

- Storing grains in infestation free condition.
- Using storage worthy structure with proper damage to avoid moisture absorption.
- Maintenance of go-down in spic & span condition.
- Undertaking periodical inspection of stock health.
- Taking immediate curative measures to control rodents, insect and microbial infestation, if needed.
- Liquidation of stock on First-in-First-out (FIFO) basis based on crop year.



### Why do grains break during raw milling?

- High fluctuation between day and night temperature and humidity during grain ripening can lead to higher grain breakage during milling.
- Factors like, harvesting stage, weather during harvesting, harvest moisture, field-drying practices and storage conditions also affect degree of grain breakage.
- The breakage may be more, if the harvest contains high proportion of chalky and immature grains.
- In addition, the kind of milling and polishing machinery employed also affect breakage.

### How to reduce grain breakage during raw milling?

- The main reason of rice breakage during milling is the initial grain quality including its moisture content. Therefore, maintaining good grain quality by proper cleaning, drying and storage practices is of greatest importance to minimize rice breakage during milling.
- The presence of mixtures of chalky and immature kernels, delays in drying, and moisture migration in storage can result in an increase in the amount of broken and discolored milled rice.
- Comparatively better milling performance has been recorded, when rice grains are at 14% moisture level. In case of high moisture, drying must be done at least in two stages, allowing a tempering period in between. The process of stopping intermittently between dryings is called tempering and is a very important practice to ensure uniform drying.
- In case of mechanical drying, care should be taken to control air temperature, mixing /recirculation of grain and tempering of grain so as to ensure uniform drying and consequently better quality milled rice.
- The grain shape and size, type of mill and operator's skill are also important in minimizing grain breakage. For raw rice milling, pneumatic Sheller and Emery cone polisher with aspiration (cooling of cone and cribs) are recommended.
- Use of rubber shellers is very useful to reduce grain breakage during milling, particularly for the long grain type rice varieties.

## A Farmers' Guide to Proper Storage and Improving Out Turn Ratio (OTR) of paddy-rice

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## A Farmers' Guide to Proper Storage and Improving Out Turn Ratio (OTR) of paddy-rice

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### Post-harvest management and its importance

The post-harvest management includes all activities starting from harvesting of paddy to consumption of rice. Proper post-harvest care is a must to reduce avoidable losses of food grains. It adds to the food availability for the growing population and also enhances the quality of grains and their suitability for marketing. It ensures both food security and an increased income, which is of utmost importance to the small and medium farmers. With rapid increase in rice production in India, it has become essential to inform and train farmers and all stakeholders on the scientific post harvest management of paddy, because the use of unscientific and outdated methods of harvesting, threshing, drying, storage and milling results in losing more than 10 per cent of paddy in the country. It has been estimated that total post-harvest losses of paddy at producers' level was about 2.71 per cent of total production. The farmers need to take the following points into consideration to ensure safe storage and high milling out turn with least grain breakage.

#### Choice of variety

- It is important to cultivate high yielding rice varieties with good grain quality traits, especially those with crack resistance.
- It is equally important to avoid varieties that show late tillering and long-flowering habit, which results into non-synchronous flowering, higher percentage of partially filled grains and thus in poor milling yield and high grain breakage.

#### Crop management practices

- It is advisable to maintain right plant population and even plant establishment in the transplanted crop.

- Due care should be taken to follow the recommended package of practices for the variety.
- Providing timely irrigation and nutrients together with control of weeds, insects and diseases are important factors that affect grain quality.
- Irrigation by Alternate Wetting and Drying (AWD) may not only save irrigation water but also help develop crack resistance in grains.
- Late application of fertilizers should be avoided to have uniformly mature grains.

### Harvesting

- The water should be drained out from paddy field about 7 - 10 days before the expected date of harvesting, which helps in easy movement by laborers and the use of mechanical harvesters.
- Harvesting during wet weather conditions should be avoided.
- The paddy crop should be harvested using proper harvesting methods, when grains become tough and have the right moisture content (20-22%).
- Harvesting can be done manually using sickles and knives, or mechanically with the use of threshers or combine harvesters.
- Early harvesting results in immature and high moisture grains. Delay in harvesting may result in lodging of crop and grain shattering, cracking of rice in the husk and attack by insects, rodents, birds and pests.
- If more than two varieties are harvested, keep the grains of each separately, to maintain purity of seeds.

### Threshing

- Threshing i.e. separating the grain from the straw can be either done by hand, by using a treadle thresher or mechanized by using a machine.
- The harvested panicles should be kept in the same direction to ensure efficient threshing.
- It is advisable to protect the harvest from rain and excessive dew by proper covering.
- The harvested crop should be threshed immediately in the field itself. If it is not possible, the sheaves should not be piled as a big heap.
- It is better to keep the harvested paddy stalk bundles in a dry and shady place to facilitate air circulation and prevent excessive heating.

### Drying of paddy

- Drying is done to reduce grain moisture content so as to prevent grain deterioration, ensure safe storage and maintain the quality.
- If moisture is not reduced to safe level (14% for food purpose and 12% for seed purpose), the grain may become discolored, get infested with fungi and deteriorate due to heat generated within the grain stock.
- Drying in a yard is weather dependent, whereas mechanical drying can be done anytime; it also ensures somewhat higher total and head rice recovery. The wet grain should be dried preferably within 24 hours after harvest to avoid heat accumulation. Fast and excessive drying should also be avoided.
- The threshed paddy should be spread about 5 cm thick and dried with frequent mixing and tempering, preferably under less intense sunlight. The process of stopping intermittently between dryings is called tempering.
- The paddy grains should be heaped, when light intensity is high (during 11am - 2.30 pm) and tempered to reduce milling breakage. Excessive and direct sun drying leads to higher breakage of the grains. If drying is done using a dryer, the temperature of paddy should not exceed 55°C.

Apart from the grain type, the temperature and humidity of drying air, wind velocity and the type of dryer (if being dried mechanically) also affect drying.

### Cleaning of threshed paddy

- The purpose of cleaning the threshed paddy is to remove the chaff, straw, dust, sand, stone and soil clods present in it. Properly cleaned grains add value to the produce and help longer and safer storage and smooth milling operation.
- For proper cleaning in the machine, the threshed paddy should be sun dried for 1-2 days.
- For cleaning, hand operated and power operated winnowing fans are commercially available.
- A hand operated paddy winnower was developed by Central Rice Research Institute, Cuttack. Two workers are required for the operation of this winnower, one for cranking the blower and other for feeding the threshed material and collection of grain. The average output is 242 kg grain/h and winnowing efficiency is 88.36%.
- The dry paddy should be packed in good quality contamination free bags like sound B-Twill jute bags, to minimize grain loss during transport.

### Storage structure

- The storage structure should be erected on a raised and well-drained site protected from moisture, excessive heat, insects, rodents, and bad weather conditions.
- The storage structure should be selected according to quantity of paddy/rice to be stored. In godowns, sufficient space should be provided between two stacks for proper aeration.
- There should be proper aeration during clean weather condition, though it should be avoided during rainy season.
- Regular inspection of stored paddy/rice must be done to maintain proper health and hygiene of stock.
- The storage structure should be clean, free of left-over grains, cracks, holes or crevices and should be fumigated before storing grains for safe storage.
- Only new and dry gunny bags should be used.
- Old gunny bags should be disinfected by boiling in 1% Malathion solution for 3-4 minutes and dried.
- Malathion (50% EC) at 1:100 dilution should be sprayed once in 15 days (21 days in winter) @ 3 lit per 100sq m. Alternatively, 40 g Deltamethrin (2.5%) powder suspended in one lit can also be sprayed once in 90 days @ 3 lit per 100 sqm. DDVP (75% EC, diluted 1:150) is another choice and can be sprayed as and when needed @ 3 lit per 100 sqm (for empty space @ 1 lit per 300 cu meters).
- The storage structure should be exposed for 5-7 days to Aluminium phosphide (9 g/MT, in cover fumigation; 63 g/MT in shed fumigation and 9g/MT+20% additional in CAP storage)
- The new and old stocks should be stored separately to check infestation and to maintain hygienic condition.
- A useful structure recommended by FAO for small and medium rice farmers is the small metallic silo. This may play an important part in ensuring food security and reducing hunger in developing countries.
- The vehicles that transport grains should be cleaned and sanitized with phenol.

### Golden principles of scientific storage and increasing milling out turn

- Harvesting paddy crop at 20-22% grain moisture and threshing immediately
- Cleaning the paddy grains free of undesirable materials and drying to 14% moisture with tempering between two drying periods.