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9. ABSTRACT

This handbook presents instructions for growing rice seedlings in several ways. Its seven sections discuss breaking the dormancy of seed, testing the viability of seed, selecting seed by specific gravity, soaking the seed, raising seedlings by the wetbed method, raising them by the dapog method, and raising them by the drybed method. Rice seedlings from a drybed nursery have several good characteristics. They are of uniform size and are easy to pull and transplant. They are free of diseases and pests. They are tough and have short but erect leaves and vigorous roots, and they recover quickly after transplanting. The advantages of the drybed method are: it requires relatively few seeds; the seedlings are easily transplanted; the number of seedlings transplanted per hill can be controlled; and the drybed method is well suited for experimental purposes. The disadvantages of the drybed method are that watering may be a problem, the seedbed preparation and care is laborious, and a heavy rain after seeding can damage the seedbed. Seeds of traditional tropical rice varieties often will not germinate immediately after harvest. They often have a dormant period of more than two or three weeks. An effective way to break dormancy is to treat the seeds with diluted nitric acid, using one liter of water for every kilogram of seeds and 6.3 ml of concentrated nitric acid for every liter of water used.

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TROPICAL RICE GROWER'S HANDBOOK **production
of seedlings**



THE INTERNATIONAL RICE RESEARCH INSTITUTE

1972

Production of seedlings

BREAKING THE DORMANCY OF SEED

To prepare enough seed for 1 hectare you'll need:

- 125 to 250 ml concentrated nitric acid (69% HNO_3)
- a cement sink, capacity 20 to 40 liters
- a bamboo or wood stirrer
- a non-corrosive liquid measuring container, graduated in milliliters
- a weighing scale
- 1 glass jar, capacity one-half liter

Mature seeds must go through a rest period (dormancy) before they will germinate. Seeds of traditional tropical rice varieties often will not germinate immediately after harvest and have a long dormant period.

Dormancy is a valuable characteristic in tropical rice areas where rain and high humidity frequently occur during the harvest period. But when the farmer wants to grow the same variety the year round and depends on the preceding crop as a source of seed, dormancy longer than 2 to 3 weeks can be a great disadvantage. Therefore he must be able to break the dormancy of seed. Seed dormancy is also a problem for the plant breeder who needs to reduce the time interval between crops and for the seed analyst who must determine germination capacity.

A desirable dormancy period in a variety is about 2 to 3 weeks. It is short enough to enable the farmers to use the seeds for the succeeding crop and long enough to prevent the grain from sprouting in the panicle during a rainy and humid harvest season.

An effective way to break seed dormancy is to treat the seeds with diluted nitric acid (0.1 N HNO_3).

Prepare the seeds. Air dry the seeds. Then clean them to remove unfilled grain, straw, and other foreign matter.

Weigh the seeds. Record the weight in kilograms to know how much solution to prepare. (Normal seeding rates range from 20 to 50 kg/ha.)

Compute amount of water needed. Always use a multiple of 1 liter of water to facilitate liquid measuring. *For a large*

quantity of seed, use 1 liter of water for every kilogram of seeds. For a small amount of seed, use not less than 1 liter of water.

Pour the computed amount of water into a container. To treat a large amount of seeds, use a cement sink, or other non-corrosive container. Use a plastic or a glass container for smaller amounts. Do not use a metal container. A metal container may react with the acid thus reducing the strength of the acid.

Compute volume of concentrated acid. To make a 0.1 N solution, you need 6.3 ml of concentrated nitric acid (purity should not be less than 68%) for every liter of water to be used.

$$\text{ml of concentrated nitric acid needed} = \frac{6.3 \times 100}{\% \text{ purity} \times \text{specific gravity of acid}}$$

Measure the volume of concentrated acid. Carefully pour concentrated nitric acid into a completely dry measuring container to the desired volume mark. **CAUTION:** Concentrated acid spilled on table top, hands, or clothing may cause serious burns. If acid is spilled, flood immediately with water.

Mix acid and water. Always pour concentrated acid into water. **CAUTION:** If water is poured into concentrated acid there will be an explosion and splattering. Stir the solution quickly but thoroughly with a bamboo or wood stirrer.

Soak the seeds in acid solution. Pour clean seeds into the acid solution. Remove all floating seeds. Soak the seed for 16 to 24 hours, but no longer.

Drain off acid solution and dry the seeds. Place seeds in the sun to dry. Sun-dry for 3 to 7 days after soaking. This should give 80 percent germination or better.

TESTING THE VIABILITY OF SEED

Testing viability is one of the minor tasks in rice production. It deserves more attention, however. Without knowing the germination percentage, you cannot make a good estimate of how much seed you need to plant a field at a recommended seeding rate. The viability of seed can be determined by three methods: the rag doll method, the Petri dish method, and the seedbox method. The result of any of these tests indicates



1. Labelling the petri dish

whether a stock of seed is suitable for planting and it serves as a basis for computing the right amount of seed to use.

PETRI DISH METHOD

You'll need:

- a grease pencil
- 4 petri dishes and covers
- filter paper

Obtain composite sample of seeds. Take seeds at random. Discard all unfilled seeds. Count four lots of exactly 100 seeds.

Label the petri dish cover. With a grease pencil write the variety name and the date of the test on the cover of each petri dish (fig. 1).

Place a piece of filter paper in each dish. Use only the bottom of the petri dish.

Moisten the filter paper. Add just enough clean water to cover the filter paper (too much water will cause the seeds to float).

Place the seeds on the filter paper. Evenly distribute 100 seeds on the filter paper in each dish. Placing too many seeds in one place tends to complicate subsequent counting of germinated seeds. Do not add water immediately after placing seeds on the filter paper because water drops may displace the seeds and group them in clusters.

Cover the petri dishes. Use the labeled covers.

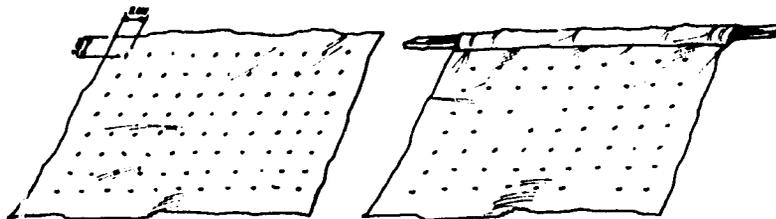
Let the seeds germinate. Place the four petri dishes in a safe place. Room temperature is favorable for germination. Do not place the dishes in an air-conditioned room. Maintain

enough moisture in the dishes to wet the filter paper by occasionally adding drops of water. The seeds will germinate in 4 to 5 days.

Count the germinated seeds. After 4 or 5 days, count the number of seeds that have shoots and roots. All shoots must be longer than 1 cm. If they are not, seed viability may have been damaged.

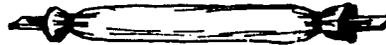
Record the result. Divide the total number of shoots in the four dishes by 4 to get the percentage viability.

Recommendations. To be acceptable for planting, seeds should have 80 percent germination or more. If germination is lower than 80 percent, but above 60 percent, you may have to sow more seed in the seedbed to make up for poor germination. If the germination is lower than 60 percent, do not use the seed unless no other is available.



2. Position of the seeds on the rag doll

3. Bamboo stick placed on the rag doll



4. A finished rag doll

RAG DOLL METHOD

You'll need:

4 pieces of cloth, 15 x 20 cm

12 rubber bands or string

4 paper labels

4 bamboo sticks about 1 cm wide and 30 cm long

Obtain a composite sample of seeds to be tested. Take seeds at random. Discard all unfilled seeds. Count exactly 100 seeds.

Label the test. Write name of variety and date of test on a paper label.

Moisten a piece of cloth. Soak a cloth in water then squeeze the water out. This helps the seed to stick when placed on the cloth. Spread the cloth on a flat surface.

Sow the seeds on the cloth. Distribute all 100 seeds evenly in rows of 10. Start about 2 cm from each edge of the cloth (fig. 2).

Place the bamboo stick on the cloth. Place the bamboo stick along the longer edge of the cloth (fig. 3).

Roll the cloth around the stick. Press the border of the damp cloth against the stick and simultaneously roll the stick with the cloth while moving toward the opposite border. Do not roll the stick without moving it toward the opposite border or you may displace your arrangement of seed. Secure the cloth in place by tying both ends with rubber bands or string (fig 4).

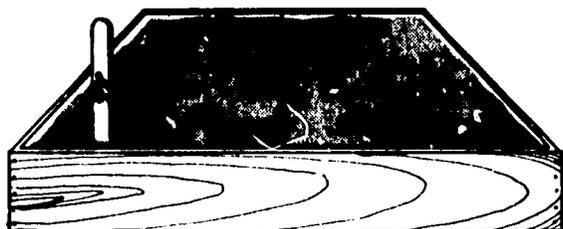
Attach paper label to the stick.

Let the seeds germinate. Moisten the seed by dipping the rag doll in the pail of water, then remove it from the pail. About three dippings per day are sufficient to keep the seed continuously moistened. Store the rag doll in a shaded place at room temperature (28 C), but not in an air-conditioned room. Protect the rag doll from rats. The seeds will germinate in 4 to 5 days.

Count the germinated seeds. After 4 or 5 days count the number of seeds that have shoots and roots. All shoots must be longer than 1 cm. If they are not, seed viability may have been damaged.

Record the result. The number of shoots counted is the percentage viability. The result is more reliable if the test is based on four rag dolls prepared at the same time.

Recommendations. Seed for planting should have 80 percent germination or more. If germination is lower than 80 percent, but above 60 percent, you may have to sow more seed in the seedbed to make up for poor germination. If the germination is lower than 60 percent, do not use the seed unless no other is available.



5. Seedbox with seed planted and labeled for replication 1.

THE SEEDBOX METHOD

You'll need:

a box about 15 x 30 x 30 cm filled 10 cm deep with soil
a paper label or wooden labeling peg

Obtain a composite sample of seed to be tested. Take seeds at random. Discard all unfilled seeds. Count exactly 100 seeds.

Label the seedbox. Write name of variety tested and date on a paper tag or a wooden pot labeling peg. Stick the label in the soil at one corner of the seedbox (fig. 5).

Plant the seeds in the box. Drop seed in rows. One box is sufficient for planting all your replications (divide the box into four sections and plant 100 seeds in each section) (fig. 5). Cover the seeds slightly with soil. Water the box after sowing, then occasionally thereafter. Do not let the soil dry out. Protect the seeds from rats. The seeds will germinate in 4 to 7 days.

SEED COMPUTATION

The approximate amount of seeds needed to plant a given area can be estimated when the percentage of germination is known. Suppose the germination of a certain seed stock is 85 percent. If your desired seeding rate is 50 kg/ha, then the amount of seed you need to plant 1 hectare (assuming the amount of unfilled grain is negligible) is

$$\frac{50}{85} \times 100 = 58.7 \text{ kg.}$$

Count the germinated seed. At the end of the germination period, count the number of shoots above the soil level. Do not count any shoot shorter than 1 cm.

Record the results. Divide the total number of shoots in all four sections of the box by 4 to get percentage viability.

Recommendations. Seed for planting should have 80 percent germination or more. If germination is lower than 80 percent, but above 60 percent, you may have to sow more seed in the seedbed to make up for poor germination. If the germination is lower than 60 percent, do not use the seed unless no other is available.

SELECTING SEED BY SPECIFIC GRAVITY

You'll need:

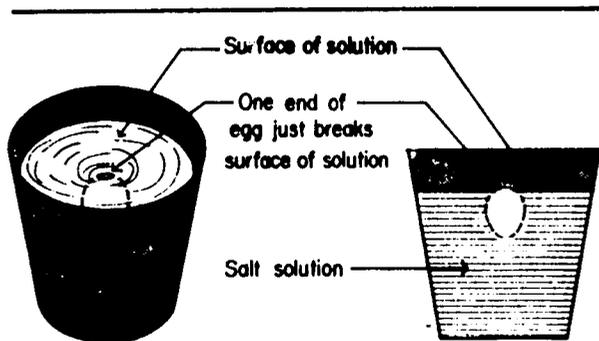
3 kg common salt or 4 kg ammonium sulfate	container, 12 liter capacity stirrer
hydrometer, or a fresh chicken egg	balance, 5 kg capacity

Although most of the unfilled seeds, straw, and dirt can be removed by winnowing, some unfilled seeds will remain with the good ones. Unfilled seeds will affect how accurately the required amount of seed can be calculated. It is therefore advisable to determine the proportion of unfilled and light seeds before soaking. To do so seeds may be separated either mechanically or by the specific gravity method. One mechanical method is to use air as in winnowing to blow the lighter seeds; another is to use a gravity table on which the lighter seeds tend to separate and remain on the side of the slightly sloping table surface which is jiggled mechanically:

You can also use a salt solution of a predetermined specific gravity to separate seeds. The light seeds will float and can be removed from the surface.

Obtain seed sample. Thoroughly mix the seeds to be tested and sample at random. Weigh exactly 1 kilogram.

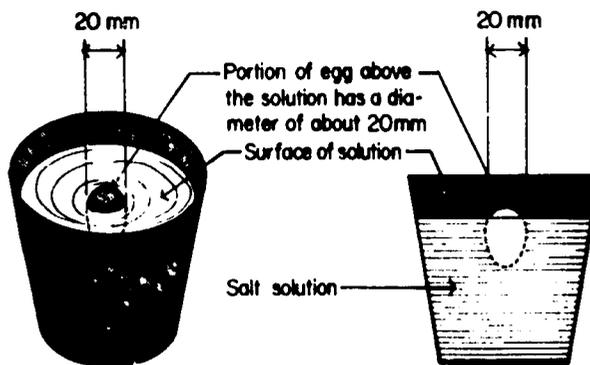
Prepare a salt solution. For traditional tropical varieties (indica), make a solution with a specific gravity of 1.08. Mix 1.65 kilogram of *common* (table) salt in 10 liters of clean water. Or instead, mix 2.2 kilograms ammonium sulfate in a bucket containing 10 liters of clean water. For traditional



6. When the specific gravity of a solution is approximately 1, one end of a fresh egg barely touches the solution surface

temperate varieties (japonica) make a solution with a specific gravity of 1.13. Mix 2.5 kilograms of common salt or 3.1 kilograms of ammonium sulfate in a bucket containing 10 liters of clean water. For new high yielding varieties, such as IRRI varieties, use just clean water. Clean (but not pure) water has a specific gravity of 1 or slightly more.

The desired specific gravity can be checked accurately with a hydrometer or, approximately, with a *fresh* chicken egg: The specific gravity is about 1 when one end of the egg surface just breaks the solution surface (fig. 6); the specific gravity is about 1.13 when the surface area of the egg above the solution surface reaches a diameter of 20 mm (fig. 7).



7. When the specific gravity of a solution is approximately 1.13, one end of the fresh egg intersects the solution surface making an area 20 mm in diameter

Add the seed sample. Stir the seeds thoroughly in the solution. Allow seeds to settle.

Remove floating seeds. Carefully remove all floating seeds. Avoid spilling them on the ground. Spread them on a piece of cloth or sack, and let them dry.

Wash and dry the good seeds. Drain the bucket and wash the good seeds thoroughly in fresh water to remove the salt. Dry the good seeds and save them for planting.

Weigh the unfilled seeds. The unfilled (floating) seeds must be thoroughly dry before they are weighed. Record the weight in grams.

Calculate the percentage of unfilled seeds.

$$\% \text{ unfilled seeds} = \frac{\text{Weight of unfilled seeds (g)}}{\text{total weight of seed sample (g)}} \times 100$$

Since you used a 1 kilogram (1,000 g) seed sample the equation can be simplified:

$$\% \text{ unfilled seed} = \frac{\text{weight of unfilled seeds (g)}}{10}$$

Record results. Record the percentage of unfilled seeds in the sample. The result is more reliable if at least two tests are made on the same source of seeds.

SEED COMPUTATION

If the rate of seeding, the percentage germination, and the percentage unfilled seed are known, the required weight of seeds to plant a given area is

$$\frac{\text{Seeding rate (kg/ha)} \times \text{area to be planted (sq m)}}{\% \text{ germination} \times \% \text{ filled grain}} = \text{seed required (kg)}$$

Example: If a stock of IR20 has 90 percent germination and 2 percent unfilled grain, how much seed is needed to plant 6 hectares (60,000 sq m) at a seeding rate of 20 kg/ha?

Step 1 — The percentage of filled grain = 100 — 2 = 98%

Step 2 — Required weight of seed:

$$\frac{20 \times 60,000}{90 \times 98} = 136 \text{ kg}$$

SOAKING AND INCUBATING SEED

You'll need:

kerosene can, 20 liter capacity	2 wooden pot labels
stirrer, a small wooden paddle	1 jute sack
water	weighing scale

Before germination can take place, rice seeds must be saturated with moisture. Dry seeds, if sown directly in the seedbed, germinate slowly because it takes time for them to absorb sufficient moisture to become saturated. Seeds that are germinated before sowing will start to grow quickly in the field or seedbed, and will be less affected by diseases, insects, birds, and other pests. Pregermination consists of soaking and incubating the seeds.

SOAKING SEEDS

Compute the required quantity of seeds. You need to know the seeding rate, the kind of seedbed (dapog, wetbed, or drybed), area to be planted, percentage germination (do not use seeds whose germination is less than 60% unless this is the only source), and percentage unfilled seeds. See *Testing the viability of seed* and *Selecting seed by specific gravity*.

Weigh the seeds and place them in a container. A kerosene can is a convenient container.

Add water to the container of seeds. Pour water in *slowly* to allow seeds to absorb water evenly and to prevent good dry seeds from floating. Gradually raise the water level by pouring in more water until it is about 10 cm above non-floating seeds.

Stir at least 1 minute and remove unfilled seeds. Unfilled seeds will float on the surface of the water. Remove and discard unfilled seed by hand or with a strainer.

Wash well-filled seeds. Wash in fresh water. Four or five washings are sufficient.

Soak the seeds in fresh water. Keep water fresh during soaking by changing it every 5 or 6 hours. Soak seeds for 24 hours at normal room temperature (27 C or higher). If the temperature is lower, consult the following table.

<i>Average water temperaturc</i>	<i>Number of days to soak</i>
10 C	10
15	6
22	3
25	2
27	1

Label the seeds. Use wooden pot label. Indicate variety and date soaked. Leave space in label for date incubated.

INCUBATING SOAKED SEEDS

After soaking the seeds for 24 hours at room temperature (27 C or higher):

Wash the soaked seeds. Rinse with fresh water two or three times, then drain off water.

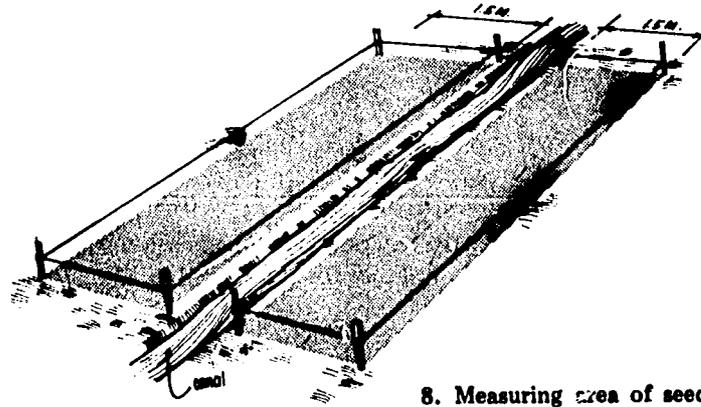
Wet the bags. Soak the bags in water until thoroughly wet. The bags should be free of other seeds.

Prepare the seeds for germination. For a large quantity of seeds, pour the seeds in a large tray or on a covered cement floor. Spread the seeds 10 to 15 cm deep and cover them with moist bags. For a small quantity of seeds, pour the seeds into a moist bag and fold it tightly. Put the bag in a shady place.

Let the seeds germinate. If the seeds are in a tray or on a cement floor mix the seeds by hand every 12 hours. If the seeds are in a bag, turn the seeds occasionally to improve aeration. Sprinkle the seeds while mixing. Keep the bags moist and prevent the seeds from becoming too hot during the incubation period. But if the seeds are too cold, add warm water to maintain the temperature between 20 to 30 C.

For a dapog seedbed, incubate the seeds 48 hours. (Seeds incubated for a shorter period will have just opened their coats and the shoots will be barely emerged. When the seeds are placed in a dapog seedbed they will pack too closely hindering maximum dapog growth. Allow shoots to grow to about 3 to 5 mm long.) For a wetbed or drybed, incubate the seeds 24 to 36 hours (longer incubation will produce seeds with long shoots and radicals, making sowing more difficult).

Label the seeds. Use a wooden pot label as in the soaking operation. Add date of incubation.



8. Measuring area of seedbeds

RAISING SEEDLINGS BY THE WETBED METHOD

You'll need:

a meter stick or steel tape	abaca or banana twine
insecticide	bamboo stakes about
sprayer	2 X 40 cm

Of the three major methods of raising seedlings — the wetbed method, the dapog method, and the drybed method — the wetbed method makes the most economical use of seed in producing seedlings. The number of wetbed seedlings planted per hill can be precisely controlled. Thus it is particularly useful when seed is scarce or when a new variety is being multiplied.

Raising seedlings by the wetbed method involves four operations: preparing the seedbed, sowing seeds, caring for the seedlings in the seedbed, and pulling the seedlings.

PREPARING THE WETBED

Compute the area required for the seedbed. The seeds should be sown in the seedbed at approximately 100 g/sq m. To obtain the required area of seedbed, divide the weight (in grams) of seeds to be planted by 100 (see *Soaking and incubating seed*). Each seedbed should be about 1.5 meters wide to make taking care of the seedbed easy. If you need more than one seedbed, allow for canals (40 cm wide) between seedbeds (fig. 8)

Select the location. The field in which the seedbed will be constructed should be conveniently located for irrigation and



9. Sowing seed on the seedbed

drainage and should be safe from uncontrolled flood; fertile, free of excess salts or other soil problems; sunny and warm, in full sunlight; large enough to provide seedlings with sufficient space to obtain required nutrients, water, and light.

Prepare the land. Prepare the land 30 to 35 days before planting time.

Regulate water level. Drain off excess water to admit no more water than required to maintain a water level just sufficient to cover the soil. The water will serve as a guide in leveling the soil.

Measure area of seedbed. Two persons can easily perform this operation. For each seedbed, use a string or twine, and four bamboo stakes to outline the predetermined area with the help of a steel tape or other measuring devices (fig. 8).

Raise seedbed level. Collect mud around and outside of the string and put it in the area inside the string. As a result, a canal forms as the height of the seedbed increases. If a second seedbed is to be constructed adjacent to the first one, do not collect soil inside the area of the second seedbed. The seedbed should be about 4 to 5 cm above the original soil level. Smooth the surface of the seedbed so that it slopes slightly toward both sides for drainage of water (fig. 9) during the first few days.

SOWING THE SEEDS

Seeds must have been pregerminated for 24 to 36 hours. Evenly broadcast about two or three handfuls of seed on a

square meter of seedbed, that is approximately 100 grams of seeds per square meter (fig. 9). If you sow seeds too closely, the seedlings will be small. It will also be more difficult to pull seedlings and there will be more chance of injuring the long roots of adjacent seedlings.

CARE OF WETBED SEEDBED

Protect seedlings from lack of water. During the first week add just enough water to saturate the soil. To control weeds after the first week, irrigate the seedbed gradually and continuously to a depth of 5 cm, depending upon the height of seedlings.

Protect seedlings from insects and animals. Every 7 days, spray Sevin 85 WP at a rate of 0.09% toxicant (active ingredient) or 1 level tablespoon per 2 liters of water (fig. 10). Other local insecticide recommendations may be used. If possible, fence the seedbed to protect it from rats, water buffaloes, etc.

Protect seedlings from nitrogen deficiency. If you observe symptoms of nitrogen deficiency, broadcast 50 to 100 grams of ammonium sulfate per square meter of seedbed (or use 20 to 40 grams of urea per square meter).

PULLING SEEDLINGS

Pull seedlings. Seedlings are ready for transplanting 20 to 25 days after sowing. Seedlings over 30 days old, when



10. Spray the seedbed with insecticide every 7 days to protect seedlings from insects



11. Pulling seedlings

transplanted, recover more slowly than younger seedlings, especially if they suffer stem and root injury. Seedlings less than 20 days old are too short to be pulled from the soil.

Grasp two to three seedlings at a time. Grasp the seedlings between the thumb and four fingers (fig. 11). Hold the seedlings as close to the base as possible. Pull gently at an angle about 30 degrees from the horizontal (fig. 11).

Characteristics of good rice seedlings from a wetbed nursery.

They are of a uniform size and are easy to pull and transplant.

They are free of diseases and pests.

They are tough and have short but erect leaves and vigorous roots.

They recover quickly after transplanting.

Advantages of the wetbed method

Less seeds are required per unit area to be transplanted.

Seedlings easily transplanted.

The number of seedlings transplanted per hill can be controlled so not many seedlings are wasted.

It is suited for experimental purposes.

Disadvantages of the wetbed method

The seedbed occupies part of a field.

Preparation of seedbed, care of seedbed, and pulling of seedlings are laborious.

A heavy rain shortly after seeds have been sown can easily wash away the seeds.

When seedlings are intended for research do not pull those on the edges of the beds since they are not uniform.

Clean roots. If too much mud sticks to roots, wash by shaking the roots in water; striking the plant roots against your feet or any object to remove mud will injure the plants.

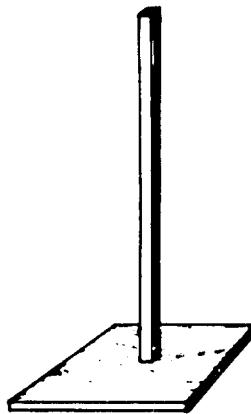
Bundle the seedlings. For convenience, the seedling bundle should be 5 to 8 cm in diameter. Use any soft material, such as banana or abaca twine for tying. Keep the seedlings from drying out.

RAISING SEEDLINGS BY THE DAPOG METHOD

You'll need:

- meter stick, or steel tape
- banana leaves
- banana bracts from a mature banana stalk
- bamboo sticks, each 1 x 15 cm
- 4 bamboo stakes, 2 x 100 cm, for each seedbed
- stick broom, or gardener's sprinkler
- woodboard with handle (fig. 12)

The dapog method of raising seedlings is common in the Philippines and is gaining popularity in other countries. In the dapog seedbed, seedlings are produced without soil. This type of seedbed occupies a smaller area than the wetbed or drybed, it requires less time to produce seedlings, and it saves labor in pulling seedlings.



12. A woodboard with handle

The dapog method consists of four operations: preparing the seedbed, sowing seeds, caring for the seedbed, and preparing seedlings for transplanting.

PREPARING THE DAPOG SEEDBED

Compute area required. You need about 1 square meter of seedbed for every 3 kilograms of seed. A width of 1.5 meters is convenient for easy management.

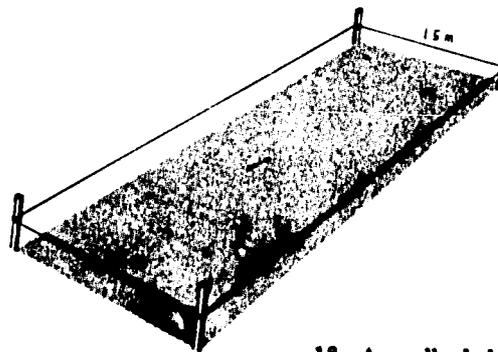
Prepare the land. Usually one plowing followed by one harrowing is sufficient.

Regulate water level. There must be enough water to cover the soil surface. The water level will serve as a guide in leveling the soil.

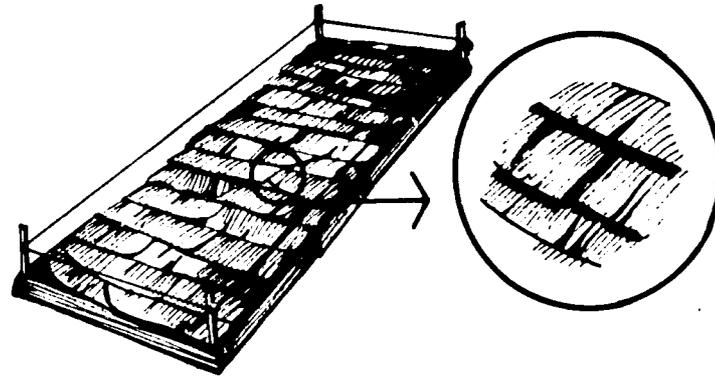
Measure the area of the seedbed. Two persons can easily perform this operation. For each seedbed use a string, or twine, and four bamboo stakes to outline the predetermined area with the help of the steel tape or other measuring device (fig. 13).

Raise seedbed level. Collect mud around and outside the area outlined by the string and transfer it to the enclosed area. A canal is formed around the bed as the height of seedbed increases. Each seedbed should be 4 to 5 cm above the original soil level. Smooth and level the surface of the seedbed.

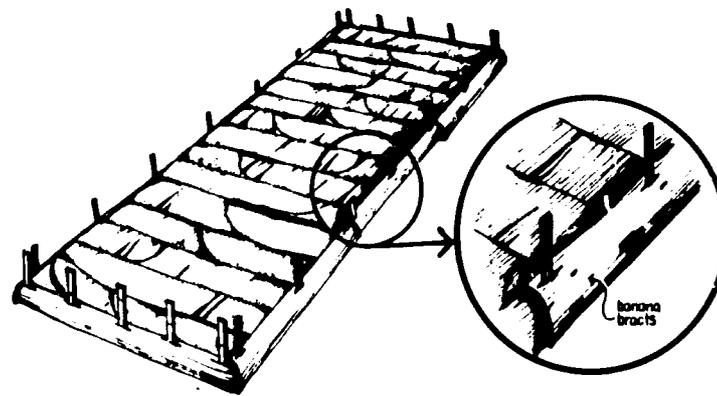
Cover the soil of the seedbed. Cover the surface of the seedbed evenly and completely with banana leaves free from



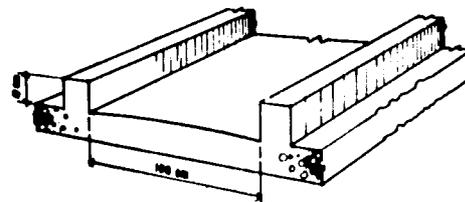
13. A seedbed should be 1.5 meters wide



14. A dapog seedbed covered with overlapping banana leaves



15. Seedbed surrounded by banana bracts which are held in place by bamboo sticks



16. Cross-section of a cement floor specially constructed for raising dapog seedlings

midribs (fig. 14). Spread the leaves with the powdery side (under side) up. The leaves should overlap each other and should have no hole or breakage. Plastic sheets may be used instead of banana leaves.

Surround the seedbed with banana bracts. Carefully lay strips of banana bracts along the edge of the seedbed. Push thin bamboo pegs through the bracts and into the soil to keep bracts upright and firmly in place (fig. 15).

Alternative procedure. If a cement floor is available, you may use it instead of prepared land. Figure 16 shows a cement floor constructed especially for a dapog seedbed.

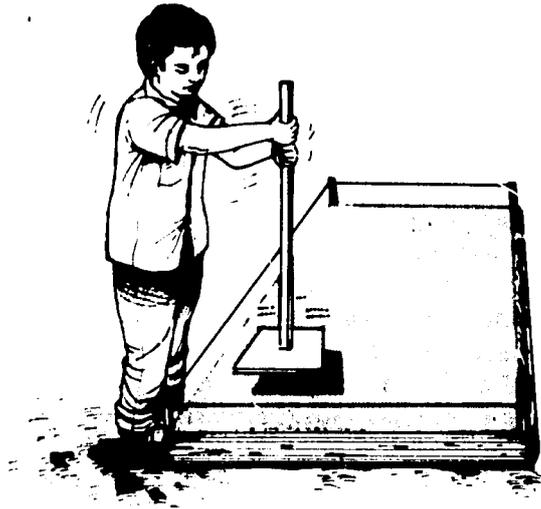
SOWING SEEDS

Scatter the pregerminated seeds over the seedbed. Seeds must have been pregerminated for 36 to 48 hours. Spread about 3 kilograms of seeds per square meter over the banana leaves (fig. 17). Pack the seeds to make a uniform layer three seeds thick. Use a woodboard to press the seeds (fig. 18). Do not press hard on the seeds or you will squeeze out the mud underneath, destroying the flatness of the seedbed.



17. Scatter pregerminated seeds over the banana leaf enclosure

Water the seeds. Immediately after pressing the seeds into a uniform layer, sprinkle water on them with a gardener's sprinkler or a stick broom. Do not pour water on them to avoid displacing the seeds.



18. Pack the seed with a wooden leveling board to make a uniform layer three seeds thick



19. Sprinkle water on the seedbed with a stick broom three to four times a day.

Characteristics of good rice seedlings from dapog seedbed

They have a uniform size.

They are free of diseases and pests, and from damage caused by them or from mechanical injury.

They are hardy, with short but erect leaves and vigorous roots.

Advantages of dapog method

Time in the seedbed is greatly reduced.

Area required for seedbed is reduced.

More choices for location of seedbed.

Seedlings do not suffer from root or stem injury.

Pulling of seedlings is eliminated.

Seeds in seedbed will not be carried away by rain.

Disadvantages of dapog method

A large quantity of seeds is required.

Seedlings are short.

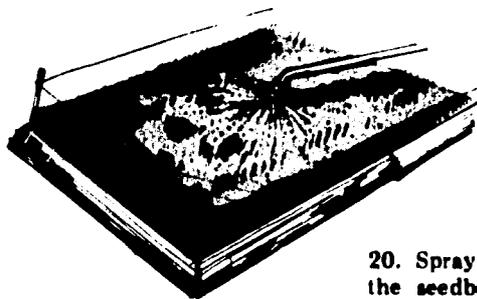
Number of seedlings per hill cannot be controlled easily.

CARE OF THE DAPOG SEEDBED

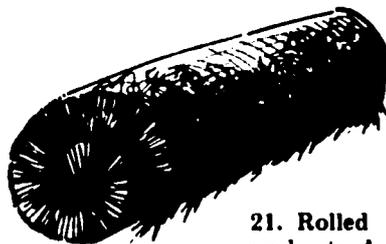
Water the seedbed. Water the seedbed three or four times a day with a gardener's sprinkler or a stick broom (fig. 19). Never let the seedbed dry out. After 4 days irrigate the seedbed continuously to cover it with 1 to 2 cm of water.

Maintain even germination. By hand or with a woodboard lightly press the seeds once a day until the fourth day. This keeps the roots of the seedlings in contact with the banana leaves or plastic sheet.

Protect seedlings from insect pests and animals. On the fifth and tenth day spray Sevin 85 WP at 1 level tablespoon per 2 liters of water (or 0.09% active ingredient) on the seedbed and 2 to 3 meters around all sides (fig. 20). Or, follow local



20. Spray insecticide on the seedbed and 2 to 3 meters around all sides



21. Rolled dapog seedling ready to be transported to the planting area

insecticide recommendations. Fence the seedbeds to protect them against rats, water buffaloes, etc.

PREPARE SEEDLINGS FOR TRANSPLANTING

Loosen and roll the seedbed. Dapog seedlings are ready for transplanting when they are 10 to 14 days old. As the bed is rolled, leaves turn inward and roots outward. If the roll is too large, cut it crosswise into convenient pieces (fig. 21).

Carry the roll of seedlings to the field to be planted.

RAISING SEEDLINGS BY THE DRYBED METHOD

You'll need:

- a meter stick or steel tape
- abaca or banana twine
- bamboo stakes about 2 x 40 cm

The drybed method for producing seedlings is used in areas where there is insufficient water to use the wetbed method.

PREPARING THE DRYBED

Compute the area required for the seedbed. You will sow 100 grams of seed per square meter. To obtain the required area of seedbed, divide the weight (in grams) of seeds to be planted by 100. Each seedbed should be about 1.5 meters wide to facilitate care of seedlings. If more than one seedbed is needed allow for a canal (40 cm wide) between seedbeds.

Select the location. The seedbed should be conveniently located for irrigation and drainage and should be safe from uncontrolled floods. The soil should be fertile, free from

excess salts, or other soil problems. The seedbeds should be in full sunlight and large enough to provide seedlings with sufficient space to obtain required nutrients, water, and light.

Prepare the land. Plow the field thoroughly and harrow until soil is thoroughly pulverized. Construct seedbeds with canals between them to provide easy access to water.

Measure area of seedbed. Using a string or twine and four bamboo stakes, outline the predetermined area with the help of a steel tape or other measuring devices.

SOWING THE SEED

Seeds must have been pregerminated for 24 to 36 hours. Broadcast the seeds evenly over the bed and cover lightly with fine soil by hand. Two or three handfuls per square meter is equivalent to 100 g/sq m.

CARE OF DRYBED

Protect seedlings from lack of water. If irrigation water is available, fill the canals between the beds with water. Splash the seedbed with water from the canals or other sources every morning and afternoon.

Protect seedlings from insects and animals. Every 7 days, spray Sevin 85 WP at the rate of 0.09% toxicant (active ingredient) or 1 level tablespoon per 2 liters of water. Other effective insecticides may be used. If possible, fence the seedbed to protect it from rats, water buffaloes, etc.

Fertilize the seedbed. Usually 60 to 100 grams of nitrogen per square meter of seedbed is needed to insure vigorous plants. Apply the nitrogen as a topdressing 15 days after seeding. Be careful to apply fertilizer only when seedbed is dry — otherwise the seedlings will be burned.

PULLING SEEDLINGS

Pull seedlings. Seedlings are ready for transplanting 20 to 25 days after sowing. Keep the seedbed moist when pulling the seedlings. Grasp two to three seedlings at a time as close to the base as possible and pull gently at an angle about 30 degrees from the horizontal.

Clean roots. If too much soil sticks to the roots, wash by shaking the roots in water; striking the seedlings against your feet will injure the plants.

Bundle the seedlings. Make the seedlings into bundles 5 to 8 cm in diameter. Use any soft material, such as banana or abaca twine for tying. Keep the seedlings from drying out.

Characteristics of good rice seedlings from a drybed nursery

They are of uniform size and are easy to pull and transplant.

They are free of diseases and pests.

They are tough and have short but erect leaves and vigorous roots.

They recover quickly after transplanting.

Advantages of drybed method

Low seed requirement.

Seedlings easily transplanted.

The number of seedlings transplanted per hill can be controlled.

It is suited for experimental purposes.

Disadvantages of drybed method

Watering may be a problem.

Preparation of seedbed, care of seedbed, and pulling of seedlings are laborious.

A heavy rain shortly after seeding can damage the seedbed.