**UNIT :- 1**

 **CEREALS**

1. A  cereal  are any  [grass](https://en.wikipedia.org/wiki/Poaceae)  cultivated (grown) for the edible purpose of its  [grain](https://en.wikipedia.org/wiki/Grain).  2. It is a type of fruit composed of endosperm, germ (seed) and bran (cover of grain/choukar). 3. These  are grown in large quantities & provide more food energy than any other type of crop. 4. So called  [staple (main) crops](https://en.wikipedia.org/wiki/Staple_food). 5. These are a rich source of  [vitamins](https://en.wikipedia.org/wiki/Vitamin), [minerals](https://en.wikipedia.org/wiki/Dietary_mineral), [carbohydrates](https://en.wikipedia.org/wiki/Carbohydrate), [fats](https://en.wikipedia.org/wiki/Fat), oils, and  [protein](https://en.wikipedia.org/wiki/Protein_%28nutrient%29). 6. When the cereals are refined (taken out by other substances) by the removal of the bran, and germ, the remaining  [endosperm](https://en.wikipedia.org/wiki/Endosperm)  is mostly  [carbohydrate](https://en.wikipedia.org/wiki/Carbohydrate). 7. They are found in the form of  [rice](https://en.wikipedia.org/wiki/Rice), [wheat](https://en.wikipedia.org/wiki/Wheat), [millet](https://en.wikipedia.org/wiki/Millet), [maize](https://en.wikipedia.org/wiki/Maize) etc.  8. Each individual cereals species has its own peculiarities.

**DISTRIBUTION/OCCURRENCE** 1. Most cereals are  [annual plants](https://en.wikipedia.org/wiki/Annual_plant). 2. Wheat, barley, etc. are the "cool-season" cereals. 3. Many cool-season cereals are grown in the tropics (region of earth surrounding the equator). 4. Cool-season cereals are well-adapted to temperate (climate not very hot or cold). 5. The "warm-season" cereals are prefer hot weather. **PLANTING/CULTIVATION** 1. The cultivation of all cereal crops are almost similar. 2. Most cereals varieties of a particular species are either  winter  or  spring  types.3. The cool season crops grow well in moderate (average) weather and cease (end) to grow in hot weather climates. 4. Winter varieties are sown in the autumn (season after summer and before winter), then become  [dormant](https://en.wikipedia.org/wiki/Dormancy) during winter. . 5. Winter varieties continue growing in the springtime (season between winter and summer) and mature in late spring or early summer. 6. The warm-season cereals are grown in tropical lowlands year-round and in temperate climates during the frost-free season. **HARVESTING** 1. Once the cereal plants have grown their seeds, they have completed their  [life cycle](https://en.wikipedia.org/wiki/Biological_life_cycle). The plants die, become brown, and dry. 2. As soon as the parent plants and their seed kernels (inner part) are reasonably dry, harvest can begin. 3. A variety of harvesting methods depends on the cost of labour, from hand tools, Such as the  [scythe](https://en.wikipedia.org/wiki/Scythe)  or  [grain cradle](https://en.wikipedia.org/wiki/Grain_cradle). 5. Generally harvesting of cereal are done by using a  [harvester](https://en.wikipedia.org/wiki/Combine_harvester), which cuts, [threshes](https://en.wikipedia.org/wiki/Threshing) (method to separate grain of corn), and [winnows](https://en.wikipedia.org/wiki/Winnowing) (blow of grain to remove outer cover).  6. If harvesting is done during humid weather, the grain may not dry adequately (completely) in the field. In this case, the grain is sent to a dehydrating facility, where artificial heat dries it to prevent spoilage during its storage.

**PRODUCTION/YIELD** Maize, wheat, and rice together accounted (over all) for 89% of all cereal production in worldwide.

**NUTRITION** 1. Some grains are deficient in the  [essential amino acid](https://en.wikipedia.org/wiki/Essential_amino_acid), Such as [lysine](https://en.wikipedia.org/wiki/Lysine), which legumes contain. So many cereals (such as legumes) are cultured, in order to get a balanced diet. 2. Many legumes, however, are deficient in the essential amino acid, Such as  [methionine](https://en.wikipedia.org/wiki/Methionine%22%20%5Co%20%22Methionine), which grains contain. Thus, a  [combination](https://en.wikipedia.org/wiki/Protein_combining)  of legumes with  [grains](https://en.wikipedia.org/wiki/Grain)  forms a well-balanced diet for vegetarians. 3. Cereals contain  [exogenous](https://en.wikipedia.org/wiki/Exogeny) (growing outside an organism) [opioid](https://en.wikipedia.org/wiki/Opioid%22%20%5Co%20%22Opioid)  [peptides](https://en.wikipedia.org/wiki/Peptide)  called  [exorphins](https://en.wikipedia.org/wiki/Exorphin)  and include  [opioid food peptides](https://en.wikipedia.org/wiki/Opioid_food_peptides%22%20%5Co%20%22Opioid%20food%20peptides)  like  [gluten exorphin](https://en.wikipedia.org/wiki/Gluten_exorphin) called endorphines.

 **RICE/PADDY**  Common name :- Asian rice. Vernacular name :- Chawal Botanical name :- Oryza sativa **CLASSIFICATION** Class :- Monocots Order :- Poales Family :- Poaceae/Gramineae Genus :- Oryza species :- sativa

1. Rice  is the  [seed](https://en.wikipedia.org/wiki/Seed)  of the  [species](https://en.wikipedia.org/wiki/Species)  [Oryza sativa](https://en.wikipedia.org/wiki/Oryza_sativa%22%20%5Co%20%22Oryza%20sativa)*.* 2. It is one of the most widely consumed  [staple (main) food](https://en.wikipedia.org/wiki/Staple_food)  of half of the world's  [human population](https://en.wikipedia.org/wiki/World_population), especially in  [Asia](https://en.wikipedia.org/wiki/Asia). 3. It is the agricultural  [commodity](https://en.wikipedia.org/wiki/Commodity) (material for commercial use) with the third-highest worldwide production. 4. There are many varieties of rice in many shapes, colours and sizes. 5. [Asian](https://en.wikipedia.org/wiki/Asian_people)  farmers yield 87% of the world's total rice production. 6. China and India being the largest producers. 7. The genus Oryza having several species. 8. Some of the common species are :- O. sativa, O. minula, O. latifolie etc.

**DISTRIBUTION/OCCURRENCE** 1.Rice is normally grown as an  [annual plant](https://en.wikipedia.org/wiki/Annual_plant). 2. It can survive as a  [perennial](https://en.wikipedia.org/wiki/Perennial) plant also. 3. It is found in  [tropical](https://en.wikipedia.org/wiki/Tropics)  areas and subtropics areas of South-east Asia. 4. It can be grown practically anywhere, even on a steep hill or mountain area with the use of water – controlling terrace systems. 5. It grows under both flooded and rainfed conditions. 6. Its parent species are native to Asia and certain parts of Africa. 7. It is now cultivated in many localities throughout the world. 8. About 95% Rice producing countries are like China, India, Indonesia, Bangladesh, Vietnam, Thailand, [Myanmar](https://en.wikipedia.org/wiki/Myanmar), Pakistan, Malaysia, Cambodia, Sri Lanka, Philippines, Korea and Japan etc.  9. Other Rice producing countries are Brazil, USA, Egypt, West Africa, Spain and Italy. 10. In India, It is chiefly grown in Assam, West Bengal, Bihar, Jharkhand, Uttar Pradesh, Orissa, Madhya Pradesh, Punjab, Maharashtra, Karnataka, Tamil Nadu and Kerala.

**NUTRITION** 1. Rice is the most important grain with regard to human nutrition and caloric intake.  2. It contains [carbohydrates](https://en.wikipedia.org/wiki/Carbohydrates), amino acid, starch, [protein](https://en.wikipedia.org/wiki/Protein), and  [fat](https://en.wikipedia.org/wiki/Fat). 3. It contains moderate amounts of  [vitamins](https://en.wikipedia.org/wiki/B_vitamins), [iron](https://en.wikipedia.org/wiki/Iron), and  [manganese](https://en.wikipedia.org/wiki/Manganese). 4. The bran of Rice has the highest energy and protein content.

**BOTANICAL DESCRIPTION/STRUCTURE**



**Root** :- The Rice has a tap root system. **Stem** :- 1. The rice plant has round and hollow stem. 2. It can grow 2 – 6 ft. tall, depending on the variety and soil fertility. 3. The stem resembles the straws. 4. It produces several stems or culms in a plant. 5. The nodes are close together at the base and as we move towards the top, the nodes are further apart from each other. 6. The internodes are hollow in all varieties but may be solid in shorter plants. 7. Each plant has a central stem called a primary tiller. 8. From the lowest node of the primary tiller arises several secondary tiller. 9. This forms a dense clump (small group of plant growing together). **Leaves** :- 1. It has flat, long, slender, ribbon like leaves. 2. The leaves are 50–100 cm. long and 2–2.5 cm. broad. 3. It arises from the nodes along the stem. **Inflorescence/Flower** :- 1. The inflorescence are panicles at the top of the plant. 2. The flowers arises from the top of the tillers in clusters called panicles or multibranched flower stalks. 3. Each branches have several smaller branches called spikelets. 4. Each spikelet is with one flower. . 5. The small   flowers are produced in a branched arching to pendulous  [inflorescence](https://en.wikipedia.org/wiki/Inflorescence). 6. One panicle is about 4 – 10 inches long. 7. The panicle has 75 – 150 or more spikelets depending upon the varieties **Fruit** :- 1. The fruit are indehiscent and caryopsis. 2. The fruit encloses the seed. 3. The fruit shows two covers called lemma and palea. 4. Lemma and palea together called hull. 5. The Rice grain (fruit) with hull is known as Paddy. 6. The fruit is one seeded. **Seed (Rice grain)** :- 1. The seed is 5 – 12 mm. long and 2 – 3 mm. thick. 2. It is of various colour, size and shape. 3. The seeds of the rice plant are in grain form in the plant. 4. Once ripe, the plants are harvested and the Rice grain are dried. 5. The dried Rice grain are threshed to remove the seeds from the hulls. **CULTIVATION/PLANTING** 1.The method of cultivation of Rice differ in different localities. 2. It is grown on standing water (low land rice) or on dry land (upland rice). 3. The low land rice is cultivated under flood conditions, whereas upland rice is cultivated during monsoon period. 4. Rice cultivation is well-suited to countries and regions with low labour costs and high rainfall. 5. It requires sufficient water. 6. The principal (main) rice growing season, known as "Berna – Bue Charne", 7. The fields are prepared by ploughing, fertilizing and smoothing. 8. The fields are then flooded with water, or if irrigation facility is not available then farmers waits for monsoon. 9. The seed is sown in seed-beds from June – July, when water is sufficient for only a part of the fields. 10. The seed grows as seedlings. 11. After this the subsidiary season starts, known as "Ropai, is from August – September, when there is usually enough water. 12. In Ropai, the seedlings are transplanted from the seed-beds to the larger fields by hand. 13. Seedlings are transplanted in rows with gaps between them. 14. The transplanted seedlings are irrigated by rain or river water. 15. During growing season, the irrigation is maintained. Farmers use irrigation channels throughout the cultivation seasons. 16. The fields are allowed to drain before cutting. 17. The weeds are uprooted by hands. 18. Manure is usually used. 19. A Rice plant completes its life-cycle within 80 – 200 days.

**HARVESTING**  1. Harvesting is the process of collecting mature Rice crops from the field. It includes cutting, stacking, handling, threshing etc. 2. The crop is harvested when the fruit (ear) ripe, the plant turns yellow and the Rice grain converted into brown hull called paddy. 3. The harvesting is done manually or mechanically. 4. The seed heads are cut with sickle. 5. In several Asian countries, paddy laid out to dry along roads. 6. However, in most countries the bulk of drying of marketed paddy takes place in mills. 7. Harvesting is followed by  [threshing](https://en.wikipedia.org/wiki/Threshing). 8. The threshing.is done through different methods to remove the Rice from the hull. 9. The much threshing is still carried out by hand but there is an increasing use of mechanical threshers. 10. The seeds of the rice plant obtained by this manner are first milled using a  [rice huller](https://en.wikipedia.org/wiki/Rice_huller) (machine) to remove the  [chaff](https://en.wikipedia.org/wiki/Chaff) (the outer husks of the grain). 11. The may be continued, removing the  [bran](https://en.wikipedia.org/wiki/Bran), i.e., the rest of the husk and the  [germ](https://en.wikipedia.org/wiki/Cereal_germ), thereby creating  [white rice](https://en.wikipedia.org/wiki/White_rice). 13. The white rice is polished by hand or in a [rice polisher](https://en.wikipedia.org/wiki/Rice_polisher), with glucose or  [talc](https://en.wikipedia.org/wiki/Talc)  powder.

**ECOLOGICAL FACTOR** Rice can be grown in different environments, depending upon water availability. Generally, rice does not thrive (grow) in a waterlogged area, yet it can survive and grow in this areas  and it can also survive flooding. **Climate** :- 1. Most rice varieties are cultivated during the  [rainy season](https://en.wikipedia.org/wiki/Monsoon_of_South_Asia). 2. The plant is grown in plenty of moisture condition. 3. It requires warm temperature throughout the growing season. 4. Rice requires high temperature above 20 °C. but not more than 35 – 40 °C. **Soil** :- 1. The clayey loam soil are well suited to the Rice crop because they have very good water holding capacity. 2. But however, it can be grown on almost all kinds of soil. Such as alluvial soil, red soil, black soil, saline soil, alkaline soil, marshy soil etc.

**SOME VARIETIES OF RICE** The high-yielding varieties are a group of crops created intentionally during the  [Green Revolution](https://en.wikipedia.org/wiki/Green_Revolution)  to increase global food production. Some of the varieties of Rice are :- **1. Jamuma** :- It is a dwarf variety. It mature in 110 days. Its grain are long and slender. **2. Sabarmati** :- It is a dwarf variety. It mature in 120 days. Its grain are medium and slender. **3. Pusa – 2 – 21 (Kannagi)** :- It is a dwarf variety. It is suitable for transplanting or for direct sown. It mature in 100 days. Its grain are short. **4. Pusa – 33** :- It is a dwarf variety. It mature in 100 – 105 days. Its grain are long, slender and scented. **5. Pusa 4 – 1 – 11 (IET 1722)** :- It is a dwarf variety. It mature in about 103 days. It is suitable for late planted. It is resistant to major diseases. Its grain are long, and slender.

**USES**  1. Rice is a staple grain eaten by people. 2. Raw rice may be ground into flour for many uses, including making many kinds of beverages, Such as  [rice milk](https://en.wikipedia.org/wiki/Rice_milk), [rice wine](https://en.wikipedia.org/wiki/Rice_wine) etc. 3. Rice does not contain  [gluten](https://en.wikipedia.org/wiki/Gluten), so is suitable for people on a  [gluten-free diet](https://en.wikipedia.org/wiki/Gluten-free_diet).  4. Rice may also be made into various types of  [noodles](https://en.wikipedia.org/wiki/Noodle). 5. Rice seeds must be boiled or steamed before eating. 6. Boiled rice may be further fried in  [cooking oil](https://en.wikipedia.org/wiki/Cooking_oil)  or butter (known as  [fried rice](https://en.wikipedia.org/wiki/Fried_rice)). 7. The bran and straws of Rice are useful for feeding domestic animals. 8. The straw of Rice is used to manufacture the hats, rooftops, baskets etc,