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Growing Rice With Bio-Plant and Pro-Plant

Photograph shows the 1litre size of bottle

1. Soil Preparation
How to Prepare the Rice Field for Planting

Land preparation is important to ensure that the rice field is ready for planting. A well-prepared field controls weeds, recycles plant nutrients, and provides a soft soil mass for transplanting and a suitable soil surface for direct seeding.

Land preparation covers a wide range of practices from zero-tillage or minimum tillage which minimizes soil disturbance through to a totally 'puddled' soil which actually destroys soil structure.

It typically involves:
1. Ploughing to "till" or dig-up, mix, and overturn the soil.
2. Harrowing to break the soil clods into smaller mass and incorporate plant residue.
3. Levelling the field.

I. Brushing and Clearing

- If the rice fields are in swampland the land preparation in inland valley swamps begins with a thorough brushing and clearing.
- Encourage the farmer to begin with the larger stumps and bushes, since grasses and other weeds grow back very quickly and are best left until just before the first ploughing.
- Bushes and tree limbs should not be left to overhang the edges of the paddies. Rice does not grow well in the shade, and insects thrive in cool, moist areas. The initial brushing and clearing should be completed about one month before planting.

2. Repair Water Control Structures

- Next, clean and repair all water control structures - irrigation gutters, drains, and sluice gates. Remove weeds that have grown in the channels and dig out accumulated silt and clay. The flow of water through the channels is impeded by weeds and sediment, and their capacity is greatly reduced.

- Repair dikes that may have eroded, paying particular attention to the headband and peripheral (irrigation) gutters. Check all sluice gates for signs of wear. If any threaten to wash out, repair them now. Remember: it is always easier to make repairs and alterations to the water control system before you plant.
- If necessary, construct bunds around the field no wider and taller than 50 cm x 30 cm.
- Make sure that bunds are well compacted and properly sealed, with no cracks, holes, etc. This will minimize water losses through seepage (particularly in sloping lands).
- Adjust the spillway height to 3 cm - 5 cm for storing the same depth of water. Maintain this height to ensure sufficient water storage capacity especially during rainy or wet season.

Note: For rat control, construct 30 cm x 30 cm bunds.

3. Ploughing and Puddling

- After the water control structures have been cleaned and repaired, ploughing may begin. The flowing of water into the field is done for several reasons:
  - Weed Control. (Weeds are destroyed and prevented initially from competing with rice seedlings.)
  - Incorporation of Organic Matter. (Weeds and crop residues, such as straw and stubble, are incorporated into the soil, where they become converted into plant nutrients through decay.)
  - Transformation of Surface Soil into a Puddle (for ease in transplanting).
  - Establishment of a Reduced Zone. (Increases the availability of some nutrients by maximizing contact between rice root hairs and soil particles.)
  - Levelling. (During ploughing, the soil can be moved around until the plots are level, thus improving water control.)
  - Formation of a Flow Pan. (Repeated ploughing to a certain depth will create an impervious hard layer, which will reduce water losses and mineral losses through leaching.)
- To be most effective, ploughing must be done thoroughly and timed properly. In inland valley swamps, the ideal schedule calls for two ploughings and one puddling. Timing these operations correctly is very important.

The First Ploughing

- The first ploughing, which involves deep ploughing, should be completed 2-3 weeks before transplanting begins. There are several reasons for such an early start:
  - To protect seedlings against the adverse effects of harmful substances generated by decomposing organic materials.
  - To allow seedlings to utilize the nitrogen-rich ammonium (NH4) released during the decomposition process.
  - To spread out the work load for the farmer. (Thorough ploughing is very hard work and is best done a little bit at a time.)
- Flood the field before ploughing to soften the soil and to make the work easier. Maintain the standing water at a 2 cm - 3 cm level for about 3−7 days or until it is soft enough and suitable for ploughing equipment to be used.
- **Implements:** Power tiller with attached mouldboard plough, hydrotiller, rotovator.
- On the day of ploughing, drain off excess water.
- The Tillage should be split into two phases. Plough the soil roughly the first time and then plough in regular furrows the second time
  1. Turn over the soil so as to get rid of weeds. Leave them exposed to the sun.
  2. Then plough the soil in regular furrows the second time. Plough in rice stubble and weeds into the soil.
- Turn the soil over to a depth of 15 cm - 20 cm (6"-8").
- Begin near the edges of the plot (so you can repair the bunds, if necessary) and work toward the centre.
- Keep the plot flooded after the first ploughing until transplanting. If the plot is allowed to dry out, 20-700 kg of valuable nitrogen could be lost into the air through a process known as *denitrification*, depending on the soil, its previous cropping history, and other factors. This period will give the organic matter sufficient time to decompose, and the toxic substances released during organic matter decomposition will dissipate before the seedlings are planted.

(1) Turning Over the Soil to Kill Weeds

(2) Preparing the Soil for Planting after (1)

Preparing the Soil in Different Conditions

Ploughing a Field in an Upland Area

Ploughing a Rain-fed Field

Ploughing an Irrigated Field

- Keep it submerged for at least two weeks. Let the water drain naturally to allow volunteer seeds and weed seeds to germinate.
- Depending on the weed population and soil condition, another tillage operation can be done.

Create Organic Matter and Compost from Rice Residues

- Composting converts crop residues into better organic fertilizers.

1. Method 1: Standard Method

- **Note:** These guidelines should be applied to 100% organic farming **and** bio-chemical farming.

1a. Soil Preparation – Land Area 1 Hectare

- If chemical fertilizer has been used on the soil for a long time, or no fertilizer at all, the best way to prepare the soil is to mix 10 tonnes of organic matter mixed with a lot of chicken dung (30% of the volume if possible), with 2 litres of Bio-Plant mixed with 1,000 litres of water per hectare. However, a standard amount is 1 litre of Bio-Plant mixed with 1,000 litres of water and 5 MT of organic matter per 1 hectare. 500 litres is the minimum amount for one hectare.
- Spread this organic matter sprayed with Bio-Plant over the soil 2 weeks before planting starts. Plough it into the soil. This will make the soil very rich in micro-organisms, and supply the roots with a lot of macro- and micro-nutrients; as well as enable the plants to obtain extra Nitrogen from the air.
- **Note:** Please prepare the soil in the same way both for a 100% organic farming test and bio-chemical farming test.
- Leave the organic matter with the Bio-Plant for 2 weeks before planting. Leaving the soil for about 14 days allows the micro-organisms to multiply before planting. The water is needed to awaken the micro-organisms as they are in endospore form. It takes about a week to awaken them, and the rest of the time is for them to multiply in the organic matter.

1b. Soil Preparation – Land Area 1 Acre

- For an acre, 4 tonnes will be best amount in the first year, but 2 tonnes will do. If the soil is weak in micro-organisms and nutrients, spray 250 cc - 500 cc of Bio-Plant mixed with 250 -500 litres of water over the organic matter once it has been laid over the ground. Then plough it in.

1c. Soil Preparation – Land Area Half an Acre

- For half an acre, 1-2 tonnes with 2 tonnes being the idea amount in the first year. If the soil is weak in nutrients, spray 125 cc - 250 cc of Bio-Plant mixed with 125 – 250 litres of water over the organic matter once it has been laid over the ground. Then plough it in.

Method 2: Preparing the Soil with Bio-compost

- This would be better than Method 1 above.
- **Per Tonne:** Chicken Dung & Cow Dung: 300 kgs.; Dried grass, rice stems, sugarcane waste, leaves, etc., cut into 1-2 inch lengths: 600 kgs.; Earth: 100 kgs. Black soil is the best.
- Dig a hole 5 m long x 1 m wide x 1 m deep. This will be enough to make 5 MT of organic fertilizer. *If you cannot dig a hole, then do the following on the ground instead and cover it with plastic.*
- Place inside the hole a 20 cm layer of dried grass, rice stems, etc. Then place on top a 20 cm layer of earth. Place on top of that a 20 cm layer of chicken shit and cow dung, and then another 20 cm layer of dried grass, rice stems, etc., and then another layer of dung on top of that. Alternate each 20 cm layer.
- Spray every layer with the following mixture: For each tonne of compost mix 20 litres of water with Pro-Plant (200 cc) and Bio-Plant (200 cc). Use 1 litre of Bio-Plant and 1 litre of Pro-Plant per 5 tonnes and 2 litres of each for 10 tonnes. Adjust the amount for extra tonnage.
- Then cover over the hole with a plastic cover so that no air gets in. Leave it for 6-8 weeks. The longer the farmer leaves it, the more time the micro-organisms have to multiply in the fertilizer mixture before the compost is placed on the soil.
- Open the plastic, and turn over and mix the compost every week.
- In the first year we recommend that the farmers use a minimum of 5 tonnes per hectare and *ideally* 10 tonnes per hectare. The reason for this amount of compost is that the soil has probably been weakened severely for many years by chemicals. If the farmers do this in the first year, the soil will recover very quickly with the bio-fertilizers and in the second year the farmers can reduce the amount of compost by half, if they wish to do so.

Method 3: Bio-Plant With No Organic Matter (When there is none available.)

- **Notes:** Sometimes a farmer says that he has no organic matter at all – no crop remains, no organic waste from people's homes, no dried leaves, no sugarcane waste, no dried grass, no animal waste. He wants to know how to use Bio-Plant without organic matter to prepare the soil.
- Mix the 1 litre of Bio-Plant with 1,000 litres of water. (A minimum amount of water is 500 litres of water, but as a guideline, the more water the better because there will be no organic matter for the micro-organisms to multiply in.)
- Spray this evenly over the whole area of soil.
- Plough the Bio-Plant into the soil, and leave the land 14 days before planting. This period will allow the bacteria and fungi to come alive.
- Spray the soil with water on Day 7 and Day 14 as the water will help the bacteria and fungi to multiply.

Incorporation of rice straw is feasible

Farmer experimentation has revealed that rice straw could be effectively ploughed back into the field if the following steps are taken:

- Spread the straw out in small heaps (weighing 4-5 kg) spaced 2 to 2.5 meters apart over the entire rice field shortly after threshing.
- Impound enough water in the field to allow the heaps of straw to become thoroughly wet.
- After the first ploughing spread the straw uniformly over the field.
- Cross-plough two weeks after the first ploughing. The straw breaks down readily into smaller pieces at this stage enabling it to be incorporated into the soil.
- Puddle, level, and broadcast pre-germinated rice seed about three weeks later.
- Any yellowing of rice seedlings observed by farmers is probably the result of the temporary immobilisation of soil nitrogen by soil bacteria because the rice had been sown immediately after the straw had been ploughed into the soil. These negative effects can be avoided if rice is sown at least three weeks after the straw has been ploughed into the soil in the second ploughing.

Benefits of straw application

Farmers have reported the following benefits from applying rice straw to their rice fields:

- Healthy, robust rice plants, which are more resistant to insect pest and disease attacks.
- Potassium fertiliser is no longer required (rice straw is rich in potassium).
- Slightly less nitrogen fertiliser required (20 kg - 25 kg per hectare).
- Yield increases of around 400 kg - 500 kg per hectare of rice after three to four consecutive seasons of straw application.
- Improved water retention of the soil.

Perform Secondary Tillage Operations

- Depending on the climate and soil type, this should be done 10−14 days after the primary workings on the soil.

Puddle the Field.

- **Implements**: Power tiller, Hydrotiller, Rotovator
- Puddling works the soil into a muddy or watertight paste. This minimizes water loss and increases nutrient retention and availability.

Harrow the Field

- Harrow the field 2−3 times within 5−7 days intervals.
- **Implements**: Power tiller with attached comb-tooth harrow, such as a rotovator.
- Harrowing breaks up the soil clods and incorporates weeds, straw, and stubble into the mud. This hastens their decomposition.
- Pass the harrow crosswise to break the soil clods. The second pass should be done lengthwise.
- If the field is flooded, reduce the depth of the water to locate uneven and high surfaces of the soil before harrowing.
- Depending on the soil and weed population, a field may require more than two harrowings.
- The third and final harrowing aims to do initial land levelling and final incorporation of crop residues, and provide proper soil tilth for crop growth.
- If using a small tractor or a draft animal, do the final harrowing with a plank leveller
- If using a large tractor, use the rotavator and leveller 2 days before planting.

Level the Field
Levelling should be done two (2) days before planting.

Implements: Power tiller with an attached wooden plank, Rotovator wide puddler with attached laser leveller

Use a wooden plank when levelling with a draft animal or small tractor. This requires total water coverage of the field for 12 days. When using a two-wheel tractor, 7−8 days of water coverage is required per hectare of land.

A levelled and smooth soil surface provides for uniform germination and growth of the crops. A well-levelled field improves water coverage and is also proven to increase crop yield and quality.

A well-prepared rice field has the following characteristics:
- Mud and water are thoroughly mixed.
- Weeds, rice straw, and stubble have been ploughed under the soil and are thoroughly decayed.
- The land is levelled.