

Origin, dispersal, cultivation and variation of rice

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Abstract

There are two cultivated and twenty-one wild species of genus *Oryza*. *O. sativa*, the Asian cultivated rice is grown all over the world. The African cultivated rice, *O. glaberrima* is grown on a small scale in West Africa. The genus *Oryza* probably originated about 130 million years ago in Gondwanaland and different species got distributed into different continents with the breakup of Gondwanaland. The cultivated species originated from a common ancestor with AA genome. Perennial and annual ancestors of *O. sativa* are *O. rufipogon* and *O. nivara* and those of *O. glaberrima* are *O. longistaminata*, *O. breviligulata* and *O. glaberrima* probably domesticated in Niger river delta. Varieties of *O. sativa* are classified into six groups on the basis of genetic affinity. Widely known indica rices correspond to group I and japonicas to group VI. The so called javanica rices also belong to group VI and are designated as tropical japonicas in contrast to temperate japonicas grown in temperate climate. Indica and japonica rices had a polyphyletic origin. Indicas were probably domesticated in the foothills of Himalayas in Eastern India and japonicas somewhere in South China. The indica rices dispersed throughout the tropics and subtropics from India. The japonica rices moved northward from South China and became the temperate ecotype. They also moved southward to Southeast Asia and from there to West Africa and Brazil and became tropical ecotype. Rice is now grown between 55°N and 36°S latitudes. It is grown under diverse growing conditions such as irrigated, rainfed lowland, rainfed upland and floodprone ecosystems. Human selection and adaptation to diverse environments has resulted in numerous cultivars. It is estimated that about 120 000 varieties of rice exist in the world. After the establishment of International Rice Research Institute in 1960, rice varietal improvement was intensified and high yielding varieties were developed. These varieties are now planted to 70% of world's riceland. Rice production doubled between 1966 and 1990 due to large scale adoption of these improved varieties. Rice production must increase by 60% by 2025 to feed the additional rice consumers. New tools of molecular and cellular biology such as anther culture, molecular marker aided selection and genetic engineering will play increasing role in rice improvement.

Abbreviations: IRRI, International Rice Research Institute.

Introduction

Rice is the world's single most important food crop and a primary food source for more than a third of the world's population. More than 90% of the world's rice is grown and consumed in Asia where 60% of the earth's people live. Rice accounts for 35 to 60% of the calories consumed by 3 billion Asians. Rice is planted on about 148 million hectares annually, or on 11% of

the world's cultivated land. Wheat covers a slightly larger land area, but a considerable amount of wheat is used as animal feed. Rice is the only major cereal crop that is consumed almost exclusively by humans. World's rice production was 553 million tons in 1996. China, the largest producer, produced 187 million tons followed by India (122 million tons), Indonesia (50 million tons), Bangladesh (27 million tons), Vietnam

Table 1. Rice production, area, and productivity of rice, 1995.

Major rice consuming and producing countries	Paddy production (000 t)	Paddy area (000 ha)	Area under irrigated rice (%)	Paddy yield (t/ha)
Asia	505 332	132 821	56	3.7
Bangladesh	27 128	9 950	25	2.8
Cambodia	3 433	1 924	16	1.1
China	187 334	31 107	92	5.9
India	121 562	42 300	46	2.8
Indonesia	49 744	11 439	54	4.3
Japan	13 435	2 118	99	6.8
Korea, DPR	2 580	650	67	3.5
Korea, Republic	6 343	1 050	70	6.1
Lao PDR	1 418	522	7	2.6
Malaysia	2 126	681	66	3.1
Myanmar	19 568	6 144	33	2.9
Nepal	2 906	1 368	49	2.4
Pakistan	5 920	2 162	100	2.5
Philippines	10 541	3 759	61	3.0
Sri Lanka	1 900	890	72	3.1
Thailand	21 130	9 020	10	2.2
Vietnam	24 464	6 766	51	3.5
Latin America	20 774	6 690	33	2.9
Africa	15 092	6 957	17	2.2
Australia	1 016	118	100	8.3
USA	7 888	1 252	100	6.7
Rest of the world	3 312	897	88	4.0
World	553 414	148 735	54	3.7

Source: World Rice Statistics Database. IRRI.

(24 million tons), Thailand (21 million tons) and Myanmar (20 million tons) (Table 1).

Only about 4% of the world's rice production is traded internationally. Thailand is world's leading rice exporter, selling about 4–6 million tons annually. The United States is the second largest exporter, even though it ranks 11th in production. It produces 6 million tons annually and exports about 40% of it. Vietnam, Pakistan and Myanmar each export about a million tons annually. India exported about 4 million tons in 1995 but exports were only about 2 million tons in 1996.

Iran, Iraq and Saudi Arabia are the major importers, taking about 0.9, 0.7, and 0.5 million tons per year, respectively. African countries, where demand for rice is increasing at a rate of about 2% annually, buy around 3 million tons or about 25% of the total world imports each year.

The importance of rice in the diet varies among countries. It accounts for over 70% of the daily calor-

ie intake in countries such as Bangladesh, Cambodia, Laos, and Myanmar but drops to about 40% in countries such as China and India whose northern areas consume more wheat. Rice is also an important staple in Latin America, Africa and Middle East. Health food advocates in Western countries pay a premium price for brown or unpolished rice but rice is polished wherever it is staple food. Why? Because its bran layers contain oils (free fatty acids) that turn rancid if the surface is scarred. Thus, brown rice cannot be stored for more than a week. In fact, brown rice may be less nutritious than white rice, because the body's digestion and absorption of it is lower. However, brown rice does have more B vitamins and 1% more protein. The difference in fiber and minerals is insignificant. Rice is 8–9% protein (wheat is 11–12%).