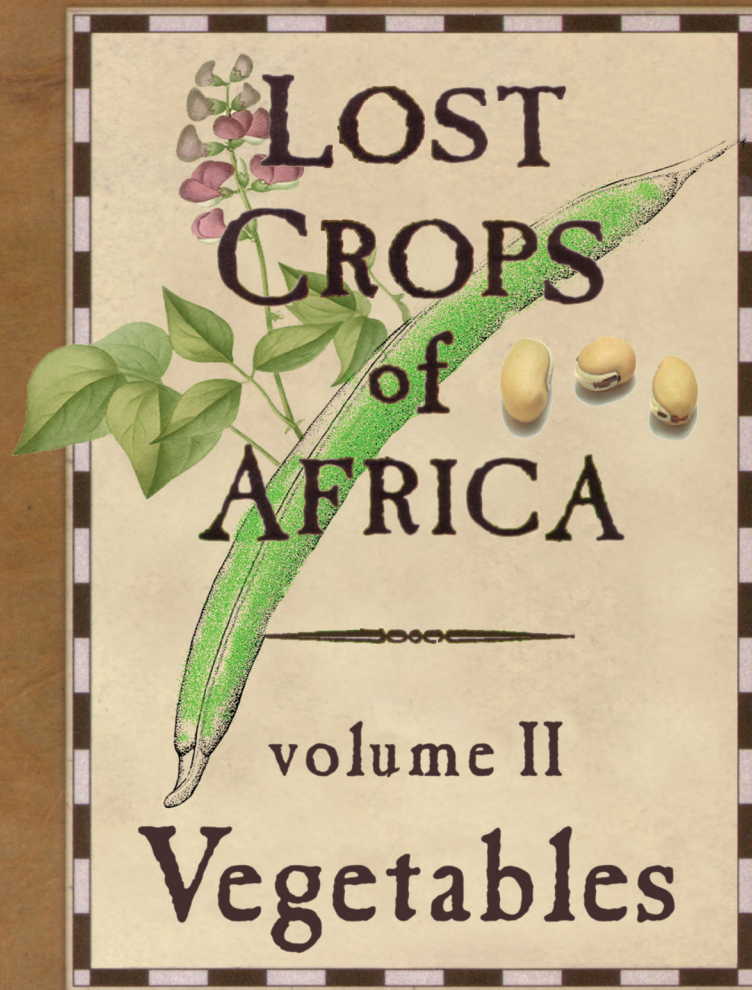


# S U M M A R Y



NATIONAL RESEARCH COUNCIL  
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## A Word to Readers

**S**ome species described in this report may be invasive outside their natural environs or may carry unseen pests and diseases (particularly small insects and microbes such as virus or bacteria) whose populations might explode catastrophically in new locations. In addition, plant genes and germplasm are subject worldwide to both tangible- and intellectual-property laws. For all these reasons, most nations have official protocols governing the safe and legitimate transfer of plant materials, and it is crucial that the requirements of such protocols be strictly followed.

This is a summary of *Lost Crops of Africa: Volume II Vegetables* and includes excerpts from the preface and introduction. The full report is available at [www.nap.edu](http://www.nap.edu).

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# PREFACE

Within that huge mass of land below the Sahara there exist several thousand indigenous plant species, already selected for food production, that still fall outside the ambit of modern research and economic development. Some are staffs of life for thousands of communities in desperate need of help, so the lack of research attention to them is a disgrace of our times.

The food plants in question are not without merit. Humanity's oldest, they have been feeding people since the beginning. Many thrive in the harsh conditions that many Africans confront daily. And many are exceptionally nutritious. Yet none are receiving adequate scientific or institutional support, despite their significance where the needs for food, nutrition, and rural development are perhaps greater than anywhere else.

We call such neglected foods the "lost crops of Africa." This abundance of half-forgotten edibles includes hundreds of vegetables. By highlighting a selection of these nutritious gems hidden in plain sight, we hope to stimulate Africa-wide and perhaps worldwide actions that boost their productivity and production, to the advantage of millions now existing at the mercy of fate. Although the project's ultimate aim is to raise nutritional levels, diversify agriculture, and create economic opportunities in Africa, many of these crops may offer untold global potential as well.

The vegetables themselves are in some places very well known. It is mainly to scientists, policymakers, and the world at large that they remain "lost." Such outsiders include of course many in Europe, North America, and elsewhere who influence African research priorities, but also science establishments and policymakers within African nations. Many sub-Saharan countries allocate their meager agricultural research funds almost exclusively to major international crops that were introduced to Africa in the past.

This book's beginnings go back to a questionnaire that asked Africans and Africa specialists to identify indigenous food plants with unrealized potential. One thousand respondents replied, naming more than 300 personal favorites. Among the nominations were more than 50 vegetables deemed to have unrealized promise of a significant character. From those we chose the 18 highlighted here.

This report is designed to reach out to leaders who can direct increased consideration toward the ancestral food plants. In addition, we hope to touch technical experts and open their eyes to the importance of working on these indigenous crops. In the main, though, we hope to inspire focus on these crops from non-governmental organizations, willing citizens, students looking for research opportunities, and other enterprising members of the public within the 30-some countries where these vegetables are found in the ground. The information, we trust, will stimulate activities that will provide each plant a chance to achieve the promise still awaiting elaboration in its genes and in the germplasm occupying prime space across Africa.



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***"The great thing about the edibles highlighted here is that they can be used for probing the heart of Africa's most basic problems—hunger, malnutrition, rural poverty, environmental destruction. Collectively, they have the power to pump rich new nutrition into what is now an anemic food supply, sputtering rural economy, uncertain public health, and less-than sustainable farm operations."***

*~ Noel Vietmeyer*



# OVERVIEW

**I**t might be supposed that a hungry continent would exploit all its available food plants to the fullest, but in Africa's case that is not so. The region below the Sahara is home to hundreds of likely contributors to the food supply, almost none of which is currently accorded scientific support, official promotion, or inclusion in development schemes.

In the beginning, Africa's edibles fed humanity. The earliest emigrants out of Africa—long before agriculture—found new foods on their journeys, but at home there was a contraction of agrobiodiversity as farming increasingly focused attention on those plants most practical as mass-suppliers of food in the greatest number of places. Still and all, for many thousands of years, hundreds of wild and (in time) cultivated native species complemented each other to comprise the core of the continental food supply.

Then before recorded history, a pivotal plant migration began as a few Asian foods wended westward to become new links in the African food chain (sorghum and others took the return route from Africa). They arrived partly thanks to increasing trade between India and Africa's eastern seaboard, as well as overland and perhaps even through surprising long-distance connections between Madagascar and today's Indonesia. Exotic species from Asia—most notably rice, bananas (in their various forms), and sugarcane—began contributing more and more to life below the Sahara.

Yet many Africans remained largely dependent on traditional food plants until about five centuries ago, when adventurers and slavers sailing the western seaboard introduced a collection of American crops. These additions notably included maize (corn), cassava (manioc), peanut (groundnut), sweet potato, tomato, common bean, chili peppers, and pumpkin. As is common with nonnative plants, the new arrivals tended toward robust and productive growth, and subsequent centuries saw them spread across Africa as farmers integrated these helpful adjuncts into their age-old

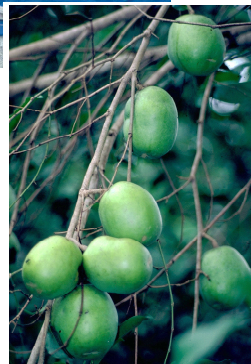
livelihood strategies. That inevitably meant that more of the traditional contributors fell away from the food supply and the minimization process proceeded.

During the colonial era the process of discarding indigenous crops gained further momentum, as the official focus shifted to those familiar crops of mercantile interest, such as cane, chocolate, coffee, cotton, and other durable, transportable, and valuable crops of that sort. Indeed, during those times subsistence crops were almost entirely neglected in organized agriculture, while valuable exportable cash crops were cultured, harvested, graded, and protected against rodents, insects, and decay with exceptional efficiency and dispatch. And an end result of these historical trends was that most of Africa's food these days comes from a mere 20 or so species, almost all of foreign extraction.

Like grains and fruits, Africa's ancient vegetables were vulnerable to the sweep of these events. Long ago, hundreds of leaves, roots, tubers, corms, rhizomes, bulbs, seeds, buds, shoots, stems, pods, or flowers were eaten. Yet across Africa today the main vegetables are crops such as sweet potato, cooking banana (plantain), cassava, peanut, common bean, peppers, eggplant, and cucumber. Countries in the elevated central regions—Burundi, Rwanda, Ethiopia, and Kenya—grow potato. Banana dominates Rwanda, and Ethiopia also relies on chickpea and lentil. And South Africa records its leading vegetable crops as potato, tomato, green mealies (maize), sweet corn, onion, pumpkin, carrot, cabbage, lettuce, and beetroot.

The disconnect in such modern-day enumerations is that these "African" vegetables come from Asia or the Americas. Indeed, a popular textbook on vegetables in Africa features about 100 species, only 3 of which are native born. Out of the continent's top vegetables today, only cowpea, yam, and okra are African.

This situation is not, in itself, a major detriment. The United States, after all, has almost half of sub-Saharan Africa's population and eats essentially no local food plants whatsoever.<sup>1</sup> But unlike the United States, Africa needs more and better food. And unlike America, which is biologically deprived of native food



<sup>1</sup> The only food crops native within the U.S. borders are minor contributors, such as sunflower, Jerusalem artichoke, Concord grape, pecan, cranberry, and small fruits like blueberry and raspberry.



plant abundance, Africa also has the blessing of hundreds of worthy candidates waiting in the wings—the old ones that during the course of history got dropped from the food supply not through insufficient merit but through the negligence or priorities of eras now past and for reasons no longer relevant.

There are lessons to be learned from such history. Many foods of the utmost importance today were bypassed in the past because they were considered “poor people’s plants.” Peanuts, potatoes, and many other top-line crops once suffered this discrimination. In the United States the peanut was scorned as “merely slave food” until little over a century ago, and in the 1600s the English refused to eat potato on the basis that it was “Irish food.” The list is lengthy, and cultural bias against peasant crops is an ultimate calamity because plants that poor people grow are usually robust, productive, self-reliant, and useful—the very type well-suited to feeding the hungriest and most vulnerable sections of society.

Surely the door is now open to a renaissance of Africa’s vegetable resources. Sadly, though, even in our times, such historical exclusionary trends continue. The imbalance between the traditional and the introduced species, already worrisome, continues tipping toward an even greater reliance on other people’s plants. More correctly, it is tipping against the use of, and appreciation for, the traditional vegetables that have fed Africans for tens of thousands of years. While science makes the top resources better, the lesser ones fall farther behind, shunting the vast majority of the cuisine into anonymity, if not extinction. This means most of Africa’s own edibles have yet to receive due attention, let alone a chance to develop to their potential under the power and promise inherent in modern capabilities.

The global homogenization of lifestyles is not fully to blame for squeezing out traditional vegetables, for modern connections and wealth have also led to an explosion in the availability of novel foods in every developed market. Rather, to a considerable extent this neglect seems to be an unintended consequence of agricultural successes in research-rich regions. And not unnaturally, Americans, Europeans, Asians, and others see Africa’s future in the vegetables they themselves depend upon. Thus soybean and the rest garner the research spotlight, rise to ever-greater levels of food and cash generation, and seem thereby to justify even more research support.

Something of this scientific spiral can be deduced from the amount of research now dedicated to soybean. By comparison, Africa’s yam and okra can hardly be

said to get any support at all; even cowpea, probably the best-funded of all African vegetables, falls far short of a soybean standard. Indeed, it is no coincidence that the continent’s top three traditional vegetable resources basically languish while their foreign counterparts seize ever more momentum within the lands to which cowpea, yam, and okra have contributed with distinction for millennia. And beyond those three “visible” African vegetables lies a huge array of “invisibles,” whose names remain unknown in the world’s leading vegetable research institutions and which as a consequence get left without support. An irony that demonstrates the potential for such “lost” African crops is that soybean itself was little-known outside Asia a century ago, yet within a lifetime it has become a crop of global heft.

Emphatically, to the extent soybean can benefit Africa, research support is a very good thing. Competition is as healthy in crops as it is in commerce, and there will always be losers. However, to feed a continent as vast and diverse as this requires more and better adapted food crops. That in turn points to the age-old vegetables, feeding people long before Africans discovered Asia, Europe, and America; these “lost crops” should be included among Africa’s future options.

When compared with the ancient stock of modern crops, these traditional African food crops remaining outside the fold of science have not been rejected because of any inherent inferiority. It is time to open minds to the power and promise of this indigenous edible wealth. It is not that the ancestors’ vegetables should be placed in the forefront of efforts to feed Africa, but they deserve to be pulled out of anonymity and given a fair chance to expose their worth to modern times. Many have important contributions to make today, and eventually—if merited—they may move on a path leading toward a well-fed continent.





Now is the opportunity to explore Africa's future in the promise of its edible botanical wealth. These days researchers are enthusiastic about genetic engineering and the new products to arise from it. This emerging technology offers promise for Africa, but enthusiasm must not obscure the fact that huge numbers of nature's organisms—already selected and improved by humans—have yet to be explored by the “traditional” scientific methods that have proven nearly miraculous at improving global food production for decades on end. Some little-known local plants may have a genetic makeup so outstanding that they could help solve some of Africa's—not to mention the world's—most pressing food problems.

Beyond all that, a revitalized development of Africa's own food plants could open new windows of opportunity beyond those agriculturists normally imagine. In principle, these domesticates can help not only feed an increasing population, but also make marginal lands more productive, lift rural incomes, and re-clothe denuded and desolate areas. Moreover, they can widen the continent's agricultural resource base, fashioning a food supply that is not only more stable but more secure. The genes for fighting off the ravages of pests and diseases may already be available. Indeed, this endeavor seems ideally suited as a mission for Africa's own under-utilized agricultural science.

But with which native vegetables should the revitalization process start? Even within living memory Africans still ate an astonishing number of different plant products. One writer lists 83 species used as vegetables just in what is today Zimbabwe. In one small part of South Africa more than 120 species were until recently common vegetables. Large 19th and 20th Century tomes (targeted largely toward scholars) were written in both English and French detailing hundreds of plants consumed daily in West Africa. Even in the arid areas of Namibia and Botswana, where environmental extremes limit options, one observer lists 18 vegetable-like plants eaten by traditional cultures in the blistering heart of the Kalihari.

It is conceivable that 3,000 native African roots, stems, tubers, leaves and leafstalks, bulbs, immature-inflorescences, and fruit-vegetables were eaten routinely. But knowledge of what can and cannot be eaten was generally passed through generations from mother to daughter and from child to child. This direct, personal, on-the-scene tutoring was effective, but taking advantage of it today is fraught with difficulty. Though some of the knowledge has been recorded, sadly much of that experience has faded from the collective memory. Merely knowing that a species was eaten is not as helpful as might be supposed, and



nowadays it may be difficult to glean from the overall gene pool those especially palatable specimens that were the only ones used in the past.

Yet not all is lost. Many indigenous edibles are still widely cherished across Africa today. Some are even attracting resurgent research interest. A few groundbreaking growers and creative researchers have become intrigued by these ancient resources. Indeed, plant champions Africa-wide consider that—given attention—these ancestral foods have a capacity to take their place alongside the modern marvels dominating today's textbooks, scientific treatises, and the international image of what a first-class vegetable should be.

Besides offering an important opportunity to diversify the food base, the traditional crops lend themselves to local initiative, not to mention local sentiment. Africa's own researchers and growers could lead the charge to reinvigorate these ancient resources.

It is also noteworthy that advances in plant breeding, genetics, and increasingly genomics will transform these ancient and neglected resources far faster than might seem likely based on historical precedent. Generally, it is no longer necessary to invest centuries to bring a crop to its potential. Given even a little attention and support, Africa's fruits and vegetables could quickly contribute even more to the environments, nutrition, economies, and personal income—particularly women's income—of many if not most African nations.

This then is a good time to be peering past the current commercial crops and developing a complementary set of contenders. That is already happening in “post-industrial” nations, where markets abound with a cornucopia of vegetables not seen twenty years ago. For Africa, its own “lost” species are an obvious place to begin that same sensible process of diversification to meet the needs of today and beyond.



# Description of Individual Vegetables



## Amaranth

Vegetable amaranths (*Amaranthus* species, Amaranthaceae) are arguably the most widely eaten boiled greens throughout Africa's humid lowlands. During the production season they reportedly

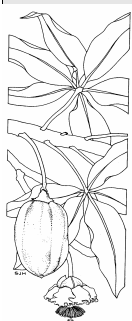
provide some societies with as much as a quarter of the daily protein intake. The tender young seedlings are pulled up by the roots and sold in town markets by the thousands of tons annually. In addition, the leaves and stems from full-grown plants make boiled vegetables with soft texture and mild flavor. All this has come about despite an almost total lack of formal development or official support. Given professional attention, these fast-growing vegetables could contribute even more vitally to nutrition, food security, and rural prosperity—especially the prosperity of rural women, who are the major producers. Climate: Humid lowlands, dry savannas, uplands.



## Bambara Bean

Seeds of this legume (*Vigna subterranea*, Leguminosae) are dug from the ground like peanuts. Typically, they are then boiled, roasted, or fried, ground into flour, and blended into many traditional dishes. Despite an almost total scientific neglect, nothing fundamental appears to be stopping this especially appetizing crop from much greater contributions to the diet of much of Africa. It produces a food of exceptional nutritional quality, so a little goes a long way toward building and maintaining a solid foundation of good health. All

in all, this tasty protein-rich bean promises to benefit the people most in need and hardest to reach through conventional development programs. Climate: Humid lowlands, dry savannas, uplands.



## Baobab

The leaf of the much beloved baobab (*Adansonia digitata*, Bombacaceae) is a staple of the savanna lands below the Sahara. In an area stretching across half the continent this vegetable ranks among the commonest foods. Bursting into foliage a little before the rains begin, the stately trees remain green and edible until a little after the rains have ceased months later. The leaf is sometimes steamed and eaten as a side-dish like spinach, but most goes

straight into soups, stews, sauces, relishes, and condiments that complete the main dish of the day. Climate: Mainly dry savannas.



## Celosia

The prettiest of all vegetable crops, celosia (*Celosia argentea*, Amaranthaceae) is used as an ornamental almost everywhere on earth. But few of its millions of admirers know that it is a common item of diet in parts of tropical Africa. The fresh young leaves, young stems, and young flower spikes are used to produce a tasty and nutritious "soup" that is a daily fare

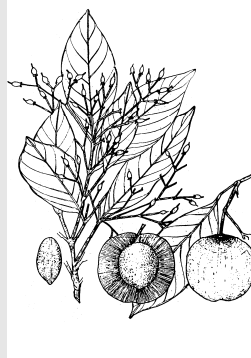
especially in West Africa. Productive and simple to grow, the plant could in the future become a much greater contributor to African welfare, especially in the hot and poorly nourished regions of the equatorial zone. Climate: Humid lowlands, uplands.



## Cowpea

Although globally obscure, cowpea (*Vigna unguiculata*, Leguminosae) is grown by tens of millions of smallholders in Africa. West Africans alone plant an estimated 6 million hectares annually. In fact, it is estimated that 200 million children, women, and men live off the plant—consuming the seeds daily whenever available. Widely appreciated by the poor, cowpea seed is not only rich in protein but in digestible carbohydrate too. Although

not strictly a "lost crop" (it traveled long-ago to South Asia, where it expanded into an important asset), it still falls far short of its potential. Indeed, that potential could be very high because this species seems strong enough to lift Africa's overall food quality. Climate: Primarily dry savannas and uplands.



## Dika

Throughout a giant triangle from Senegal to Uganda to Angola, dika (*Irvingia wombolu* and *Irvingia gabonensis*, Irvingiaceae) is a part of the daily diet. Although this tree's fruits are popular in some areas, the seed is the major resource. These so-called "dika nuts," which are something like cashews, can be eaten raw or roasted. Most, though, are ground and combined

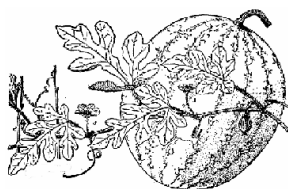
with spices to form the key ingredient in "ogbono soup," a spicy dish extremely popular among West and Central Africans. As a result, this so-far-undomesticated tree scores high on the list of species inhabitants hope to see developed. Climate: Humid lowlands, dry savannas, uplands.





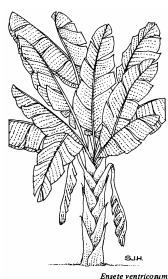
### Eggplant (Garden Egg)

This vegetable (*Solanum aethiopicum*, Solanaceae), like its better-known Asian cousin (*S. melongena*), provides brightly colored egg-shaped fruits that are a significant vegetable resource almost Africa-wide. The species is high yielding, easy to grow, and simple to harvest and handle. It is integral to many cuisines, cultures, and economies. Yet in many parts of Africa there is considerable scope for producing much better varieties in much better quantities. Climate: Humid lowlands, dry savannas, uplands.



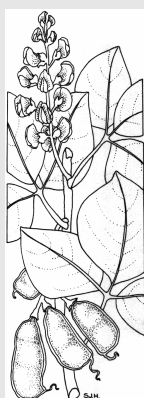
### Egusi

Egusi is a melon-like crop grown for its large white seeds, which in West Africa are a component of many meals. The plants themselves are from several species and genera, notably including watermelon itself (*Citrullus lanatus*, Cucurbitaceae). Ground up coarsely, the seeds thicken stews and contribute to a widely enjoyed steamed dumpling. Some are soaked, fermented, boiled, and wrapped in leaves to form a popular seasoning. They are also roasted and made into a spread not unlike peanut butter. They are even compacted into patties that serve as a meat substitute. Seen in overall perspective, this is a versatile crop with valuable for both subsistence survival and modern commerce. Climate: Humid lowlands.



### Enset

Although few outsiders have ever heard of it, this tree-like herb (*Ensete ventricosum*, Musaceae) underpins the food supply in Ethiopia's densely populated highlands. An estimated 10 million people consume it. The plant is perhaps the biggest vegetable of all and looks like a banana "tree." The food, however, comes mainly from the trunk, which on the largest specimens can be a meter in diameter and three meters tall and is filled with starchy pith. A second food comes from underground, where can be found a corm that may be almost a meter long and a meter in diameter and is packed, like some giant potato, with starch. Any plant producing food by the cubic meter is surely something to use more intensively in a hungry continent, but so far this one is barely known to science, let alone to Ethiopia's neighbors. Climate: Upland.



### Lablab

In Asia lablab (*Lablab purpureus*, Leguminosae) is a popular foodstuff. For the rural peoples of southern India, for instance, its pods and seeds supply much of the daily protein. The strange thing is that lablab is African. Stranger still is the fact that it is almost unknown in present-day Africa. Yet this clambering bean possesses qualities that could prove exceptionally valuable for nutritional well-being, rural development, and environmental stability in almost every corner of its continent of origin. Climate: Humid lowlands, dry savannas, uplands.



### Locust Bean

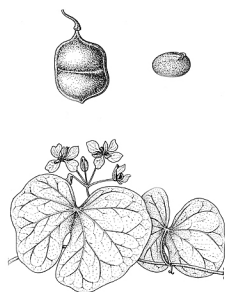
Another legume, the West African locust bean (*Parkia biglobosa*, Leguminosae), grows more than 20 meters tall. Its pods, which dangle all over the tree's spreading crown, contain seeds as well as a dryish pulp that can be half sugar. The seeds are gathered by the thousands of tons and peddled by itinerant traders throughout West Africa, often as a medicinal. Chiefly, they are fermented into the famous dawadawa. This sticky, sour, cheesy solid is rich in protein, vitamins, and food energy and even in the tropical heat it keeps well without refrigeration. Dawadawa is exceptionally popular as a seasoning, but it is also an important soup ingredient. This single species, which has received almost no horticultural recognition, combines likely answers to Africa's twin needs of food and tree cover. Climate: Dry Savannas.



### Long Bean

This delightful legume (*Vigna unguiculata*, Leguminosae) resembles a snap bean except for the singular fact that it is pencil-thin and up to a meter long. Often called yardlong bean in English, its green to pale-green pods are tender, stringless, succulent, and sweet. The surprising thing about what is universally acclaimed an "Oriental vegetable" is that it is a special form of cowpea—a species of unquestioned African origin (see cowpea, above).

Now is the time to welcome long bean back home to contribute as much to Africa as to Asia. Climate: Humid lowlands, dry savannas, uplands.



### Marama

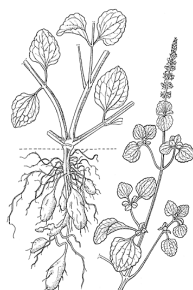
Above ground, this plant (*Tylosema esculentum*, Leguminosae) produces seeds rivaling peanut and soybean in nutritive quality. Below ground, it produces a high-protein tuber much bigger even than sugar beet and much more nutritious even than potato or yam. The plant thrives in poor-quality soil and under the harshest of climates. Indeed, in its native habitat, the deserts of southern

Africa, rain often stays away for years on end. But this seems a resource more in theory than reality; it is undomesticated and has far to go before anyone can truly capitalize on such valuable qualities. Climate: Semiarid lands.



### Moringa

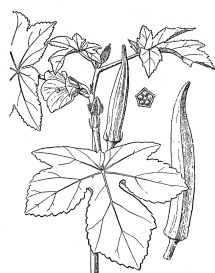
Yielding protein, oil, and carbohydrates, and with a lode of vitamins and minerals, moringa (*Moringa oleifera*, Moringaceae) is possibly the planet's most valuable undeveloped tree, at least in humanitarian terms. A sort of food market on a stalk, it yields at least four different edibles: pods, leaves, seeds, roots. And beyond edibles, it provides products that make village life more self-sufficient: lubricating oil, lamp oil, wood, paper, liquid fuel, skin treatments, the means to purify water, and more. Taken all round, this supreme poor-person's plant shows a remarkable capacity to help solve problems such as hunger, malnutrition, rural poverty, disease, deforestation, and visual blight. Although the experiences come almost exclusively from India, the genus *Moringa* is inherently African, so it has ancestral roots in the sub-Sahara soil. Climate: Humid lowlands, dry savannas, uplands.



### Native Potatoes

Africa's native "potatoes" (especially *Solenostemon rotundifolius* and *Plectranthus esculentus*, Labiatae) are actually members of the Mint Family. Smaller than modern commercial potatoes, their tubers hang in bunches from the base of the plant. They are

mostly boiled, but can also be roasted, baked, or fried. Despite kinship to pungent herbs like basil, mint, sage, and thyme, the tubers have a bland taste and can replace potato in most recipes—including potato salad. Not only are they nutritious, they are productive. Even in their current fairly unimproved form, native potatoes can produce a lot of food from a small area. And they seem primed for rapid advancement to a major African resource. Climate: Humid lowlands, dry savannas.



### Okra

A perfect villager's vegetable, okra (*Abelmoschus esculentus*, Malvaceae) is robust, productive, fast growing, high yielding, and seldom felled by pests and diseases. It adapts to difficult conditions and can thrive where other food plants prove unreliable. Among its useful food products are pods, leaves, and seeds.

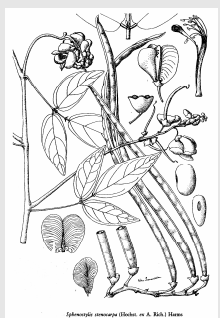
Among its useful non-food products are mucilage, industrial fiber, and medicinals. Seen in overall perspective, this often-derided resource could be a tool for improving many facets of rural life. Its production and maintenance is fairly well known in the U.S. and elsewhere, and this offers the possibility of rapid advancement within Africa. Climate: Humid lowlands, dry savannas, uplands.



### Shea

Although few outsiders know this tree, shea (*Vitellaria paradoxa*, Sapotaceae) remains among West Africa's most extensive food sources. West Africans employ its smooth-skinned, egg-shaped nut much like Westerners employ lard and butter. For a vegetable lipid this one is strange in that it remains solid even under tropical conditions. Countless Africans also

use it for skincare, and these days shea butter is going global and going upscale as an ingredient in some of the most expensive cosmetics ever formulated. Climate: Dry savannas.



### Yambean

The African yambean (*Sphenostylis stenocarpa*, Leguminosae) is a legume grown mainly for its fleshy swollen roots, which look something like sweet potatoes but are succulent, sweet, and crisp as a fresh-picked apple. In nutritional terms, they are a class above the mainline root crops, containing more than twice the protein of sweet potatoes, yams, or potatoes

and more than ten times that of cassava. Moreover, the protein is of exceptional nutritional quality, superbly complementing the proteins of maize, sorghum, and the other staples. In addition, both seeds and leaves are edible. And the African yambean is no slouch in the yield department, either. It produces its edibles in abundance, and seems capable of delivering record quantities of protein from soils normally considered marginal. Climate: Humid lowlands and uplands.



# OVERCOMING MALNUTRITION

**T**hese days there is increasing appreciation for the class of food we call vegetables. Evidence is rising on all sides that a lack of vegetables increases susceptibility to infection and disease as well as to stunted physical and mental growth. Vegetables also help palliate the scourge of Africa's major health problems that are today exacerbated by the lack of a balanced diet.

By and large, vegetables supply dietary elements in which other food materials are deficient. For one thing, they are prime sources of minerals, being typically rich in calcium and iron and also contributing phosphorus, potassium, copper, magnesium, manganese, and cobalt. A few vegetables—notably legumes, such as various beans—are valuable sources of proteins. Furthermore, their cellulose, an indigestible carbohydrate, absorbs water and provides the bulk material, or roughage, that promotes intestinal function.

For another, vegetables are important sources of vitamins. Vitamin C, vitamin A, and folic acid are what make them essential to human well-being, but most vegetables also provide other B vitamins, including thiamine (B1), riboflavin (B2), pantothenic acid (B5) and pyridoxine (B6), which are important for brain function, immune-system operation, and the production of several important hormones. Many vegetables also contain small but useful amounts of vitamin E.

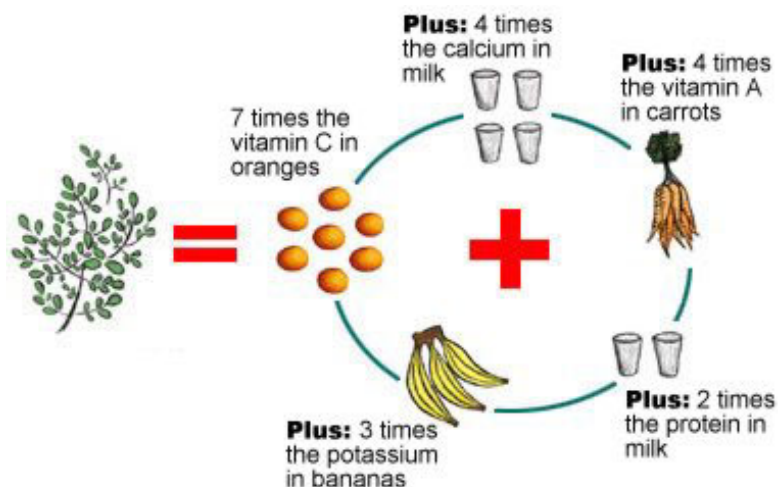
By choice or circumstance, the diets of many African communities are deficient in vitamins, minerals, and other nutrients vegetables supply. Through research and extension of traditional vegetables, much could be done to change the situation...cheaply and rapidly. Seen in Africa-wide perspective, this is likely to be at least as effective as any move to “biofortify” cereal grains.

It seems worth mentioning here that much can be achieved through school gardens, where children learn about growing vegetables while at the same time also attaining a better level of nutrition. Traditional vegetables would be worthy components of such enlightened school projects, supplying lessons far beyond the dignity of dirty fingers.

Below is a summary of the merits, *specifically in terms of fighting malnutrition*, of each of the 18 vegetables this book highlights. Additional information, when available, is given in the separate chapters, but in general nutritional details for these crops are limited and at times of doubtful usefulness because of outmoded techniques. Even those vegetables for which there are no data are likely to have nutritional values in common with most vegetables.

## Amaranth

In overall nutritional power, amaranth greens are not dissimilar from the better-known leafy vegetables. Their exceptional protein quality, however, makes them useful supplements to cereals and root foods. For this reason, India has been known to fortify weaning foods with amaranth-leaf flour. Moreover, the leaves are packed with vitamin A-forming carotenoids, whose lack blinds thousands of children each year. In



Gram for gram, fresh moringa leaves outperform these well-known nutritional champions, and they taste good too. (TreesForLife.org.)

addition, the leaves provide vitamin C and tend to accumulate dietary minerals, notably iron and calcium. All this puts amaranth greens among the finest potherbs for reducing the ravages of nutritional deficiencies.

### **Bambara Bean**

Bambara bean is a rare example of a complete food. It has such a nice balance of nutrition that people supposedly can live on it alone. Ripe or immature, the seed is roughly 60 percent carbohydrate, 20 percent protein, and 7 percent oil. In addition, the protein contains more of the nutritionally essential amino acid methionine than almost any other bean, making this peanut-like bean even more valuable. For these reasons this crop could be a superb tool for attacking Africa's under-nutrition.

### **Baobab**

Baobab leaf provides at least three nutritious ingredients: protein, vitamins, and minerals, not to mention dietary fiber. The protein is of high quality, containing notable amounts of lysine and tryptophan. And baobab leaves contain very high levels of provitamin A, which means they could potentially prevent millions of children from going blind.

### **Celosia**

Celosia leaves certainly contribute their share of nutrients, including calcium, phosphorus, iron, and vitamins, as well as not a little protein. Among people in the know, these dark-green leaves are especially valued for promoting physical stamina. Likely, they can play a part in reducing chronic malnutrition but so far there is no solid experience upon which to make a judgment.

### **Cowpea**

Dried cowpea seed consists of protein (up to 24 percent) of good nutritional quality. The bean is nearly 2/3 complex carbohydrate, with some oil (up to as much as two percent), and minerals and nutrients of lesser stature. On top of that cowpea is palatable and relatively free of the kind of metabolites that suppress soybean's value in combating malnutrition. For all these reasons, this grain legume could have a fine future in more effectively balancing the diets of Africans by the millions.

### **Dika**

Dika, too, offers good possibilities for lowering scandalous levels of chronic malnutrition. The kernel meal is high in oil and protein (including six of eight essential amino acids), and would make an exceptional nutritional tool in West and Central Africa where marasmus (the malnutrition caused by a lack of food

energy) and kwashiorkor (the malnutrition caused by a lack of protein) are major baby killers. In addition, the fruit has more vitamin C than pineapple or orange and also has vitamin A in quantity. Collectively, these features make a strong case for more testing, more research, and horticultural development that might lead to many more purposeful dika plantings.

### **Eggplant (Garden Egg)**

Although far from being nutritional powerhouses, these colorful egg-like fruits provide protein, vitamins, and minerals. By the standards of the modern Western world they are a dieter's dream: low in sodium, low in calories, high in dietary fiber, and a good source of potassium. For Africa, however, they probably lack the nutritional punch to knock out the malnutrition that threatens the lives of children.

### **Egusi**

Wherever protein-calorie malnutrition remains chronic, egusi seed could provide an exceptional boost for public healthcare. More than half its weight is edible oil. Another 30 percent is a protein of high nutritional quality. The seed also contains important amounts of minerals and vitamins, especially thiamin and niacin. This is a nutritional combination of potent portent, considering that the crop can thrive where malnutrition among babies is rampant and infant formula is rare. It doesn't take much of any food that is half oil and almost a third protein to provide the calories and amino acids that stressed, sick, and fast-developing little bodies need each day. Egusi could thus be a vital tool against marasmus, kwashiorkor, and other nutritional debilitations.

### **Enset**

On the face of it, enset flour is little more than pure starch. The crop is therefore more like a staple than a vegetable. Yet strangely, people in the enset zone of Ethiopia are renowned for superior nutritional status, perhaps because enset so effectively fulfills their quest for simple carbohydrates.

### **Lablab**

With a crude-protein content of 20-28 percent, lablab seeds are worth considering in malnutrition prevention programs. In addition, the amino acids are moderately well balanced, with an especially high lysine content, which means that they help balance out diets that are over-heavy on the staples. The seeds are also a good source of energy. However, as with soybean, they contain antinutritional factors. The leaves, too, are rich in protein, as well as iron. Likely, this crop can play a big part in improving nutrition, but careful investigations are needed before proceeding on any mass scale.



### **Locust Bean**

Locust beans make a concentrated food with a nice complement of protein, fat, sugar, starch, and fiber, not to mention vitamins and minerals. Lysine makes up about 7 percent of the protein, a level similar to that in whole egg, one of the gold standards of proteinaceous foods. The fat is of the unsaturated kind, the major fatty acid being linoleic—a nutritionally useful ingredient often deficient in the diets of the poor. The smelly fermented locust-seed product, dawadawa, is possibly more nutritious still, but the young who overwhelmingly make up the malnourished may not find it as appealing as everyone else does.

### **Long Bean**

This vegetable is sometimes called poor-man's meat in Asia because it produces so prolifically and makes a filling meal. Long-bean pods, eaten like green beans, provide fair amounts of provitamin A and vitamin C, and the leaves contain 25 percent protein of a high nutritional quality. Already well known in some places outside Africa, long bean seems like a ready tool for bolstering Africa's nutritional well-being.

### **Marama**

On its face, marama is astoundingly promising for lifting nutritional levels in the dry zones. Its seeds rival soybean in both protein content and protein quality, and they far surpass soybean in edible oil content. On top of that, the tuber portion of the plant contains a remarkable 9 percent protein. Marama, however, is a wild plant of the southern African deserts and may prove impossible to produce in quantity either there or elsewhere. At this time, the most appropriate actions involve cautious horticultural research and nutritional testing. This is a putative crop that first needs a foundation on which to build.

### **Moringa**

In a few parts of Africa, various moringa products are already promoted as food additives. The pod provides *all* the essential amino acids; vitamins A, B, and C; and a wealth of minerals. Its high levels of iron and calcium make it particularly valuable for women young or old. The leaves are remarkable for methionine and cystine, vitamins A and C, calcium, and iron. In the Philippines, where moringa is exceptionally popular, these leaves are commonly boiled and fed to babies. They reportedly also increase lactation in mothers. Any foodstuff with such nutritional qualities could prove a potent means to fortify a malnourished continent, both directly and through mother's milk.

### **Native Potatoes**

Native potatoes occur where a shortage of suitable vegetable crops now results in endemic malnutrition. They produce large amounts of good food from a small amount of ground. The tubers contain around twice the protein found in potatoes, and a meal can contribute most of an adult's daily requirement. A standard serving also provides a large percentage of the daily requirement of calcium and vitamin A, as well as more than the daily complement of iron. For a root crop, the content of essential amino acids and food-energy are notably high as well.

### **Okra**

Okra provides three food products: pods, leaves, and seeds. All have dietary value. Half a cup of the cooked pods, for instance, provides nearly 10 percent of the recommended levels of vitamin B6 and folic acid, not to mention fair amounts of vitamins A and C. The leaves contain protein, calcium, iron, and vitamins A and C. The seeds are potentially a good source of an especially nutritious protein, rich in tryptophan and having adequate levels of the nutritionally vital sulfur-containing amino acids. Okra protein thus complements and fulfills that of cereal grains and legumes, not to mention of root crops.

### **Shea**

Even though it is not a major portion of any meal, this solid vegetable fat has an importance to the inhabitants of the semiarid zone along the Sahara's southern edge that is difficult to overstate. It enhances the taste, texture, and digestibility of the major regional dishes. This is not a vegetable like the others we describe, but for millions living in this harsh location, where food is difficult to produce and life hard to sustain, shea butter is a part of everyday existence. For the struggle against marasmus, this would seem a natural ally.

### **Yambean**

African yambean is a classic in that it could benefit millions of the malnourished, but no one has yet championed its greater use. The seeds are about one-quarter protein, and the protein has essential-amino-acid levels likely to make it the soybean's nutritional equal. The tubers are nutritious too. Those swollen root tissues amount to 10 to 20 percent raw protein, which is of high nutritional quality. For children, especially, yambean may be valuable. Nibbling on the tasty raw tubers will provide a quality protein of a kind they cannot easily get elsewhere.

# BOOSTING FOOD SECURITY

**W**hen considering the “facts of life” it is commonly forgotten that a primary one is the need to eat every day. Unfortunately, plants seldom provide their edible bounty on such a convenient schedule. This means that people who find their own food must withstand periods in which nothing can be gleaned from soil or shelves. In addition, for much of Africa the possibility of multi-year drought is a pervasive fear and a sometime purveyor of famine.

Sadly, those living in poverty have little margin for error: crop- and climate fluctuations or periodic natural disasters or human conflict quickly create conditions for catastrophe. And it is not realistic to expect that relief efforts can always succeed. Not surprisingly, though, there are ways indigenous vegetables can help fill even some of the longer gaps in the dietary continuum, both in normal and abnormal times.

Of special significance, here, is the fact that the native vegetables’ adaptive qualities were selected by Africans under precisely the variable conditions and climatic vulnerabilities of that continent.

Below is a summary of the merits, *specifically in terms of food security*, of each of this book’s 18 highlighted vegetables.

## **Amaranth**

These plants already secure the food supply for millions. They are easy to produce and grow so fast that the first harvest can sometimes be gathered just three weeks after planting. Subsequently, several successive harvests can be made, and this aptitude for both jack-rabbit starts and for feats of endurance not only eases the farmer’s burden in filling the family stomachs, it creates huge yields in the kind of small spaces relegated to the destitute and disenfranchised.

## **Bambara Bean**

Due to its dependable production, bambara bean has the potential to improve food security in many rural areas. Indeed, it promises to become a stable, low-cost, and profitable food crop for Africa’s small-

scale farmers living where the rains are not to be trusted. Resilient and reliable, it commonly yields food from sites too hot and too dry for peanuts, maize, or even sorghum. It might truly prove an ideal insulator against starvation wherever rainfall is unreliable.

## **Baobab**

Among vegetables, a food class renowned for short seasons and transitory availability, baobab is a leafy vegetable that keeps on producing throughout the rainy season—often half the year. In addition, any surplus harvest can be dried. In desiccated form, the leaves keep well even under the pest and climatic pressures of rural Africa. Clearly, this is a food-security treasure.

## **Celosia**

A supremely self-reliant and uncomplicated resource, celosia propagates easily, requires little care, and often reseeds itself like a weed. Its Malawian name means “eaten by lazy ones,” a recognition that not only is it easy to produce but it cooks quickly and efficiently. As a back-up security support for subsistence farming this lowly herb seems to offer true value.

## **Cowpea**

One of the more remarkable and precious things about this species is that certain of its cultivars mature with as little as 300 mm of rainfall. This makes it the grain legume of choice for the Sahelian zone and the contiguous savannas, both of which are surprisingly populated, erratically dry, and vulnerable to mass outbreaks of malnutrition and misery. Cowpea seeds provide quality protein and other essential nutrients that complement the otherwise unbalanced diets the poorest sectors are forced to stomach.

## **Dika**

The fruits have traditionally been collected from wild trees in the forests, so not much has been reported about their likely ultimate contribution to food security. Nonetheless, harvesters gather dika nuts by the thousands of tons each year, and those dried kernels are especially stored for the hungry season.





### **Eggplant (Garden Egg)**

This is a resource that is easy to raise, relatively free of disease and pests, and capable of providing a steady supply of both food and income. The plants are known for a capacity to furnish terrific amounts of food from a tiny space. Also, the fruits have a storage life up to three months. Having firm skins, they also transport well. Furthermore, this African eggplant can be dried and stored for later use, notably in emergencies such as when the growing season is finished and nothing fresh is available.

### **Egusi**

Noteworthy is the fact that egusi seeds can be stored for long periods without particular trouble from pestilence or degradation. This is one oilseed that can supply food year-round. And it is a quality food: the oil making up the seed's largest nutritional component is polyunsaturated.

### **Enset**

Enset's importance for poor-people's food security seems self-evident. Interviews with farmers suggest that Ethiopian peoples who depend on the plant NEVER suffer famine. Indeed, a family with just a small plot of enset supposedly will have food forever. This long-lived species represents natural food security, always available for general use or for exclusive use in rare times when all other eatables fall short.

### **Lablab**

This is not an exceptional food-security crop, but a well-established lablab plant's root system often penetrates into water sources more than 2 m deep, permitting luxurious growth to persist long after the rains have ended and the surface soil is parched. Because of its extended production season, the crop continues providing food, fodder, and soil protection long after other herbaceous species have dried and died.



### **Locust Bean**

This is one of the best species for securing a supply of food when nature has other plans. Although locust beans are a part of the daily diet across a zone often devastated by drought, this tree also turns into a lifesaver during famine times. Its seeds contain protein, fat, sugar, starch, vitamins, and minerals, and are about as balanced and concentrated a food as could be

devised. Add that they mature in the dry season, the traditional "hungry time," and their value as emergency food becomes plain. Even when drought has seared the landscape, this deep-rooted tree continues producing its foodstuffs, as if on its own schedule.

### **Long Bean**

Long bean plants are succulent and therefore probably not the greatest security food, but they not only thrive in hot humid climates, they produce food very quickly. Indeed, the leaves can be harvested within three weeks of planting, and some types produce harvestable pods inside two months. The main varieties continue producing for months on end, thus giving rise to an extended harvest that keeps providing fresh food over long periods.

### **Marama**

This protein and energy-rich species nourishes people in southern regions where rain is so slight and erratic that some years almost none whatever falls. It lives through such conditions, not to mention blistering summers, apparently with ease. In addition, it survives low winter temperatures, especially the freezing nights of the Kalahari. But as a continental food source it hardly seems promising, owing to its lack of horticultural development and apparent narrow geographic range.

### **Moringa**

A rugged, resilient tree species, moringa tends to produce well in marginal growing conditions and is a reliable source of greens in seasons and locations where few other vegetables produce much of anything. In West Africa the leaves appear at the end of the dry season, a time when other sources of leafy green vegetables have mostly died. All this adds up to a food-security gem.

### **Native Potatoes**

These tubers, which are overwhelmingly employed as subsistence food, also make a good food-security insurance policy. They can, for example, be dried and set aside for the hungry times. These clonal crops are easy to handle and propagate. Taken all round, then, these ancient resources could prove good tools not only for reducing malnutrition and hunger, but for tiding African families through the times when other food is unavailable.

### **Okra**

Although not normally grown under stressful conditions, the plant shows considerable tolerance to drought and heat, and should perform more reliably than most plant resources in Africa's savanna regions, where food supplies are currently often undependable.

### **Shea**

Traditionally, this large and treasured tree, not unlike oak in general appearance, provided the primary edible vegetable fat to peoples inhabiting a vast tract of wooded grassland that is vulnerable to some of the worst droughts of the arable world. Nutritionally speaking, it is noteworthy for providing buttery kernels capable of providing a steady source of dietary energy year-round.



### **Yambean**

With built-in adaptability to a wide range of climates and soils, African yambean is a reliable performer. It grows easily and is well suited to the hot wet tropics, an environment unfriendly to so many crops that people there suffer from a lack of healthful agronomic options.





# FOSTERING RURAL DEVELOPMENT

**B**eyond their fundamental subsistence use, vegetables make good cash crops. They command relatively high prices and can be produced efficiently on a small scale. This makes them excellent resources for relieving rural poverty. Like fruits, they provide farmers an easy entry into the world of commerce and into at least the prospect of prosperity. Indeed, anyone with access to land can grow vegetables.

For many rural Africans, these plants and their products provide opportunities for economic gain. Many species are already grown at home and sold in local markets; children also collect them to sell within their village. Nevertheless, supplies now reaching the cities are generally considered to fall far short of the natural demand.

Mostly, vegetables are produced by women, peddled by women, and prepared and served by women. They therefore offer a convenient lever for lifting female existence to a higher plane. This is of broader importance than may be apparent: Improve the lives of women, and you improve the lives of babies born and unborn. In a related vein, vegetables offer good opportunities for gender-oriented innovation and female-led entrepreneurial enterprises.

Below is a summary of the merits, *specifically in terms of improving rural development*, of each of the 18 vegetables highlighted in this book.

## **Amaranth**

In the lives of the rural poor this low-cost crop is notably important as a source of income. Many desperate farm families grow more amaranth for sale than for their own subsistence. Women are the prime producers. The crop is mostly grown, harvested, and marketed close to home, and it forms a crucial part of both the rural economy and the female existence. Thus if science can boost output or reduce production costs it will disproportionately benefit not only the group most at risk but also the one most likely to support society.

## **Bambara Bean**

This crop has outstanding commercial possibilities. Beyond the normal farm and village sales, commercial food processing is likely to open up buoyant new

bambara-bean markets. In this regard, it is notable that the canned product seems to have high marketing potential in urban areas. Across Africa there is room for bambara-bean-processing enterprises, which will create new outlets for farmers and boost income opportunities for rural areas. There's even potential for world exports.

## **Baobab**

Africa's most emblematic tree is also a likely vehicle for poverty prevention. Traditionally, baobab has not been deliberately cultivated, merely encouraged and protected. However, farmers in West Africa have recently begun producing it in an organized way for vegetable markets in the city. This is succeeding because where baobab trees aren't available for the picking, the leaves necessary for the evening meal must be purchased. For city-dwellers finding that can become a never-ending struggle: Making baobab-leaf sauce can at times cost the equivalent of a day's work. On the other hand, sales continue brisk and country-women derive important income from selling the leaves.

## **Celosia**

Celosia seems a promising green for commercial cultivation in the hot humid tropics, especially during the rainy season, when other crops succumb to molds, mildews, and like maladies. It can be very high yielding and its young leaves have a good taste and a good nutritional value. Celosia is already southern Nigeria's most important leaf vegetable and is raised in myriad home gardens and farm plots both for the family and the local marketplace.

## **Cowpea**

Beyond its value to the malnourished, this is a high-potential cash crop. At present it is the second most important grain legume across the African continent; only peanut—a scion of South America—occupies more African farmland. Nigeria, the biggest producer, grows several million tons a year, yet its potential across a broader swath of Africa is scarcely considered.

## **Dika**

Through dika, millions of farmers already earn a critical income. They sell the fruit for juice, jam, jellies, and the fresh market. In addition they sell the oil to factories making margarine, soap, or pharmaceuticals. The greatest profit center of all, however, is in the defatted kernel meal. This shelf-stable soup ingredient even has export potential. Indeed, entrepreneurial West Africans living in the United States already hawk molded ogbono cubes, mostly over the internet.

### **Eggplant (Garden Egg)**

Throughout Africa, local garden eggs provide a continuing source of income for farmers. In rural districts from Senegal to Mozambique women are commonly seen hefting baskets of them on their heads to sell in nearby villages or townships. Yet these vegetables have untapped commercial promise and could become the cornerstone of localized rural economic development drives. There is also perhaps potential for exporting African eggfruits to Europe and North America and thereby earning hard currency.

### **Egusi**

Egusi seed is in high demand in tropical markets, especially those in urban areas. Almost all the food sellers in Benin, Cameroon, Ghana, Nigeria, Togo, and the other nearby nations display it for sale. Egusi is also peddled over the Internet to aficionados around the world. From greater production and greater profitability women would be special beneficiaries. They are the main growers and, due to the relatively high cash income they receive, egusi is already a sort of female treasure.

### **Enset**

Enset's importance extends far beyond food; every part is useful for something. Farmers in Ethiopia's southern highlands declare that, "enset is our food, our clothes, our beds, our houses, our cattle feed, and our plates." In other words, this is a crop of life; like coconut it provides a basis for subsistence survival. Although much is sold in Addis Ababa, whether the crop can be harnessed for commercial purposes more widely in Africa is far from certain.

### **Lablab**

The forms of lablab that have been developed as green vegetables are promising profit-makers, producing huge yields of pods (up to 7.5 tons per hectare) that look and taste good, and doing it quite quickly (4 months). In addition, the dry seeds are becoming commercially important in Australia, where it is claimed that they are suitable even for export (mainly as livestock feed), like some sort of southern-hemisphere soybean counterpart.

### **Locust Bean**

Across West Africa locust seed is a major item of commerce, as is its famed fermented paste, dawadawa. These together constitute an important economic activity for women. Production of the pungent dawadawa is a traditional family craft and, although most is produced for home use, it also commonly ends up sold in local markets.

### **Long Bean**

This productive legume yields a lot of food in a very small space. On worn-out soils it is said to out-produce peanuts. A true legume, it is largely independent of fertilizer....enriching soil by trapping atmospheric nitrogen in bacteria-filled nodules on its roots. It not only fits into African farming, it also fits into African cuisine, especially into the vegetable-laden sauces and relishes. These tasty, universally admired treats therefore hold out the prospect of a good income for those who choose to grow long bean for profit.

### **Marama**

As of now, this is too far from being a commercial crop to promise purely economic benefits.

### **Moringa**

Potentially there is profit to be made from what at present is a quintessential subsistence resource. First, moringa is a fast-growing, high-yielding oilseed. Second, the trunk is gaining importance as a raw material for papermaking. And third, pods and leaves could be produced for the fresh market or for processing. Adding to its rural-development benefits is the discovery that the seeds can help purify water. There are indications, too, that moringa-seed extracts make useful treatments against skin complaints. Moringa is also valuable as feed for livestock.





### **Native Potatoes**

Although native potato is not a cash crop in the normal sense, part of the harvest is commonly put up for sale in the villages. Collectively, African women derive income thereby. It is notable that the crop occurs in areas of low agricultural potential across the continent's most needy regions. In addition, prepared food products seem quite possible. Native potato therefore holds the potential to provide more income to those who produce, collect, and process the tubers, most of them female.

### **Okra**

Okra could have an unexpectedly important future as an industrial crop. There seems to be little difficulty in producing the plant on any particular scale. In the United States, for example, some is already produced in quantities big enough for the pods to be canned, frozen, or brined for supermarkets coast to coast. In addition, okra could, at least in principle, have a future producing things that are unexpected from a vegetable crop, including construction materials, handicrafts, forage, and fuel.



### **Shea**

Shea is often a principal economic resource underpinning the lives of those inhabiting vast areas where little else saleable can be found or farmed. According to estimates, the tree provides more than half of all women's income in the rural Sahel. Foreign exchange is also earned: both seed-kernels and the butter are shipped to Europe and Japan, where they are processed into baking fat, margarine, cocoa-butter substitutes, and various highly touted beauty aids. Some of these are appearing in North America too.

### **Yambean**

Possibly the African yambean will make a valuable cash crop across regions that desperately need a farm-based fulcrum for leveraging rural development upwards. The highly efficient way in which it absorbs nitrogen makes it an especially attractive tool for helping those who suffer due to worn out soil. The tuber yield is generally high and can undoubtedly be raised—possibly dramatically—merely by preliminary research attention. But as of now there is not much documented experience this grossly neglected resource, so the future cannot be judged with any clarity.



# SUSTAINABLE LANDCARE

**A**fter decades of focusing on fewer and fewer farmed foods, agriculture is once again promoting a diversified “product line.” At the same time, numerous farming techniques are being discovered—or rediscovered—that yield bounteous crops reliably while leaving the land better off than before the crop was grown. Many of these technologies require little capital investment, making them ideal for the cash-poor countryside. Peering forward from today’s limited perspectives on diversity and sustainability, it seems likely African vegetables provide opportunities for more sustainable land use, in large measure because of the relative gentleness with which they treat the land. In addition, they provide ecosystem services: pollen and nectar for bees, for instance, or effectively swath the soil. In addition, their increased use acts like an in-situ conservation program that, at least in some measure, helps preserve Africa’s ancient heritage of food plant genes. This is important because the diversity in these crops is diminishing and essentially nothing is being done to conserve them in a comprehensive manner.

Below is a summary of the merits, *specifically in terms of sustainable landcare*, of each of the 18 vegetables this book highlights.

## **Amaranth**

Amaranth demonstrates exceptional vitality in many types of sites. Most are pioneer species, whose niche in nature is the quick colonization of disturbed land. They use the C4 photosynthetic mechanism, common in arid-land species, which enables them to survive not only hot weather but dry weather as well. Given some ingenuity, it seems they could be turned to good account for quickly protecting naked land until it can be re-clothed with a longer lasting cover.

## **Bambara Bean**

Bambara bean epitomizes the idealists’ ideal of a “sustainable crop.” Every plot is a mixture of genetic diversity and no plant is fertilized or sprayed. In addition, the species’ nitrogen-fixing capacity helps boost soil fertility, naturally. The crop can even be used as a soil conditioner. And beyond all that, it thrives in laterite, the ancient, reddish acidic soil substrate that is toxic to many plants and is an

underlying curse of tropical agriculture. Programs aiming to achieve sustainable farming in Africa could find bambara bean a good foundation around which to base their programs.

## **Baobab**

Extending the use of baobab leaf to regions beyond West Africa offers possibilities for enhancing both the crop and the environment, not to mention nutrition and rural prosperity. Already often likened to “Africa’s soul,” this is a tree that can tap into the heart of many of the continent’s most basic needs: humanitarian, economic, *and environmental*.

## **Celosia**

Humidity and heavy rainfall fail to limit growth, so celosia is commonly cultivated during the wet season when other crops collapse due to weather or wanton maladies. Because of its tolerance to conditions both wet and dry, and because it is usually unaffected by pests, diseases, or soil type, it is among the most promising greens for unforgiving or fickle growing conditions. The plants spring up with surprising vigor from tiny seed. They have special promise for cultivation next to millions of huts and hovels, whose occupants can then pluck off some leaves each day and drop them into the soup pot. This is about as gentle an agriculture as is possible.

## **Cowpea**

One of the best landcare food crops, cowpea has deep roots that help stabilize the soil as well as dense foliage that shades and covers the surface and preserves moisture. Both these below-ground and above-ground traits are of special importance in the dry zones, where moisture is at a premium, soil is fragile, and wind a dirt-scouring demon. Like most other legumes, cowpea fixes atmospheric nitrogen, thus lifting the nitrogen content in the soil around it. It is often intercropped with sorghum, millet, or maize, as much to foster their good health as to furnish its own beans.

## **Dika**

Dika thrives in places such as the evergreen forests of Central Africa, and its special adaptation to heat and humidity raises the possibility of improved forms becoming employed in the form of an eco-friendly crop for dense, moist, heavily shaded conditions. Also, in southeast Nigeria, dika has been extensively planted to control soil erosion. In the future, it might even help reduce the pressures to damage the ecosystem whose future worries so many today: the African rainforest. People with dika trees will have few pressures to seek new land to cultivate.

### **Eggplant (Garden Egg)**

This very adaptable crop can be grown in widely different climates. The plants are fast maturing and produce several harvests of fruits, so they yield both quick results and extended ones. This notably benefits soil conservation activities, especially when eggplant is used to cover bare soil in the spaces between the farm's main crops. They tend to tolerate shade and so can be fitted in around various taller plants, such as bananas, cassava, and trees. They are suited to various infertile and difficult soils, and are likely candidates for wringing food and income from numerous kinds of "agricultural wastelands." All this makes garden eggs good for the ground.

### **Egusi**

Egusi is easy to grow. Indeed, it survives on barren sites, not to mention some of the driest and most climatically challenged locales. Further, it blankets the soil and helps protect the surface from damaging rain and wind. Most of all, though, this vigorous annual suppresses weeds. The plantings may need a month or so of tending, but after that they typically remain weed free.

### **Enset**

Surprisingly, farmers often do little to maintain or improve their enset plots, other than add manure. Although they incorporated exceptional quantities of animal waste, it is still fair to say that the plant provides a long-term sustainable food supply with minimal inputs. It is said that many enset fields have been in continuous production for decades, if not centuries, and yet they remain productive, stable, and unfailing. If any food crops can match that record we've not heard of them.



### **Lablab**

Beyond all its uses for food and fodder, the plant can be used advantageously to provide organic matter and fix soil nitrogen, thereby boosting subsequent crop yields in a cheap and environmentally friendly manner. It is possible that lablab could become an essential part of certain sustainable farming systems. Managers of coconut, rubber, and oil-palm plantations know from

long experience that it is one of the most valuable, trouble-free, and trustworthy of all leguminous herbs for suppressing weeds and rejuvenating worn-out soils. To them the food is a trivial matter by contrast with the environmental advantage.

### **Locust Bean**

It is noteworthy that the locust tree tolerates a wide range of alluvial, sandy, and lateritic soils. It also resists pests and diseases, survives fires, and thrives in full sun and fearsome tropical heat. Moreover, its deep roots make it almost independent of equable rainfall. All this would seem to make locust an ideal candidate for mass planting in appropriate parts of Africa, notably the once-forested savannas. The trees also promise to make many now sun-drenched streets and highways into shady food waysides. All in all, more locust beans—whether planted for provisions or protection—add up to more hope for a better continent.

### **Long Bean**

Although nothing is reported about long bean *per se*, other cowpea forms fix nitrogen efficiently and make useful living mulches for restoring barren land. Long bean should do the same. Indeed, it has been called a nearly perfect match for Africa's soil, Africa's weather, and Africa's people. The seeds of select strains also cook fast, an important consideration wherever fuelwood is scarce and expensive, as it is in that vast parched crescent of concern between Senegal and Mozambique.

### **Marama**

In principle at least marama should prove ideal in the vulnerable drought-prone sandy zone of southern Africa. But not enough is known about this crop to suggest large-scale "environmental" plantings.

### **Moringa**

This raggedy species looks like a forester's nightmare but its ability to thrive in wastelands and provide rapid tree cover could make it the choice for many reforestation projects. Likely, too, it is a good nurse crop for slower-growing species that eventually dominate the site. In addition, moringa is an excellent candidate for fast-track beautification of streets, slums, and squatter settlements. The presence of the living tree, though far from spectacular, improves the scene as well as the surroundings—providing shade and shelter from the elements.

### **Native Potatoes**

While much remains to be learned about the native potatoes themselves, a recent report declares that: "root crops will be many things to many people by 2020." Driving the authors to this deduction is the adaptation



of root crops to marginal environments, their vital role in promoting food security at the household level, and their flexibility in mixed farming systems. There's no reason to doubt that such conclusions also apply to these little-known root crops and that the African landscape will benefit thereby.

### Okra

By and large, okra seems an eco-friendly crop. Though not a legume, it is not destructive to the soil. Quite the opposite: At the end of the harvest season, the foliage and stems can weigh 27 tons per hectare. With fuel costs rising worldwide, okra biomass seems likely to become more notably useful than even now, especially as more tropical forests are destroyed.

### Shea

Shea (and locust) commonly provide the only tree cover across a vast area that is vulnerable to

desertification. A self-reliant perennial species providing food in the dry, drought-seared savanna would seem the ultimate in sustainable agriculture. Making the most of the difficult climate and the most of the largely worn-out soil, the trees need little care and may live for centuries. The time-honored farm/park landscape covering major portions of the Sahel is said to be a perfect example of large-scale agroforestry at its best.

### Yambean

African yambean could well prove to have a superb soil-repairing capacity. Already, there is preliminary evidence that it could be excellent for crop rotations, for ground cover, and for binding soil. The plant thus seems a fine candidate for sustainable development purposes. This is, in other words, a food source that supports itself while helping both the soils beneath and the species surrounding and succeeding it.

**TABLE 1: POTENTIAL ROLES FOR SELECTED AFRICAN VEGETABLES**

*** = <i>Outstanding</i> ; ** = <i>Notable</i> ; * = <i>Average</i>	Overall	Nutrition	Food Security	Rural Development	Sustainable Landcare	PRIMARY OCCURRENCE			
						West Africa	Central Africa	East Africa	Southern Africa
Amaranth	**	***	**	***	*	√	√	√	√
Bambara Bean	***	***	***	***	**	√	√	√	√
Baobab	**	**	***	***	***	√	√	√	√
Celosia	**	*		*	*	√			
Cowpea	**	***	***	**	**	√	√	√	√
Dika	**	**	*	***	***	√	√		
Eggplant (Garden Egg)	**	*	**	**	**	√	√	√	√
Egusi	***	***	**	***	**	√	√		√
Enset	*	*	***	*	**			√	
Lablab	***	**	**	***	***	√	√	√	√
Locust Bean	**	**	***	**	***	√			
Long Bean	***	**	*	***	**	√	√	√	√
Marama	*	*	*	*	*				√
Moringa	***	***	**	***	**	√	√	√	
Native Potatoes	*	**	**	**	*	√	√	√	√
Okra	**	**	**	***	**	√	√	√	√
Shea	***	*	**	***	***	√			
Yambean	**	***	**	*	***	√	√	√	√

# WHAT WE CAN DO

**T**he edibles highlighted here can be used for probing Africa's most basic problems—hunger, malnutrition, rural poverty, environmental destruction. For Africa, these species represent some of the best foods for the future. They also represent some of the best science projects. In addition to scientists and policy-makers, there's much for ordinary folks and non-governmental organizations to do. Here are some suggestions.

## In the Classroom or Forum

- Create classroom materials and conduct children's gardening projects;
- Foster traditional African vegetables in university courses, government extension programs, agricultural fairs, and operations run by foundations, foreign governments, and development banks;
- Alert decision-makers, philanthropists, corporate leaders, and politicians to the untapped potential of these vegetables.

## In Research

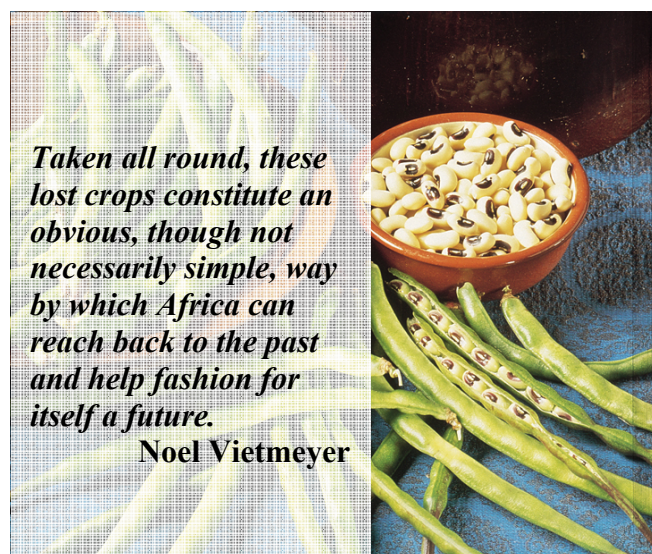
- Conduct research on food technology, nutritional analysis, DNA probes, taxonomic identification, toxicological tests, agronomy, horticulture, pathology, vegetative propagation, selection, breeding, and more.
- Translate documents such as this one into local languages or translate scientific papers to-and-from especially French;
- Compile country profiles of a lost crop, including regional recipes, beliefs, stories, management methods;
- Search colonial-era archives in Africa and Europe for any previous investigations;
- Record these crops' myriad vernacular names and uses;

## In the field and marketplace

- Learn from local farmers how to master the complexities of growing each vegetable under the prevailing local conditions;
- Coordinate the collection of a lost crop's seeds, locally, nationally, regionally, or perhaps internationally;
- Sponsor or monitor the collection of plant materials, the documentation of traditions, experimentation within laboratories, for vegetables important to a particular region.
- Provide a forum for swapping or selling seeds or other planting materials in an open, ethical exchange.
- Develop and adapt processing, storage, and transportation technologies;
- Develop new recipes incorporating them into different cuisines;

## On the Web

- Establish a cyber-exchange linking suppliers of African crop products to marketplaces around the world;
- Set up websites to highlight a vegetable, a region's indigenous vegetables or the use of native produce to counter a problem such as malnutrition;
- Run an email alert service to pass on the latest news relating to these resources as advances emerge worldwide;
- Organize web-links among institutions and individuals working on Africa's "lost crops".



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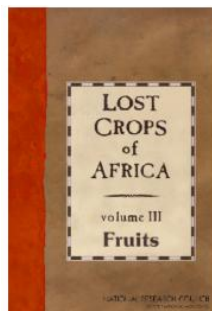
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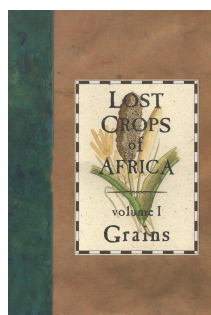


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## *Lost Crops of Africa: Volume III: Fruits (forthcoming)*

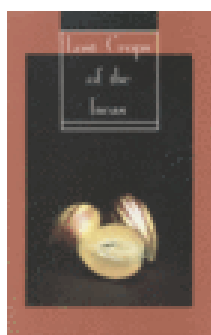
This report is the third in a series evaluating underexploited African plant resources that could help broaden and secure Africa's food supply. The volume describes 24 little-known indigenous African cultivated and wild fruits that have potential as food- and cash-crops but are typically overlooked by 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 chapter, based on information provided and assessed by experts throughout the world. Volume I describes African grains and Volume II African vegetables.



## *Lost Crops of Africa: Volume I: Grains (1996)*

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There is an overlooked food resource in sub-Saharan Africa that has vast potential: native food plants. All in all, Africa has more than 2,000 native grains and fruits—"lost" species due for rediscovery and exploitation. This volume focuses on native cereals, dispelling myths about the nutritional value, flavor, and yield of African grains. The authors present information on where and how each grain is grown, harvested, and processed and list its benefits and limitations as a food source.



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