosity, increasing water retention, increasing soil biological activity, preventing erosion, improving aeration and rainwater infiltration, irrigation, and plant nutrition sources. In dryland, organic matter has the major role in increasing water retention, increasing pH, and soil porosity.

Several kinds of organic materials are biochar, manure (cow, goat), bio decomposers, compost, biological agent, and local microorganism. Biodecomposers accelerate the decomposition process of biomass such as straw residue, and weeds. Long-term use of biological agents can increase soil fertility, repair soil damage caused by the overuse of chemical fertilizers and pesticides, and increase drought resistance. There are steps to create compost from crop residue:

1. Make sure that the area is level, well-drained, and in shade.
2. Chop compost materials into small pieces (3–5 cm).
3. Make compost in layers consisting of crop residue, if possible combined with beans waste or manure in a 2:1 ratio.
4. Sprinkle the compost heap with decomposing material (e.g., M-Dec, cow urine), add diluted solution of N fertilizer such as urea, or microorganism solution (e.g., tricho) then cover it so it will decompose faster.
5. Keep the compost pile moist-not too wet and not too dry. Make sure that no water is running out of the compost heap.
6. Mix and turn the heaps every one week.

7. Compost should be ready within 4–8 weeks if the humidity and temperature conditions are good.