

## LOST CROPS OF AFRICA VOLUME I: GRAINS (1996)

Africa has more native grains than any other continent. It has its own species of rice, as well as finger millet, fonio, pearl millet, sorghum, tef, and dozens of other cereals whose grains are eaten from time to time. This food heritage has fed people for generation after generation stretching back to the origins of humankind. It is also a local legacy of genetic wealth upon which a sound food future might be built. Largely bypassed in modern times by rice, maize, and wheat, local African grains could not keep pace with these wondrous foreign cereals, and the continent has slowly tilted away from its own ancient cereal wealth and embraced the newfound grains from across the seas.

Nevertheless, these “lost” plants have much to offer, and not just to Africa. They represent an exceptional cluster of cereal biodiversity with particular promise for solving some of the greatest food-production problems of the twenty-first century. Africa's native grains tend to tolerate extremes. They can thrive where introduced grains produce inconsistently, and most can grow better than other cereals on relatively infertile soils. For thousands of years, they have yielded grain even where land preparation was minimal and management poor. They combine well with other crops in mixed stands. They tend to be nutritious, and at least one is thought to be better tasting than most of the world's well-known grains.

***Lost Crops of Africa Volume I: Grains*** is the first in a series of three reports evaluating underexploited African plant resources that could help broaden and secure Africa's food supply. Volume II (2006) describes African vegetables and Volume III (2008) African fruits. Eleven species of cultivated grains were selected for highlighting in this report, along with a number of wild grains. Easy to read and richly illustrated, the report describes the promises and challenges of each grain, along with its uses, nutrition, agronomy, harvesting and handling, and limitations. Special appendixes discuss potential breakthroughs for grain farmers, and in grain handling, convenience foods, and child nutrition.

Today, forward-thinking scientists are looking at African cereals with new eyes. Food technologists are finding possibilities in processes that can open up vibrant consumer markets for products made from Africa's grains, and engineers are showing how the old grains can be produced and processed locally without the spirit-crushing drudgery of the past. This book will open everyone's eyes to the long-lost promise inherent in the grains that are the gifts of ancient generations, to increase use of the best of them toward improved food supplies, nutrition, and economic conditions in Africa.

## Grain Species

### AFRICAN RICE

Most people think of rice as an exclusively Asian crop, but farmers have grown a native species in West Africa for at least 1,500 years. This crop comes in a wealth of different types that are planted, managed, prepared, and eaten in different ways. Some mature extremely quickly and will fit into seasons and situations where other cereals fail. African rice can be used for all the same purposes as Asian rice, making it extremely versatile, and remarkable developments are emerging from laboratories, such as raising yields through hybridization with its Asian cousin. Grown in three ways: dryland (upland), paddy, and "floating", African rice generally receives less polishing than Asian rice during processing, and thus has greater nutritional quality when served.

### FINGER MILLET

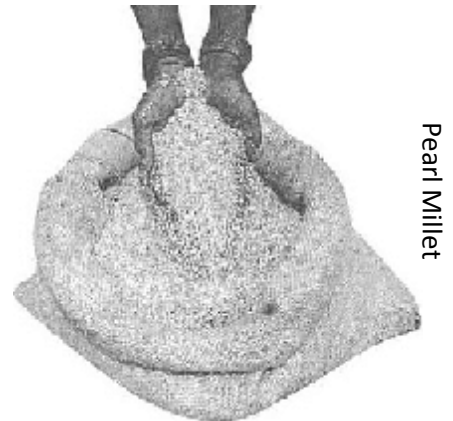
In parts of East and Central Africa, millions of people have lived off finger millet for centuries. One of the most nutritious of the major cereals, it is rich in methionine, an amino acid critically lacking in the diets of hundreds of millions of the world's poor. The plant yields satisfactorily on marginal lands, and its tasty grain is remarkable for its long storage life. Some Africans thrive on just one meal a day because of the nutritive value and "filling" nature of this cereal. This is a versatile grain that can be used in dozens of types of foods, including porridge, bread, malt, beverages, fodder, and popped products. Its protein content is comparable to that of rice.

### FONIO (ACHA)

A West African crop, fonio (*Digitaria*) is grown mainly on small farms for home consumption. It is probably the world's fastest maturing cereal, and is important as a safety net for producing when other foods are in short supply or market prices are too high for poor people to afford. It is usually grown on soils that are considered too infertile for pearl millet, sorghum, or other cereals. Rich in the amino acid methionine, it also has a high level of cystine, a rare feature in a cereal. It is made into porridge and couscous, ground and mixed with other flours to make breads, popped, and brewed for beer. With its appealing taste and high nutritional value, this could become a widespread gourmet grain for savanna regions, perhaps throughout much of Africa and the world.

### PEARL MILLET

About 4,000 years ago, pearl millet was domesticated from a wild grass of the southern Sahara. Today, it is the world's sixth-largest cereal crop. It is used as whole, cracked, or ground flour; dough; or a grain-like rice. It contains at least 9 percent protein and a good balance of amino acids and, with more oil than maize, is a "high-energy" cereal. Of all the major cereals, it is the one most able to tolerate extremes of heat and drought.



Pearl Millet



Sorghum

### SORGHUM

Sorghum is the dietary staple of more than 500 million people. Only rice, wheat, maize, and potatoes surpass it in the quantity eaten. However, it produces merely a fraction of what it could. It is among the most photosynthetically efficient and quickest maturing food plants, can grow in both temperate and tropical zones, endures hot and dry conditions, and withstands high rainfall. Its grains are boiled like rice, cracked like oats for porridge, "malted" like barley for beer, baked like wheat into flat breads, or popped like popcorn for snacks. The whole plant is often used as forage, hay, or silage, and the stems for building, fencing, weaving, broom-making, and firewood. Sorghum can also be used for liquid fuels, and may eventually prove a better source of alcohol than sugarcane or maize. Sorghum may also be turned into vegetable oil, adhesives, waxes, dyes, sizing for paper and cloth, and other high-value starches. Perhaps the world's most versatile domesticated plant, sorghum probably has more undeveloped genetic potential than any other major food crop.

## TEF

This staple cereal, which contains no gluten, is the most esteemed grain in Ethiopia, where its production exceeds that of most other cereals. It is ground into flour and made into the pancake-like fermented bread, *injera*, which forms the basic diet of millions. About 13 percent protein, well balanced in amino acids, and rich in iron, tef is also used for gruel and cakes, and even as unthreshed animal feed, since it is nutritious and extremely palatable to livestock. Tef straw is also the preferred binding material for clay walls, bricks, and household containers. All but unknown beyond Ethiopia until recently, commercial production has started in the U.S. and South Africa, and an export trade in tef grain has begun. In the U.S. it is used as a thickener for soups and gravies and included in pancakes, muffins, cookies, cakes, stir fry dishes, casseroles, and puddings.

## Other Cultivated Grains

There are a number of African food grains truly overlooked by modern science. Though occasionally cultivated by farmers on a small scale, many are essentially wild grasses, and are among Africa's least known crops.

### GUINEA MILLET

Guinea millet may be the world's most obscure cereal crop. People value it highly in the small region it is grown, yet little has been done to improve it. Although unstudied, guinea millet appears to have useful characteristics.

### EMMER

This rare wheat is one of the sweetest and best-tasting cereals. It originated in the Near East, but has an ancient African heritage. It reached Ethiopia 5,000 years ago and, although it virtually disappeared elsewhere in the world, it comprises almost 7 percent of Ethiopia's entire wheat production.

### BARLEY

Used for thousands of years, Ethiopian barley has been isolated so long that it has developed its own genetic "personality" and at one time was given its own botanical name. Highly nutritious, and with many promising "irregular" types, it ranks fourth among Ethiopian crops, both in production and area, but its value goes far beyond economics and nutrition: it is deeply rooted in cultural life.



Ethiopian Barley

### ETHIOPIAN OATS

In Ethiopia there is a separate species of tetraploid oats that, domesticated in the distant past, is a largely nonshattering plant that retains its grain so people can easily harvest it. These oats have long been used in Ethiopia, often combined with tef for *injera*, but are unknown elsewhere.

### KODO MILLET

Although wild forms of kodo millet occur in Africa, the plant is not grown as a crop there; in India, it is in the process of being domesticated. These cultivated forms could have an important future in Africa as well. Although kodo millet frequently infests rice fields in West Africa, it is tolerated and many farmers take pleasure in seeing it in their plots. Should the rice crop fail or do poorly, the field will likely end up choked with kodo millet, which can then be harvested for food.

## Wild Grains

Africans have been eating wild grains for 100,000 years but in modern times these grains have been discounted as mere "scarcity foods." This is obviously wrong since wild grains were eagerly eaten even when pearl millet was abundant. The harvest in the Sahara was large scale, sophisticated, and commercial. Examples of wild grains include drinn (*Aristida*), golden millet, kram-kram (*Cenchrus*), panic grasses, wild rices, jungle rice or bourgou (*Echinochloa*), wild tefs, crowfoot grasses (*Dactyloctenium*), and others. Beyond direct use as cereals, Africa's wild grasses may also have international value as genetic resources. Some are related to species used for food or fodder, and so are likely to have genes of broader importance—particularly because many come from locations where hot temperatures, scant rains, and insects make the better-known grains impossible to produce.

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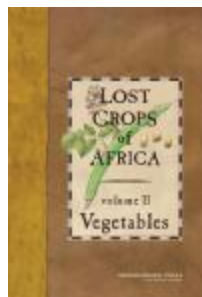
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#### ***Lost Crops of Africa: Volume III: Fruits (2008)***

This report describes 24 little-known cultivated and wild fruits indigenous to Africa that have potential as food- and cash-crops but are typically overlooked by scientists, policymakers, and the world at large. The book assesses the potential of each fruit to help overcome malnutrition, boost food security, foster rural development, and create sustainable landcare in Africa. Each fruit is also described in a separate detailed chapter, based on information provided and assessed by contributors throughout the world.

### For More Information

Copies of *Lost Crops of Africa Volume I: Grains* (408 pp.) and related volumes are available from the National Academies Press; (800) 624-6242 or (202) 334-3313 (in the Washington metropolitan area), or may be read free online at [www.nap.edu](http://www.nap.edu). For more information on the project, contact staff at (202) 334-2801 or visit the Policy and Global Affairs web site at [www.nationalacademies.org/pga](http://www.nationalacademies.org/pga) (see Capacity Building).