

# Pack 106, Item 11

# Type: Backgrounder

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**Backgrounder: Rice production**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Introduction:***

Rice is the seed of the grass species *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice). It is the main source of food for hundreds of millions of people worldwide. The natural habitat of rice is tropical swamplands, but it can also be cultivated in a variety of subtropical and tropical habitats.

Unlike other grasses grown as agricultural crops, rice plants thrive in extremely moist conditions. The ideal temperature for growing rice is roughly 24° C. The average height of a rice plant varies greatly between 0.4-5 metres. Rice matures in 3-6 months. Different kinds of rice plants produce a variety of grains, including short- and long-grain rice, as well as perfumed grains such as basmati and jasmine rice.

***Why is this subject important to listeners?***

Small-scale rice farmers in many countries can improve their yields and livelihoods by using tried and tested strategies. Farmers need to follow important steps for successful rice production, such as using seeds that can withstand unfavourable conditions, and applying fertilizers at the appropriate rate and timing, and with the appropriate methods.

***What are some key facts?***

* Rice is a staple food for almost half of the world’s population.
* Over 40,000 varieties (with different colours, sizes, tastes, and grains) exist, and more than 100 are grown worldwide.
* Rice is a complex carbohydrate which is rich in sugars, proteins, and vitamin B. It is a primary source of the energy we need for daily activities.

***What are the big challenges of growing rice?***

* Farmers in rainfed lowlands face challenges related to poor soil quality, droughts, and floods.
* Lands used for upland rice production have a wide variety of challenges. They can be low-lying (making them prone to soil erosion), drought-prone, rolling, or steeply-sloped.

***Gender aspects of growing rice***

* In Africa and Asia, women carry out much of the back-breaking labour in rice production, either in traditional rainfed, mangrove, or upland rice production, including tasks such as transplanting and weeding.
* Despite women’s important contributions to rice farming, women have less access than men to knowledge, skills, agricultural inputs, improved seeds, land, credit, agricultural extension services, small equipment, and light machinery.

***Predicted impact of climate change on rice production***

* The overall impact of climate change on rice production is likely to be negative. More specifically:

1. *Temperatures will increase, resulting in more heat stress and rising sea levels.* 
   * Higher temperatures can reduce rice yields by causing spikelet\* sterility and reducing grain quality.
2. *There will be more frequent and severe climate extremes.*
   * Even though rice thrives in wet conditions, uncontrolled flooding caused by rising sea levels will make rice production difficult in coastal areas.
   * Climate change influences the frequency of rice diseases and pest problems. Increased water shortages, irregular rainfall patterns, and related water stresses will increase the intensity of some diseases. As climate change intensifies, it is predicted that the intense droughts that are frequent in rainfed rice-growing areas could spread to water-stressed irrigated areas.
   * It is predicted that climate change will increase weed infestation and competition between rice and weeds, a major challenge for rice production.
   * New production practices may help farmers cope with climate change and lead to reduced occurrences of diseases such as rice blast, brown spot, grain rot, and bacterial blight.

***Key information about growing rice***

**1. Suitable land and land preparation**

* In areas with high populations of perennial weeds (for example, *Cyperus* spp., *Paspalum distichum*, *Cynodon dactylon*, etc.), disc plough the field immediately after harvest in order to expose the roots of weeds to the sun. Where this is not possible, use a rake or hoe. [*Editor’s note: Broadcaster can search online for pictures of these weeds, then find the local name of the weed.*]
* After ploughing and harrowing, make bunds around the field to retain water and suppress weed growth. Where ploughing and harrowing are not possible, use hand hoes or animal traction to accomplish the same task.
* Irrigate or find other ways to allow water into the field.

For further information: See documents 1, 3, 6.

**2. Seeds, varieties, and planting**

The most suitable variety is the one that best fits what farmers and consumers need, not necessarily the one that gives the highest yield. The choice of variety will be influenced by:

* availability of water (either from rain or irrigation),
* soil type,
* elevation of the field (above sea level),
* whether rice will be sold or consumed at home,
* potential yield,
* resistance to disease,
* eating qualities,
* milling yield, and
* suitability for the market.

When selecting a variety, also check the length of the growing season, height, and grain quality.

Use good quality seeds without insect damage and contaminants (weed seeds, stones, debris, etc.). Seeds should have high viability (above 80%). When seed viability is unknown, conduct a simple seed test by adding water to the seeds. Discard grains that float in the water.

**Nurseries**

Rice can be either directly sown in the field or transplanted. In direct seeding, seeds are sown directly in the field. In transplanting, seedlings are first raised in a nursery before being transplanted into the field.

* + *Dry bed nursery*: Water regularly to keep the bed moist, but prevent it from forming puddles. Provide a good drainage system to avoid flooding.
  + *Wet bed nursery*: Choose fertile, well-drained soil exposed to full sunlight. Drain excess water from the nursery bed. Apply NPK 15-15-15 fertilizer or rice husk and rice bran as mulch to produce better seedlings. Scare birds away with scarecrows or catapults to prevent damage during germination.

For further information: See documents 1, 4, 6.

**3. Growing practices**

*Transplanting and direct seeding:*

* + Transplanting*:* Transplant 14-21 days after sowing at 2-3 seedlings per hill, 3-4 cm deep, and with a spacing of 20 x 20 cm – 30 x 30 cm.
  + Direct seeding*:* Dividefield into plots of 50 x 100 metres and make bunds. Sow seeds at 20 cm between rows and 15-20 cm within rows (between hills).

Apply herbicides to control weeds. Alternatively, maintain a 2-5 cm level of water in the field to minimize weed emergence and lower weed pressure. If there is enough water, fields can be continuously flooded from the time of transplanting to when the crop canopy covers the soil completely.

*Gap filling:*

* + Fill empty spaces with seedlings 7–10 days after transplanting, using leftover seedlings from the nursery.

For further information: Documents 1, 4.

**4. Soil fertility**

Apply phosphorus and potassium one week before transplanting. Work fertilizers well into the soil. Three to five weeks after transplanting, use deep placement\* of urea (2-3 cm).

Alternatively, use organic fertilizers such as manure, compost, or crop residues.

For further information: documents 1, 3, 4.

**5. Weeds**

* + Hand weed 14-20 days after transplanting. Hand weed again about 30-40 days after transplanting.
  + Regularly inspect the field, and remove and destroy weeds.

For further information: Documents 1, 3, 4, 5, 7.

**6. Pest and disease management**

* Erect scarecrows at random intervals in fields to scare birds away.
* Plant at the same time as your neighbours (or within a 2-week window) to minimize insect, disease, bird, and rat pressure on individual fields.

For further information: Documents 1, 5, 6, 7.

**7. Harvesting**

* + The crop is ready for harvesting when grains are hard and turning yellow/brown (about 30-45 days after flowering).
  + Cut stems with a sickle about 10-15 cm above the ground.
  + Stack the harvested rice crop in an upright position to dry before threshing.

For further information: Documents 1, 3, 4, 5, 6.

**8. Threshing**

* To reduce losses, thresh immediately after harvesting and drying.
* Avoid threshing on bare floors to prevent introducing sand, stones, and other foreign matter.
* Thresh carefully and avoid dehusking the grains.

For further information: Documents 3, 4, 6.

**9. Winnowing**

* Winnow to separate chaff and empty grains from mature, well-filled grains.
* Remove foreign matter (e.g. weed seeds, dirt, and straw) from paddy.
* Recommended winnowing practices:
  + Place grain on a winnowing tray.
  + Place a net or mat on the ground beneath.
  + Tilt the tray against the wind.
  + Pour grain slowly from a height of about 1 metre.
  + Wind will separate light from heavy grains.
  + Keep only the heavier grains.
  + Repeat the procedure if needed.
  + Use a fan or blower if there is not sufficient wind.

For further information: Documents 1, 4, 6.

**10. Drying**

* Dry paddy rice to a safe moisture level (about 13-14%) on a clean concrete floor, turning over periodically. (If farmers do not have access to a moisture metre, they usually press the grains between their teeth. Dry grains do not easily break.)
* Sun-dry slowly for 2-3 days to reduce breakage during milling.
* Do NOT dry on bare floors or roadsides since this leads to contamination with stones and other foreign matter.

*To improve sun drying:*

1. Spread grain in a thin layer, ideally 2–4 cm. If layers are too thin, grains tend to heat very quickly, which reduces the number of whole, unbroken grains. If layers are too thick, the grains on top will be much dryer than the grains on the bottom. After mixing, the moisture will be re-absorbed, resulting in cracked grains.
2. Turn or stir the grain every 30 minutes. During good weather, mixing or turning the grain is the most important activity for maintaining good quality. If the moisture level within the grain is uneven, this will cause rewetting and subsequent cracking of drier grains.
3. On very hot days, grain temperature can rise above 50–60ºC. In this case, cover the grain at midday to prevent overheating.
4. Cover the grain immediately if it starts raining. Rewetting of grain results in cracked grains and a high degree of breakage during milling.
5. Prevent contamination of grain with other materials and keep animals away from the grain.

For further information: Documents 1, 3, 6.

**11. Milling and storage**

* Milling removes the husk or hull from the grain and the bran from the kernel.
* In general, rice to be used for food should be stored in paddy form rather than as milled rice, as the husk provides some protection against insects and helps prevent deterioration in quality.
* Store rice in:
  + 40−80 kg bags made from jute or woven plastic,
  + in bulk (on the farm or in commercial collection houses), or
  + in hermetic (airtight) containers.
* Store only well-cleaned rice. Inspect stored rice weekly for signs of pests (e.g., insects and rodents).
* Ensure sufficient air circulation to maintain a uniform moisture and temperature.

For further information: Documents 1, 3, 4.

***Where can I find other resources on this topic?***

1. Arraudeau, M. A. & Vergara, B. S., 1988. *A farmer’s primer on growing upland rice.* International Rice Research Institute. <http://books.irri.org/9711041707_content.pdf> (16.3 MB)
2. GRiSP (Global Rice Science Partnership), 2013. *Rice Almanac*, 4th edition. Los Banos (Philippines): International Rice Research Institute. <http://books.irri.org/9789712203008_content.pdf> (22.3 MB)
3. LSU AgCenter, 2000. *Rice Production Best Management Practices (BMPs)*. Baton Rouge, LA: LSU AgCenter, Louisiana State University. <http://www.agmrc.org/media/cms/2805rice_412982BFD8BCD.pdf> (1,027 KB)
4. Nwilene, F. E. et al, 2008. *Growing lowland rice: a production handbook*. Africa Rice Center. <http://www.fao.org/fileadmin/user_upload/ivc/docs/Growing%20lowland%20rice_%20production%20handbook_prepress%20final%20version_19-05-08_low%20res.pdf> (870 KB)
5. Tenkile Conservation Alliance, undated. *Introduction to Rice Cultivation & Management*. [http://www.tenkile.com/documents/TCA-Rice-Farming.pdf](http://www.tenkile.com/documents/TCA-Rice-Farming.pdf%20)  (754 KB)
6. *Rice Production Manual*, Los Baños (Philippines): International Rice Research Institute, 2015. <http://www.knowledgebank.irri.org/images/docs/12-Steps-Required-for-Successful-Rice-Production.pdf> (1.2 MB)
7. *Rice Doctor App*. Google Play Store. Developed by IRRI; Philippine Rice Research Institute (PhilRice); Research Institute for Rice, Indonesia; and Lucid Team at the University of Queensland, Australia. For information and download, go to: <http://www.knowledgebank.irri.org/decision-tools/rice-doctor>

***Key definitions***

1. **Bund:** A bank or mound used to control the flow of water. Bunds are generally used on sloping fields to reduce water runoff and soil erosion.
2. **Field drying:** In the traditional harvesting system, farmers leave their harvested rice in the field for an extended time because they are either waiting for the thresher or because they want to pre-dry the paddy. This can lead to growth of moulds, discolouration of grain, and other challenges. It is very difficult to produce good quality grains with field drying. Where possible, this should be avoided.
3. **Paddy field:** A flooded parcel of farmland used to grow rice.
4. **Paddy rice:** Paddy rice refers to individual rice kernels in their natural, unprocessed state. Sometimes referred to as rough rice, paddy is harvested directly from rice fields or paddies and transported to a processing site. As part of the processing, the protective hull is removed, leaving only the rice kernel for consumption.
5. **Spikelet:** The rice "flower" is called a spikelet.
6. **Upland rice:** Rice grown on dry soil rather than flooded rice paddies.
7. **Urea deep placement**: When urea fertilizer is surface broadcast in floodwater, it dissolves easily and the nitrogen quickly moves out of reach of the rice plants. Approximately two-thirds of urea broadcast in this way is not available to the crop. Urea deep placement (UDP) helps to reduce this nutrient loss. UDP involves burying urea granules near the root zone of crops. UDP increases the efficiency of nitrogen use because most of the urea stays in the soil close to the plant roots, where it is absorbed more effectively.

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