


Rice

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Rice
 <p data-bbox="792 1327 961 1360"><i>Oryza sativa</i> L.</p> <p data-bbox="808 1375 945 1409"><i>Oryza sativa</i></p>
Scientific classification
<p data-bbox="711 1486 945 1520">Kingdom: <u>Plantae</u></p> <p data-bbox="711 1535 1047 1568">Division: <u>Magnoliophyta</u></p> <p data-bbox="711 1583 982 1617">Class: <u>Liliopsida</u></p> <p data-bbox="711 1631 938 1665">Order: <u>Poales</u></p> <p data-bbox="711 1680 958 1713">Family: <u>Poaceae</u></p> <p data-bbox="711 1728 933 1761">Genus: <u><i>Oryza</i></u></p>
Species
<ul data-bbox="467 1843 747 1927" style="list-style-type: none">• <i>Oryza glaberrima</i>• <i>Oryza sativa</i>

Rice refers to two species (*Oryza sativa* and *Oryza glaberrima*) of grass, native to tropical and subtropical southern & southeastern Asia and to Africa, which together provide more than one fifth of the calories consumed by humans^[1]. (The term "wild rice" can refer to wild species of *Oryza*, but conventionally refers to species of the related genus Zizania, both wild and domesticated.) Rice is an annual plant, growing to 1–1.8 m tall, occasionally more, with long slender leaves 50–100 cm long and 2–2.5 cm broad. The small wind-pollinated flowers are produced in a branched arching to pendulous inflorescence 30–50 cm long. The seed is a grain (caryopsis) 5–12 mm long and 2–3 mm thick.

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Cultivation



The planting of rice is often a labour intensive process

Rice is a dietary staple for a large part of the world's human population, making it the most consumed cereal grain. Rice is the world's third largest crop, behind maize ("corn") and wheat. Rice cultivation is well suited to countries and regions with low labour costs and high rainfall, as it is very labour-intensive to cultivate and requires plenty of water for irrigation, much like the licorice crops found in Eastern Europe. However, it can be grown practically anywhere, even on steep hillsides. Although its species are native to South Asia and certain parts of Africa, centuries of trade and exportation have made it commonplace in many cultures.



Terrace of rice paddies in Yunnan Province, southern China.

Rice is often grown in paddies. The shallow puddles take advantage of the rice plant's tolerance to water: the water in the paddies prevents weeds from outgrowing the crop. Once the rice has established dominance of the field, the water can be drained in preparation for harvest. Paddies increase productivity, although rice can also be grown on dry land (including on terraced hillsides) with the help of chemical weed controls.

In some instances, a deepwater strain of rice often called *floating rice* is grown. This can develop elongated stems capable of coping with water depths exceeding 2 meters (6 feet).



Rice plants (*Oryza sativa*) at Kew Gardens, London, England

Rice paddies are an important habitat for birds such as herons and warblers, and a wide range of amphibians and snakes. They perform a useful function in controlling insect pests by providing useful habitats for those who prey on them.

Whether it is grown in paddies or on dry land, rice requires a great amount of water compared to other food crops. Rice growing is a controversial practice in some areas, particularly in the United States and Australia, where some individuals claim it produces little GDP for the large amounts of water used to produce rice. However, in nations that have a periodical rain season and typhoons, rice paddies serve to keep the water supply steady and prevent floods from reaching a dangerous level.

Rice blast, caused by the fungus *Magnaporthe grisea* is the most significant disease affecting rice cultivation.

Preparation as food



Old fashioned way of rice polishing in Japan.

The seeds of the rice plant are first milled using a rice huller to remove a chaff (the outer husks of the grain); this creates brown rice. This process may be continued, removing the germ and the rest of the husk, called bran at this point, creating white rice. The white rice may then be buffed with glucose or talc powder (often called *polished rice*, though the term may also refer to white rice in general), parboiled, or processed into flour. The white rice may also be enriched by adding nutrients, especially those lost during the milling process. While the cheapest method of enriching involves adding a powdered blend of nutrients that will easily wash off (in the United States, rice which has been so treated requires a label warning against rinsing), more sophisticated methods apply nutrients directly to the grain, coating the grain with a water insoluble substance which is resistant to washing.



Terraced rice paddy on a hillside

While washing is counterproductive for the powder enriched rice, it is absolutely necessary when talc-coated rice is used, not least because of concerns about the negative health effects of talc consumption and possibility of asbestos accompanying the talc. Despite the hypothetical health risks of talc (such as stomach cancer), talc-coated rice remains the norm in some countries due to its attractive shiny appearance, but it has been banned in some or is no longer widely used in others such as the United States. Even where talc is not used, glucose, starch, or other coatings may be used to improve the appearance of the grains; for this reason, many rice lovers still recommend washing all rice in order to create a better tasting and better consistency rice, despite the recommendation of suppliers.



Modern rice polishing machines

Rice bran, called *nuka* in Japan, is a valuable commodity in Asia and is used for many daily needs. It is a moist inner oily layer that is heated to produce a very healthy oil. Another use is to make a kind of pickled vegetable.

The raw rice may be ground into flour for many uses as well, including making many kinds of beverages such as amazake, horchata, rice milk, and sake. Rice flour is generally safe for people on a gluten-free diet. Rice may also be made into various types of noodles.

The processed rice seeds are usually boiled or steamed to make them edible, after which they may be fried in oil, or butter, or beaten in a tub to make mochi.

Rice, raw	
Nutritional value per 100 g	
Energy	360 kcal 1510 kJ
<u>Carbohydrates</u>	79 g
<u>Fat</u>	0.6 g
<u>Protein</u>	7 g
<u>Vitamin B6</u>	0.15 mg12%
<u>Water</u>	13 g
Percentages are relative to US <u>RDI</u> values for adults.	

Rice, like other cereal grains, can be *puffed* (or *popped*). This process takes advantage of the grains' water content and typically involves heating grain pellets in a special chamber. Further puffing is sometimes accomplished by processing pre-puffed pellets in a low-pressure chamber. By the ideal gas law, one can see that either lowering the local pressure or raising the water temperature would result in an increase in volume prior to water evaporation, thus resulting in a puffy texture.

Cooking

Rice is cooked by boiling or steaming. It can be cooked in just enough water to cook it through, or it can be cooked in a large quantity of water which is drained before serving. Electric rice cookers, which are popular in Asia and Latin America, simplify the process of cooking rice.

Rice may also be made into rice porridge by adding more water than usual, so that the cooked rice is saturated with water to the point that it becomes very soft, expanded, and fluffy. Rice porridge is very easy to digest, so it is especially suitable for the sick.

Rice may be soaked prior to cooking. Soaked rice cooks faster. For some varieties, soaking improves the texture of the cooked rice by increasing expansion of the grains.

In some culinary traditions, especially those of Latin America and Italy, dry rice grains are fried in oil before cooking in water.

When preparing brown rice, a nutritionally superior method of preparation known as **GABA Rice** or GBR (Germinated Brown Rice)^[21] may be used. This involves soaking washed brown rice for 20 hours in warm water (38 °C or 100 °F) prior to cooking it. This process stimulates germination, which activates various enzymes in the rice. By this method, a result of the United Nations Year of Rice, it is possible to obtain a more complete amino acid profile, including GABA.

History



Etymology

According to *Microsoft Encarta Dictionary* (2004) and to *Chambers Dictionary of Etymology* (1988), the word *rice* has an Indo-Iranian origin. It came to English from Greek *óryza*, via Latin *oriza*, Italian *riso* and finally Old French *ris* (the same as present day French *riz*).

The same Indo-Iranian origin produced the Arabic *ar-ruzz*, from which the Portuguese and Spanish word *arroz* originated.

According to Edmund Leach and other scholars, the Tamil term for rice was derived from Sanskrit *vrihi*, and not vice versa.^[3]

The word 'rice' understood to have originated from Tamil word 'aricee' that had gone into Greek first when Greeks were trading with Tamils in India before Christ period. The word later known to have come into English via French.

History of cultivation



Japanese short-grain rice

Rice cultivation is considered to have begun simultaneously in many countries over 6500 years ago. Two species of rice were domesticated, Asian rice (*Oryza sativa*) and African rice (*Oryza glaberrima*).

Genetic studies suggest that common wild rice, *Oryza rufipogon*, was the wild ancestor of Asian rice.

According to Londo and Chiang, *O. sativa* appears to have originated around the foothills of the Himalayas, with *O. sativa* var. *indica* on the Indian side and *O. sativa* var. *japonica* on the Chinese side.

According to Jared Diamond, the earliest attested domestication of rice took place in China by 7500 BCE.

China has a complete history of cultivating rice for about 7000 years. Remains of early cultivated rice have been found in the Yangtze valley dating to about 8500 BC. China entered the dry-land rice period during 5000~4500 BC in the nearby area of Yangtze Delta (Hemudu culture, discovered in 1970s), and the wet-land rice period in about 2500 BC in the same area (Liangzhu culture). Now it's commonly considered that some areas such as plains now in Shaoxing and Ningbo in Zhejiang province are the cradlelands of east Asian rice. ^[*citation needed*]

However, archaeologists have recently discovered much older burnt grains (domesticated rice) in Sorori, Korea, potentially challenging this view of Chinese origin.

It is generally assumed that the Rigveda does not know rice. There is however mention of ApUpa, Puro-das and Odana (rice-gruel) in the Rig Veda, terms that, at least in later texts, refer to rice dishes, The rigvedic commentator Sayana refers to "tandula" when commenting on RV 1.16.2., which usually means rice. It was also speculated that the rigvedic term dhana (dhanaa, dhanya) could possibly refer to rice. Both Charaka and Sushruta mention rice in some detail. The Arthashastra discusses some aspects of rice

cultivation. The Kashyapiyakrishisukti by Kashyapa is the most detailed ancient Sanskrit text on rice cultivation.

African rice has been cultivated for 3500 years. Between 1500 and 800 BC, *O. glaberrima* propagated from its original center, the Niger River delta, and extended to Senegal. However, it never developed far from its original region. Its cultivation even declined in favor of the Asian species, possibly brought to the African continent by Arabs coming from the east coast between the 7th and 11th centuries CE.

Dry-land rice was introduced to Japan and Korea (arguably challenged by discovery of sorori grains) circa 1000 BC. Later wet-paddy intensive rice agriculture was introduced into Korea during the Middle Mumun pottery period (c. 850-550 BC) and reached Japan by the Yayoi circa 300 BC.



The rice motif on this five-yen coin underscores the importance of the grain to the people of Japan

O. sativa was adapted to farming in the Middle East and Mediterranean Europe around 800 BC. The Moors brought it to the Iberian Peninsula when they conquered it in 711 AD. After the middle of the 15th century, rice spread throughout Italy and then France, later propagating to all the continents during the great age of European exploration. In 1694, rice arrived in South Carolina, probably originating from Madagascar. The Spanish brought rice to South America at the beginning of the 18th century.

In the United States, colonial South Carolina and Georgia grew and amassed great wealth from the slave labour obtained from the Senegambia area of West Africa. At the port of Charleston, through which 40% of all American slave imports passed, slaves from this

region of Africa brought the highest prices, in recognition of their prior knowledge of rice culture, which was put to use on the many rice plantations around Georgetown, Charleston, and Savannah. From the slaves, plantation owners learned how to dike the marshes and periodically flood the fields. At first the rice was milled by hand with wooden paddles, then winnowed in sweetgrass baskets (the making of which was another skill brought by the slaves). The invention of the rice mill increased profitability of the crop, and the addition of water power for the mills in 1787 by millwright Jonathan Lucas was another step forward. Rice culture in the southeastern U.S. became less profitable with the loss of slave labour after the American Civil War, and it finally died out just after the turn of the 20th century. The predominant strain of rice in the Carolinas was from Africa and was known as "Carolina Gold." The cultivar has been preserved and there are current attempts to reintroduce it as a commercially grown crop.

World production and trade

World production of rice has risen steadily from about 200 million tons of paddy rice in 1960 to 600 million tons in 2004. Milled rice is about 68% of paddy rice by weight. In the year 2004, the top three producers were China (31% of world production), India (20%), and Indonesia (9%).

World trade figures are very different, as only about 5-6% of rice produced is traded internationally. The largest three exporting countries are Thailand (26% of world exports), Vietnam(15%), and the United States (11%), while the largest three importers are Indonesia (14%), Bangladesh (4%), and Brazil (3%).

Rice is the most important crop in Asia. In Cambodia, for example, 90% of the total agricultural area is used for rice production (see "The Burning of the Rice" by Don Puckridge for the story of rice production in Cambodia <http://sidharta.com/books/index.jsp?uid=67>).

Rice Pests

Rice pests are any organisms or microbes with the potential to reduce the yield or value of the rice crop (or of rice seeds). Rice pests include weeds, pathogens, insects, rodents, and birds. A variety of factors can contribute to pest outbreaks, including the overuse of pesticides and high rates of nitrogen fertilizer application (e.g. Jahn et al. 2005)[5]. Rice pests are controlled by cultural techniques, use of pest-resistant rice varieties, and pesticides (which include insecticide). Increasingly, there is evidence that farmers' pesticide applications are often unnecessary.

**Top Paddy Rice Producers - 2005
(million metric ton)**

 <u>China</u>	185
 <u>India</u>	129
 <u>Indonesia</u>	54
 <u>Bangladesh</u>	40
 <u>Vietnam</u>	36
 <u>Thailand</u>	27
 <u>Pakistan</u>	18
 <u>Myanmar</u>	25
 <u>Philippines</u>	15
 <u>Brazil</u>	13
 <u>Japan</u>	11
World Total	700

Source:

UN Food & Agriculture Organisation (FAO)

Cultivars



Rice cultivars are often classified by their grain shapes and texture. For example, Thai Jasmine rice is long-grain and relatively less sticky, as long-grain rice contains less amylopectin than short-grain cultivars. Chinese restaurants usually serve long-grain as plain unseasoned steamed rice. Japanese mochi rice and Chinese sticky rice are short-grain. Chinese people use sticky rice which is properly known as "glutinous rice" (which does not contain dietary gluten) to make zongzi. The Japanese table rice is a sticky, short-grain rice. Japanese sake rice is another kind as well.

Indian rice cultivars include long-grained and aromatic Basmati (grown in the North), long and medium-grained Patna rice and short-grained Masoori. In South India the most prized cultivar is 'ponni' which is primarily grown in the delta regions of Kaveri River. Kaveri is also referred to as ponni in the South and the name reflects the geographic region where it is grown. Rice in East India and South India, is usually prepared by boiling the rice in large pans immediately after harvesting and before removing the husk; this is referred to in English as parboiled rice. It is then dried, and the husk removed later. It often displays small red speckles, and has a smoky flavour from the fires. Usually coarser rice is used for this procedure. It helps to retain the natural vitamins and kill any fungi or other contaminants, but leads to an odour which some find peculiar. This rice is easier on the stomach to digest. In South India, it is also used to make idlis.



Brown Rice



Polished sona masuri rice.

Aromatic rices have definite aromas and flavours; the most noted cultivars are the aforementioned basmati, Patna rice, and a hybrid cultivar from America sold under the trade name, Texmati. It is a cross between Basmati and American long-grained rice that is creating great controversy. Both Basmati and Texmati have a mild popcorn-like aroma and flavour. In Indonesia there are also *red* and *black* cultivars.

High-yield cultivars of rice suitable for cultivation in Africa and other dry ecosystems called the new rice for Africa (NERICA) cultivars have been developed. It is hoped that their cultivation will improve food security in West Africa.

Scientists are working on so-called golden rice which is genetically modified to produce beta carotene, the precursor to vitamin A.

Draft genomes for the two most common rice cultivars, *indica* and *japonica*, were published in April 2002. Rice was chosen as a model organism for the biology of grasses because of its relatively small genome (~430 megabase pairs). Rice was the first crop with a complete genome sequence.^[15] Basmati rice is the oldest, common progenitor for most types.

On December 16, 2002, the UN General Assembly declared the year 2004 the International Year of Rice. The declaration was sponsored by Bangladesh, Brunei Darussalam, Burkina Faso, Cambodia, Cuba, Cyprus, Democratic People's Republic of Korea, Ecuador, Fiji, Gabon, Grenada, Guyana, India, Indonesia, Japan, Kazakhstan, Korea, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Madagascar, Mali, Malaysia, the Marshall Islands, Mauritania, Myanmar, Nauru, Nepal, Nicaragua, Niger, Nigeria, Papua New Guinea, Pakistan, Peru, the Philippines, Saint Vincent and the Grenadines, Singapore, Sri Lanka, Sudan, Tajikistan, Thailand, Togo, Vietnam, and Zambia.