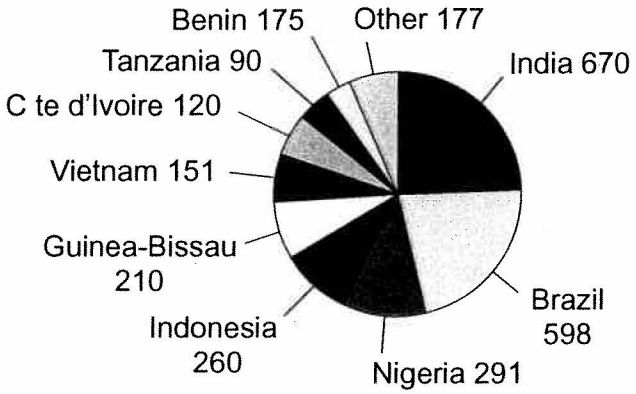
Cashew *Anacardium occidentale*

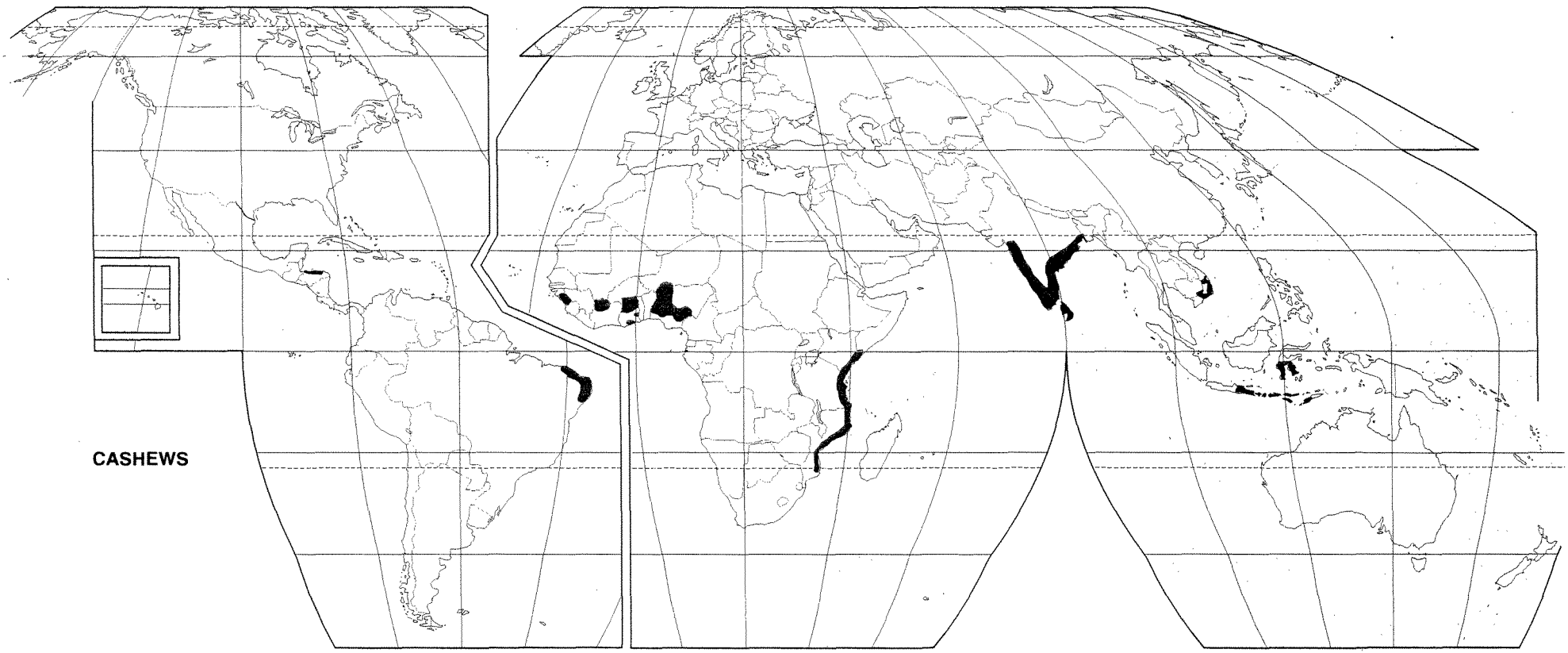
Production	
Area Under Cultivation	2.7 Million ha
Global Production	1.6 Million MT
Average Productivity	593 kg/ha
Producer Price	$425 per MT
Producer Production Value	$594 million
International Trade	
Share of World Production	62%
Exports	0.2 million MT
Average Price	$4,939 per MT
Value	$867 million
Principal Producing Countries/Blocs (by weight)	India, Vietnam, Nigeria, Brazil, Tanzania, Indonesia, Côte d'Ivoire, Guinea-Bissau, Vietnam
Principal Exporting Countries/Blocs	India, Vietnam, Brazil, Tanzania, Guinea-Bissau, Côte d'Ivoire,
Principal Importing Countries/Blocs	United States, Netherlands, United Kingdom, Germany, Japan, Australia, Canada, France
Major Environmental Impacts	Conversion of natural forest in west, east and southern Africa and in Brazil Plant toxicity tends to discourage other biodiversity in the same area
Potential to Improve	Good Better management practices are known Impacts and inputs are few and can be reduced further Organic and fair trade certification exists

Source: FAO 2003. All data for 2000.
Note: Production figure is in unshelled nuts and exports are in shelled nuts or kernels. The conversion rate used: 5 kg unshelled nuts = 1 kg shelled nuts.

Cashew

Area in Production (Mha)




CASHEWS
Main areas of production
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Chapter 11

Cashew

Overview

The cashew is native to northeast Brazil. At the time of Portuguese colonization, cashew was a major food crop for Indians throughout the region. Large native stands of cashew trees were found throughout the northeast, especially on coastal lands but also well inland. The leaf of the cashew tree contains compounds that are toxic to other plants and animals. Leaf fall discourages the growth of other vegetation under the cashew tree. Also, the seed is surrounded by a concentrated caustic solution that burns the skin. This prevents wild animals from eating the seeds. These two characteristics encourage the growth of large stands of cashew trees that dominate the landscape.

Cashews can grow to be quite old. Unlike many trees, however, as they get older they tend to sprawl and branches touch the ground, take root, and become the base of other trunks that continue to sprawl, take root, and expand the tree farther and farther from the original base. The oldest and largest cashew tree now alive in Brazil is so old that it has spread over an entire hectare of land (Morton 1987). While little more than a foot in diameter at the main trunk, the tree is estimated to be more than a thousand years old.

Mature trees commonly have a canopy diameter of 12 meters. However, studies of roots show that while they often grow quite deep to tap into water sources, they also spread laterally at distances that are commonly twice that of the canopy.

The cashew is unusual because it flowers, sets fruit, and maintains a full leaf cover during the driest part of the year. Good yields occur when it is dry during the peak flowering period. About 14 percent of flowers are hermaphroditic; the remainder are male. About 70 percent of the hermaphroditic flowers fail to produce nuts. The crop is mainly cross-pollinated. Insects play an important pollinating role, as does the wind. The period from flowering to fruit fall is from fifty-five to seventy days.

In the sixteenth century, the Portuguese took cashew seeds to Africa, India, the Middle East, and other parts of the world. The value of the plant at that time was as cheap food (fruits and kernels), but more importantly it was a way to stop soil erosion in coastal areas. Cashews grow well in sandy soils and are extremely tolerant of saline soils. Cashews are grown throughout coastal areas in the tropics.

The trees produce nuts, fruits, gum, and charcoal. The only cashew product traded in any quantity internationally, however, is the nuts. The cashew fruit is as unusual as the rest of the tree. The shell of the nut is leathery and spongelike, not brittle, and contains a thick oil. The nut kernel is protected by an additional thin skin (the testa). The nuts are self-contained and are attached to the end of a fruit (called a cashew apple) that has many different uses, particularly in Brazil and in parts of Africa and Asia. There is no information available about the total production of fruits worldwide or the proportion of that total that is consumed.

Producing Countries

The Food and Agriculture Organization of the United Nations (FAO) reports that there were nearly 2.7 million hectares planted to cashew trees in 2000. This data is somewhat incomplete, however. Brazil, for example, has large areas of natural cashew stands that are not captured in such statistics. In fact, it is estimated that most of Brazil's production comes from such areas. The FAO data indicate that the main producing countries by area are India (670,000 hectares), Brazil (598,490 hectares), Nigeria (291,000 hectares), Indonesia (260,000 hectares), Guinea-Bissau (210,000 hectares), Benin (175,000 hectares), Vietnam (151,000 hectares), Côte d'Ivoire (95,000 hectares), and Tanzania (90,000 hectares). According to the FAO these nine countries account for nearly 94 percent of all land used to grow cashews and just over 91 percent of all cashew nut production (FAO 2003).

In 1994 FAO statistics indicated that the main cashew producers by weight were Brazil (32 percent), India (24 percent), Mozambique (9 percent), Indonesia (6 percent), and Tanzania (5 percent). However, by 2000 India produced and processed more cashew nuts than any other country, as shown in Table 11.1. It was followed by Vietnam, Nigeria, Brazil, and Tanzania (FAO 2003). During the 1990s much of India's growth came from shelling the nuts produced in other countries, particularly in African countries. This happened because India's labor productivity costs are lower than Africa's. India is not only the biggest cashew producer, it is also the second largest consumer of cashew kernels. Indian cashews are known in the international market for their small size and overall shelling quality. In addition, though, they are known for their variable taste; this may result, in part at least, from the fact that nuts shelled in India have been grown in many different countries.

Table 11.1 Main Cashew Producing Countries by Area and Total Production, 2000

Country	Area Harvested (ha)	Cashew Nut Production (MT)
India	670,000	500,000
Brazil	598,490	114,467
Nigeria	291,000	184,000
Indonesia	260,000	90,400
Guinea-Bissau	210,000	72,725
Benin	175,000	26,000
Vietnam	151,000	270,400
Côte d'Ivoire	125,000	78,000
Tanzania	90,000	121,200
Mozambique	50,000	57,894
World	**2,742,167**	**1,600,002**

Source: FAO 2003.

For the past 40 years, India and Brazil have dominated cashew production. In 2000, they still accounted for 47 percent of the global area planted to cashews and 44 percent of total production. Along with Nigeria, Tanzania, Mozambique, and Kenya, they are the long-standing producers. In addition to these countries, however, there are a number of new producers that are increasingly important. These include Vietnam, Indonesia, Guinea-Bissau, Benin, Côte d'Ivoire and Ghana. In Vietnam, the value of cashew exports has surpassed tea to rank third among top agricultural exports, just after rice and coffee. Sri Lanka is another minor producer of cashews in Asia. Even though it is small in comparison to other countries, the crop is important, and there are some 30,000 small-scale cashew processors in Sri Lanka.

Cashews are an important commodity in Brazil. With a total area of some 700,000 hectares, the industry is responsible for annual revenues on the order of U.S.$200 million per year. In addition there are some 300,000 jobs created directly and indirectly by cashew production and the processing of nuts and juice (Porto and Paiva 2001).

Table 11.2 gives information on global cashew production based on how much production is exported and whether the exports are of unshelled or shelled nuts. While this data is incomplete (not all countries report it), it still gives an indication as to which countries consume most of their cashew nut production internally, which export the lower-value unshelled nuts, and which shell their own nuts to take advantage of the more valuable exports.

Table 11.2 Global Production and Trade of Cashew Nuts, 2000

Country	Cashew Nut Exports		Total Production
	Unshelled (MT)	Shelled (MT)	(MT)
Brazil		33,588	114,467
India	7,485	81,661	500,000
Kenya	511	87	12,500
Mozambique		4,700	57,894
Sri Lanka	28	91	4,610
Tanzania	94,482		121,200
Côte d'Ivoire	63,379	353	78,000
Guinea-Bissau	73,210		72,725
Indonesia	25,621	1,998	90,400
Vietnam	29,731	34,200	270,400
Nigeria	2,947		184,000
Benin			26,000
World	**229,189**	**139,438**	**1,600,002**

Source: FAO 2003.

Range of Cashew Products

Several products can be produced from the cashew tree. These include nuts, fruits, nutshell liquid, and resin to name but a few. Of all these products only cashew nuts have significant trade internationally.

Cashew nuts are internationally the best-known product of the tree. Cashews are one of the most delicious and highly sought-after nuts. People seem to enjoy plain, roasted cashews the most. Cashews are also used to add flavor to a wide range of foods such as ice creams, sweets, chocolates, cookies, meat dishes, etc. There are hundreds of recipes that use cashew nuts. The cashew is a very nutritious food; as shown in Table 11.3 it is high in protein. It contains no harmful cholesterol and is rich in minerals and vitamins. It has as little as 1 percent soluble sugar. Thus, it can be safely consumed by those suffering from diabetes. When ground, the cashews are a relatively easily digested form of protein and are recommended for people on chemotherapy or with HIV/AIDS. Cashews are useful for those with anemia since they are rich in iron. As with most nuts, however, some people are allergic to them. Cashew nut consumption may pose a health risk to persons sensitive to other nuts as well as to its botanical relatives poison ivy, poison oak, or poison sumac.

Table 11.3 Chemical Composition of Shelled Cashew Nuts

Constituents	Percentage
Proteins	21.0
Fat	47.0
Moisture	5.9
Carbohydrates	22.0
Phosphorus	0.45
Calcium	0.05
Iron	5.0 mg/100g

Sources: Davis 1999; CEPC 2003.

The cashew fruit (cashew apple) is rich in vitamins and amino acids. It can be used for making many typical fruit products such as jellies, jams, juice, wine, and liquor. In many parts of Africa the fruit is made into a wine and a spirit for sale on local markets. In Brazil, the apple is used mostly to make juice, but it is also used in the manufacture of jams and alcoholic drinks. In Goa, India, the juice from the apple is fermented and then distilled into a cashew liquor called *feni*. In countries that utilize the cashew apples, the income from the sale of wine and liquor can be equal to the income from the sale of nuts (Jim LaFleur, personal communication).

The apple's juice has an antiscorbutic (antiscurvy) effect due to its high vitamin C content. It is used extensively in the cosmetic industry, as a substance capable of capturing free radicals. It is used in the preparation of shampoos, lotions, and scalp creams. The juice from cashew apples, when the tannin has not been removed, is prescribed as a remedy for sore throat and chronic dysentery in Cuba and Brazil. Fresh or

distilled, it is a potent diuretic and is said to possess sudorific (sweat-inducing) properties. The juice is applied as a liniment to relieve the pain of rheumatism and neuralgia (Morton 1987; Grieve 1995).

Even when discarded, the cashew apple serves as food for livestock or wild animals. At this time, tremendous volumes of cashew fruit are thrown away by the nut industry. In Brazil alone an estimated 400,000 metric tons of fruit are thrown away each year, and most of the fruit is discarded in India as well. By 1997, Vietnam was producing some 500,000 metric tons of cashew fruit that were not being used (Kinh et al. 1997) Since most of this fruit is de facto organic, it could be certified and used as a backup juice (replacing white grape) in the organic juice industry.

Cashew nutshell liquid is a natural resin that is extracted from the honeycomb structure of the cashew nutshell. It contains 90 percent anacardic acid and 10 percent cardol. Both are caustic and can contaminate the nuts and blister the skin of the shellers (Davis 1999). The liquid is a by-product of the cashew industry and a versatile industrial raw material. There is considerable potential for its utilization in the development of drugs, antioxidants, fungicides, and other chemicals. In the tropics, the liquid from cashew shells is used in some medicines for the treatment of ailments such as scurvy, warts, ringworm, cancerous ulcers, and even elephantiasis. The oil is also used for treating timbers to make them termite proof.

The liquid is now distilled to make a number of substances but the primary ones are cardanol and cardol. The major use is to make cashew friction particles for the brake lining industry. The liquid is also used to make resins, varnishes, paints, plastics, insecticides, preservatives, drying oil, epoxy, binders in automotive strip linings and brake linings, and heavy duty coatings that have the ability to stick to poorly prepared surfaces. The next generation of products from cashew nutshell liquid have lower viscosity and lighter colors. Many will aid epoxy and friction formulators to meet the demands of the next century (AP Horticulture 2003; Cardolite 2003).

A number of minor products can be produced from different parts of the cashew tree:

- Gum from cashew fruit stems is used as a varnish for books and woodwork. It is said to protect them from insects and ants.
- Anacardic acid, a substance derived from oil in the nutshell, has antibiotic properties against gram-negative bacteria and is also used to treat leprosy and ringworm.
- The black juice of the nut and the milky juice from the tree after incision are made into an indelible marking-ink.
- The stems of the flowers give a milky juice which, when dried, is hard and black and is used as a varnish.
- The timber from the tree can be used in furniture making, boat building, packing cases, and in the production of charcoal. When farmers trim the trees to increase production by exposing branches to direct light, they can also turn the trimmings into charcoal.

- The leaves have some medicinal uses. An infusion of the leaves can be gargled for sore throat. In Indonesia older leaves are used to make poultices to treat burns and skin diseases.
- The gum from the tree, when dried, has properties similar to gum arabic and guar gum. Those products sell for more than $2,000 per metric ton as stabilizers and emulsifiers in a wide range of foods from beer to ice cream to salad dressings. In the age of fat-free food, such emulsifiers are increasingly important to bind ingredients. However, since many are allergic to cashews, using it as an ingredient in many different foods could pose health and liability issues.

In less sophisticated shelling operations, the cashew nutshell liquid, the shell, and the oil cake are often used as conventional boiler fuel to reduce overall energy costs. The liquid and shell can also be sold to other industries (e.g. foundries or cement works) for similar uses. The oil cake is also a suitable fuel for generating gas for boilers and internal combustion engines.

Consuming Countries

The United States, the European Union, Japan, and the countries of the former USSR are the major importers of cashew nuts. Combined, they account for some 90 percent of global imports. The main European importers are Germany, the United Kingdom, the Netherlands, and France. The United States is the largest importer of shelled nuts, importing nearly half of all exported cashew kernels.

India dominates the cashew nut market. It is the largest producer and importer of unshelled nuts, the largest producer of shelled nuts, and the second largest consumer of shelled nuts. In the past, the former USSR accounted for 25 percent of the global import market for processed cashew nuts, but that market has shriveled up since the breakup of the former Soviet Union.

Asia and Europe also purchase significant amounts of cashew nuts. The Japanese market is the most important market in Asia, but it accounts for only 4 to 5 percent of the international trade of shelled cashew nuts. Some 30 percent of Vietnamese production goes to the Chinese market, while 40 percent is exported to the U.S. market. The cashew nut share of the nut market in the European Union is in the range of 3 percent of the total nut imports.

Production Systems

The cashew tree is evergreen. It grows up to 12 meters high and can have a spread of 25 meters. Its extensive root system allows it to tolerate a wide range of moisture levels and soil types. Commercial production, however, is undertaken on well-drained, sandy loam or red clay soils. Annual rainfall needs to be at least 889 millimeters and not more than

3,048 millimeters. Cashew trees are most frequently found in coastal areas (Intermediate Technology Development Group n.d.).

Many varieties of cashew are cultivated. Some produce better nuts and some produce better fruits. Looking just at the fruits, for example, type K 10-2 has the best size and juice content. Apples of BLA-1 and Ansur 1-27 have high carbohydrate content. The fruit of type M 6/1 has the highest sugar content. K 27-1 has a high vitamin C (ascorbic acid) content. BLA-40 has low tannin content. M 10/4 has high protein content. Vengurla 37-3 has high content of other extractives, and BLA-273 has high crude fiber content. Depending on the end use of the nut or fruit a producer might select one variety over another.

Cashews are grown mostly in arid, coastal areas of India, Southeast Asia, and East and West Africa. On the dry Pacific side of Central America there are also many recently established plantations of cashews. In Brazil they are located as clumps all over the arid area of Rio Grande do Norte between Fortaleza and Natal. They also grow wild inland as far west as the Agreste, a transition zone of sandy soils between the humid Atlantic coastal forest zone and the dry interior. Similarly, cashews are also found in semiarid areas of Asia such as Indonesia. Most of the plantations are on clay soils, though in some parts of Brazil they are on sandy soils. In general, cashews are an excellent crop for deforested and degraded coastal areas. They grow between sea level and approximately 760 meters and grow poorly in high altitudes where the temperatures are too low.

In many countries cashews are grown as border trees on ranches and in orchards with very little care, but the trees always look very healthy. In plantations, they are planted on grids as monocultures. There is nearly always grass cover on the ground but not much more vegetation, as production areas tend to be somewhat saline as well as very dry and this does not encourage other vegetation. The trees are allowed to grow very tall, and there is little tree modification except for topping them off when they become too high.

Cashews are easy and inexpensive to produce. They can be grown in small plots by farmers, and with simple but regular plant protection measures, they yield well above 10 kilograms per tree per year. Field maintenance of cashew requires less time and money than most other perennial crops and any annual crop. Some pruning is necessary to create light for the best flowering, fruit growth, and maturation as well as to facilitate nut collection and allow for weed control.

The tree's main soil requirement is unimpeded drainage. Good yields can be achieved without the addition of fertilizers or manures. Cashew is often grown satisfactorily on infertile sands. Though trees will bear without added nutrients, fertilizers (such as urea, rock phosphate, and muriate of potash) are sometimes used, usually applied in circular trenches around the plants. The best growers avoid applying fertilizer during heavy monsoons (which wash away fertilizers) and also when the soil moisture is poor (as soil moisture promotes better absorption of nutrients).

Cashew trees are usually planted at stake, i.e. the seeds are planted directly in the field. (Cashews can also be propagated by vegetative means including grafting, air layering, or

tissue culture.) The seeds are floated prior to planting; any that float are not considered viable and are not planted. Ideally, trees should be planted as near the beginning of the rainy season as possible. In Asia cashew trees are usually planted as space permits among coconut palms, mango trees, banana plants, cassava, etc. However, they are also planted in pure stands in southern Tanzania. When cashews are planted at a close spacing, the trees must be thinned as soon as their canopies meet.

Once established, trees and fields need little care. In the first couple of years, lower branches and suckers are removed. Intercropping may be done during the first few years, with cotton, peanuts, or yams. Cashews grow quickly and start producing fruits in the second or third year. Full production is attained by the tenth year, and trees continue to bear until they are about thirty years old. When the trees are older, cattle and other livestock are allowed to graze among them to keep the weeds in check.

Harvesting is done when the fruit changes color from green to yellow, orange, red-orange or red. This can be done by picking with a pole-picker that has an attached net. This tends to be the preferred method of harvesting to ensure that the fruits are intact when sold as fresh fruit or into the juice market.

Nut producers prefer to simply let the fruits with attached nuts fall to the ground. They fall only when they are mature. However, once nuts fall, they must be picked up within a week or they will begin to discolor. The nuts are picked from the ground, separated from the fruit, washed, and dried under the sun. Small growers can store the nuts in a dark, dry place for some months in order to collect a sufficient volume to sell. The nuts are eventually sold to intermediaries.

Yields vary. In Tanzania, yields of cashew nuts from pure stands average about 590 kilograms per hectare. However, under optimal conditions, yields in Tanzania can reach 1,100 kilograms per hectare. Studies have shown that with genetic selection, yields can reach as high as 2,200 kilograms per hectare (Agriculture News from Africa 2000).

The World Bank estimates that roughly 97 percent of cashews are harvested from wild growth in Brazil and small peasant holdings throughout the world. Almost all of East Africa's cashew crop is grown on small farms. The Bank estimates that only 3 percent come from monocrop cashew plantations (Rosengarten 1984, as cited in Davis 1999). Consequently, cashews are an extremely important income generator for small farmers and the rural poor. For most of these producers cashew is an attractive crop because it provides income even when completely neglected. Furthermore, on-farm or local processing can increase income. Thus, the crop provides value-added processing employment opportunities, unlike many agricultural products, as well as foreign exchange earnings for the country.

Another important factor with cashews is that they can be produced on a wide range of soil types so that many producers can grow them. They also produce both fruit and nuts. Either or both can be sold for income or consumed on the farm depending on the needs of the producer. This makes them a very versatile source of income, akin to honey.

There are some constraints to cashew production, however. Some of these constraints have to do with achieving scales that would allow the processing to become more efficient. For example, in order to avoid complying with labor laws and save taxes in countries such as India and Brazil, many cashew processors keep the size of their units small so as to enjoy the status of small-scale industries. Extracting cashew kernels from their tough outer shell is a laborious job. The fact that shelling cashews is so labor intensive has increased employment opportunities in both urban and rural areas for hand-shelling. While this system creates more higher-value whole nuts, hand-shelling is slower than shelling nuts with mechanical technology. The new technology, though reducing labor costs over time, results in much greater breakage. The main advantage of the new technology is that it tends to meet buyer requirements for hygiene, quality, quantity, and schedule.

There are other issues that affect the production and value of cashews. Some diseases affect cashew nuts. For example, an insect pest in Brazil has reduced the marketable nut harvest by some 50 percent. Many producers also do not know how to manage their groves by pruning, spacing, or weeding. Harvest and storage techniques are not always appropriate, and improper techniques can produce nuts of no or low value.

The fact that cashews are essentially a source of income for small farmers and landless labor is both the blessing and the curse of the industry. There is, as a consequence, an absence of market integration or coordination between producers, shellers, and exporters. This results primarily from the fact that for most farmers this is a rather small source of income compared to other cash or food crops. They do not see it as a crop that is worth a lot of effort. There are also often antagonistic relations between growers, shellers, and the industry as a whole. Many intermediaries are involved in the market chain and this tends to make it much less transparent in terms of price and product quality.

Processing

Shelling cashew nuts is undertaken in large factory operations as well as decentralized smaller-scale operations and even piece work systems connected to either of the other systems. There are hundreds of thousands of small-scale cashew processors. Guinea-Bissau has some 90,000 and Sri Lanka has 30,000, for example. Similarly, small-scale processors are responsible for approximately 95 percent of all shelled raw nuts sold into the market in Mozambique (Wandschneider and Garrido-Mirapeix 1999). In Brazil there are twenty-three large mechanical processing plants with capacity to shell 240,000 metric tons of nuts per year. There are also some 120 small, manual processing plants with a combined capacity to shell 20,000 metric tons of nuts per year (Porto and Paiva 2001).

The cashew harvest lasts for two months. Due to the protective liquid in the shell, nuts can be stored for up to a year before processing, although most processors feel that quality begins to deteriorate after six months. One of the main costs of processing facilities of any kind is the working capital to stockpile the nuts that will be shelled over the next 6–9 months.

Whether small or large-scale commercial processing is to be undertaken, the nuts need to be dried and then stored in an aerated and dry environment. The initial drying usually takes place in the sun. The nuts are then sorted by size.

After the nuts are dried to 10 percent humidity, the rest of the processing can begin. In small-scale artisan processing systems the nuts are boiled in water for 40 minutes in order to separate the kernels from their shells and to loosen the paper-thin skins on the nuts. In larger commercial operations, the nuts are passed through a pressurized steam system, usually an autoclave, to do the same thing. In both instances, the shells are then removed.

Small-scale processing units treat the steamed or boiled nuts differently than larger systems, however. In the small-scale or artisanal system the nuts are again sun-dried and sorted by size. The reason the nuts are dried again is to shrink the nut from the shell after it has absorbed water from the boiling process. In large-scale shelling operations, the soaked nuts are partially dried in ovens to shrink them from the shell and reduce the drying time required before they can be shelled. Drum roasting and hot-oil roasting are also undertaken in larger factories prior to shelling to neutralize the liquid in the shell.

The next processing step in both systems is to slice the tough, leathery cashew shell off of one side of the nut and then separate the kernels from their shells. Cashew processing—the removal of the kernels from the tough shell and the skin—is more complicated than it appears because of the irregular size and shape of cashew nuts. In fact, the irregular size and shape make the mechanical shelling of perfect, whole nuts very difficult.

In more primitive shelling operations, now mostly for home or local consumption, the unshelled nuts are roasted in an open pan. In this process the nut begins to smoke. It is then removed from the fire, cooled and shelled immediately by hand. This process tends to scorch parts of the kernel, reducing its value and making it hard to sell on international markets. These nuts, however, have a distinct flavor that is preferred in the growing regions.

In all small-scale operations, and many large-scale ones too, the shelling process is done by hand at least for the larger nut sizes that are more valuable when sold as whole nuts. The biggest problem for the industry has been to find ways to undertake this process mechanically to lower labor costs. Some of the larger commercial shelling operations use mechanical shelling, either with automated conveyor belts that pass the nuts through blades to cut them open or using dry freezing to crack the nuts in some of the most capital-intensive operations. Unfortunately, mechanical shelling ends up with the majority of the shelled nuts being broken (e.g. 55 percent or more). Broken nuts have far less value. By comparison, experienced hand-shellers can produce up to 90 percent or more whole kernels from the nuts they shell (Porto and Paiva 2001). Two people with specialized skills are required to work together to shell nuts by hand—one cuts the shells and the other peels the outer shell from the kernel. Two people can shell and peel about 15 kilograms of kernels per day (this is the main reason that cashew nuts are more expensive than other nuts). When shelling by hand, workers have to be careful because the liquid in the nut shell can burn the skin if proper measures are not taken. Normally this means using a vegetable oil or even rubber gloves to cover the hands at all times.

Another disadvantage of the larger processing plants is the tendency of the steam pressure system to cause discoloration and a deterioration of quality. Once nuts are heated, chemical changes can occur in the oils that tend to reduce their freshness and overall shelf life.

After shelling, the kernels are baked in ovens for 7 to 8 hours at 70 degrees Celsius to lower their moisture content to 4 percent. Reducing the humidity of the kernels increases their shelf life. Depending on the technology employed, drying can be undertaken either in the open sun, in solar furnaces, or in high-volume furnace dryers. Increasingly, shelling operations use the nutshells as fuel to power the high-volume driers. Once the moisture has been removed the nuts are cooled.

After the nuts are cool enough to work with, the paper-thin inner skin is removed. This skinning can be done either by hand or by machine. By hand, one person can remove the skin from about 10 to 12 kilograms of kernels per day (Intermediate Technology Development Group n.d.). Breakage during the peeling can be as much as 30 percent.

Once skinned, the kernels are ready to be classified and packed. Classification is done by size of whole kernels, color, and physical integrity (e.g. wholes, halves, various sized pieces, crumbs, dust). There are dozens of classifications of cashew nuts, from the largest whole nuts all the way to cashew powder. Each is recognized by traders and each has a different value. The overall high value of cashew nuts is sufficient to warrant such differentiation of the product.

Once sorted, cashew nuts are vacuum-packed in 20-kilogram Mylar bags inside cardboard boxes. Alternatively, some factories seal the nuts in 20-pound (9 kilogram) tin cans. Oxygen causes the quality of nuts to deteriorate, so whenever possible oxygen is removed from the containers by flushing them with nitrogen. The nuts are generally exported in large container lots. The total weight of a container is 15 to 17 metric tons. However, because all boxes or cans are clearly marked, nut sizes can be mixed within a single container depending on the purchase of the buyer.

No further processing is ever performed for international markets. However, in local markets many of the nuts are made into confections, pastries, and other products. This does not, however, take place at the shelling factories.

At large-scale processing facilities, another stage of processing occurs after shelling and before the kernels are dried. Cashew nutshell liquid is extracted by the expeller method. It is literally pressed mechanically to release the liquid from the honey combed nutshell. This liquid, which in the past has been treated as toxic waste, is now sold as a by-product with many different industrial uses (see above).

Substitutes

Cashew nuts are delicacies. They are a luxury product in the dried fruit and nut category. The price of cashews is almost double that of the price of other similar nuts against which

it competes in the global marketplace. All other nuts—peanuts, pecans, hazelnuts, almonds, macadamia nuts, Brazil nuts, walnuts, pistachios, and pine nuts—are potential substitutes for cashew nuts. For a global nut market of 395,000 metric tons per year for all types of nuts, the share for cashew nuts averages 70,000 to 75,000 metric tons per year, or between 17 and 19 percent of the total.

Because there are so many nuts that are substituted in the market, total production of all nuts does not tend to swing too dramatically. This wide range of substitutes, in fact, gives cashews and most nuts relative price stability, at least by comparison to many of the other commodities discussed in this book.

Market Chain

There are two markets for cashew nuts—one for unshelled nuts and the other for shelled nuts. Globally, some 62 percent of all shelled cashew nut production is exported (FAO 2003). By contrast, nearly all cashew fruit and fruit pulp has remained a secondary, underutilized home-market product.

The value of the nuts as they move through the market has been crudely described by Porto and Paiva (2001). For every dollar spent on cashew nuts, producers receive (on average) 8 percent, the shelling industry receives 20 percent, and the remainder of the market receives 72 percent.

Before the cashew nut reaches the processing mill it can pass through as many as four different intermediaries, from the farm to the village collector to the larger town storehouse and then to the transporter, who ships the nuts to the processing center. This system has not changed during the past 100 years. As a nonperishable crop, cashews that are stored properly can last for as long as two years before they are finally processed. In general, there are only one or two processing plants in any given area. This means that producers have relatively few options for selling the in-shell nuts.

From the perspective of the processor, however, the market is a little different. Processors can sell their product in Europe, the United States, Japan, or domestically. Some processors sell directly to manufactures (Planters and Cadburys being the largest such corporations), but most sell to importers, brokers, or distributors. Even in this age of globalization, most processors still do not have direct contact with the retailers of cashew nuts.

In India, itinerant merchants and agents collect most of the produce from local growers. At present, India exports shelled cashew kernels of different grades, which are sold to companies in Europe and the United States. These companies in turn use them to make mixed nuts or to manufacture other finished food products (e.g. chocolates, confections, ready-to-eat cereals).

Since the mid-1970s Brazil has steadily increased its exports of shelled cashew nuts, but even so about half of Brazil's nuts are consumed locally. About 75 percent of the cashew

nuts exported by Brazil are shipped to the United States. Brazil's exports now represent only 7 percent of world production but about a quarter of world exports. India dominates exports globally, with about a third, and Vietnam accounts for slightly more exports than Brazil.

In Mozambique up to two thirds of total raw nut production does not enter formal marketing and shelling systems. Instead it is consumed by producer families or sold into local markets. In Mozambique, the marketing of those raw cashew nuts that are traded involves several different actors. There is increased participation and competition in cashew trading in the country, especially at the retail level. Producer associations have begun to intervene in cashew marketing. Moreover, the domestic market for cashew kernels is extremely small in Mozambique, so increased production is forcing those in the market to look for additional markets outside the country.

At this time, however, most of East Africa's cashew nuts are still exported to India, where they are roasted and shelled before being consumed locally or exported to the United States or Europe. By contrast, Guinea-Bissau has stopped exporting unshelled nuts to India and instead is shelling them locally to create employment and add value. As a consequence, six to eight times more money now accrues to the local economy, and the country has become one of the top exporters of shelled cashew nuts in the world (Jim LaFleur, personal communication).

Market Trends

Between 1961 and 2000, global shelled cashew nut production increased by 394 percent (FAO 2003). More recently the expansion of production has slowed to about 3 percent per year. Cashews are one of the few agricultural commodities for which prices have not declined over the past forty years. While there has been a sharp decline in the price of nearly all other agricultural commodities, there continues to be a positive trend in the real price of cashew nuts. The cashew nut market is highly concentrated in some parts of the world, with near monopolies prevailing. This means that producers have few options for selling their nuts and must take whatever price is offered. Otherwise producers face the costs of transporting the nuts some distance to another potential buyer who might not pay any more.

The acreage under cultivation in major cashew-producing African countries like Kenya and Mozambique is decreasing. Much of this is due to diseases that affect the trees' ability to set fruit and produce nuts. The costs of controlling these diseases are high because they are labor-intensive and require purchased chemicals such as sulfur. Because most of East Africa's cashew nuts are exported to India, the potential value added through shelling is not available to the producers, which affects their willingness to tend the trees. Consequently, continued declines in production in East Africa will, in turn, affect the cashew nut industry in India.

In India the area under cashew cultivation is limited, and there is a desire to increase it. Given that many of the trees in existing plantations are quite old, there is also a need to replant them. In addition, contract farming could be encouraged so that producers would have guaranteed markets for their product and processors would have guaranteed supplies to keep their plants in operation.

Once the world leader in raw nut production and an important kernel manufacturer, the Mozambique cashew sector went through a long period of decline after independence. The industry is now struggling to resolve major structural problems. There have been practically no new plantings since the late 1960s, and if the present situation remains unchanged the cashew tree population will continue its natural decline as a result of age and clearing. The domestic market for cashews in Mozambique is extremely small and will remain so for the foreseeable future. This puts the Mozambican cashew industry at a disadvantage vis-á-vis its competitors in India and Brazil, who benefit from significant domestic markets.

As the data in Table 11.4 demonstrates, the five countries that have dominated the cashew nut markets globally have reacted differently to market signals. Kenya, Mozambique, Tanzania and Brazil have decreased or maintained their areas devoted to cashew production while India has increased its area more than 3.5-fold. Globally, the story is a bit different. With the exception of the 1970s, the global area planted to cashews has increased significantly for the past forty years. During the 1990s, however, the total area planted increased by nearly 75 percent (FAO 2003). Most of these trees have not yet achieved full production. As they do, this will definitely increase overall supplies of cashew nuts and unless consumption continues to expand at the same rate, international prices and producer income will fall.

Table 11.4 Trends in Cashew Production by Country, 1961–2000

		Production (MT)		Harvested Area (ha)	
Country	Year	Apple	Nut	Apple Area	Nut Area
Brazil	2000	1,500,000	114,467	580,000	598,490
	1990	1,350,000	107,664	551,844	582,818
	1980	660,054	75,000	184,151	
	1970	405,762	20,309	81,220	
	1961	251,550	9,670	50,000	
India	2000		500,000		670,000
	1990		285,590		530,869
	1980		180,266		447,376
	1970		123,319		281,171
	1961		85,000		200,000
Kenya	2000		12,500		2000
	1990		7,000		1,100
	1980		15,000		2,000
	1970		22,200		2,250
	1961		3,000		300
Mozambique	2000		57,894		50,000
	1990		22,524		40,000
	1980		71,100		130,000
	1970		184,000		290,000
	1961		107,000		180,000
Tanzania	2000		121,200		90,000
	1990		17,060		35,000
	1980		41,416		70,000
	1970		107,445		186,000
	1961		50,000		83,000
World	2000	1,568,008	1,600,002	606,000	2,742,167
	1990	1,415,000	614,278	576,844	1,621,080
	1980	716,914	464,215	208,151	879,473
	1970	451,762	511,939	101,220	855,132
	1961	293,550	287,535	68,000	516,550

Source: FAO 2003.

Developments in India's processing capacity and the processing capacity of those countries who currently sell unshelled nuts to India will be the key determinant of future world demand and prices. Also, if Brazil finds ways to reduce losses from insects, its

increased production, too, will affect the quantity of nuts on the market as well as global prices.

Other economic and policy issues can affect the competitiveness of the cashew nut industry. In 1995 Mozambique was required by the World Bank and the International Monetary Fund to change its policies to allow the unrestricted export of unprocessed cashew nuts to India. It was argued that small producers would benefit from the increased markets and higher prices for their unshelled nuts. By 2000 this still had not happened. The move, however, appears to have cost some 8,500 jobs in the country. In 2000, Mozambique banned the export of unprocessed cashew nuts, ending a five-year battle with the World Bank and International Monetary Fund, but exports have yet to recover (Quenum 2001).

Environmental Impacts of Production

Cashew nut production has long been undertaken on a smaller scale than many agricultural commodities. Most of the money from cashews is made not from producing them but from shelling them before selling them into the market. For this reason, investments have taken place at the shelling level rather than at the production level. This means that there have been few plantation-scale areas of production and few purchased inputs designed to increase production. Both of these factors mean that the environmental damage from cashew production has been less than for most other commodities.

Unfortunately, however, some plantations have been established. Given the harsh conditions that the tree is able to withstand, many of the affected areas have vegetation that would never otherwise be cleared for agriculture. For example, large expanses of cooperative plants of thousands of hectares of cashews are now planted on some interior scrubland areas (caatinga) in Northeast Brazil. Similarly, small farmers have pushed cashew planting into many coastal areas of east Africa as well as the interior areas of southern Africa (e.g. in the Miombo). While individually the plantings are small, collectively they have a large cumulative impact on natural habitat.

Some producers do use pesticides and fertilizers on their crops. By 2000, however, this was the exception rather than the rule. So long as the markets do not increase dramatically for cashew nuts, these impacts are likely to be within acceptable limits because producers will not be able to afford the inputs.

Habitat Conversion

With 97 percent of the total cashew crop produced by small farms or collected from the wild in Brazil, there is still very little large-scale habitat conversion associated with the production of cashews. Plantation establishment could pose environmental impacts, especially in drier, often more fragile and more marginal areas.

Agrochemical Use

There is very little weed control involved in cashew production, other than allowing livestock to graze beneath mature trees. As a result, herbicides are generally not used. Similarly, there are few fertilizers used in cashew production (other than urea rock phosphate and muriate of potash during initial planting), and these are applied very sparingly due to their cost. In fact, most farms do not receive any fertilization for years.

Few, if any, pesticides are used in cashew production in most areas. However, in some parts of Africa two species of *Helopeltis* can damage cashew trees by sucking juices from the leaves, young shoots, and inflorescences. These pests have been controlled by dieldrin sprays or dusting with benzene hexachloride (BHC), or DDT plus BHC (Agriculture News from Africa 2002). If the area for cultivating cashew is large, aerial sprays can be employed. This creates a potential for pesticide toxicity as the pesticide mixture is sprayed over a large area.

One reason for the minimal use of agrochemicals is that producers do not perceive cashews as an important profit-making crop. Rather, it is insurance for obtaining income without high costs during lean times. On many cashew farms the cashew is in fact the vegetation that provides the most food for wildlife; in many areas there are few sources of food for wildlife with as high nutritional content.

Better Management Practices

Cashew trees are one of the few crops that generally have a more positive than negative environmental impact associated with their cultivation. This is because they tend not to be cultivated in plantations that require clearing large areas of land. The notable exception is in Brazil where some cooperatives, with government assistance, have planted thousands of hectares of the trees. Rather, cashews are most often planted in clumps and as border vegetation. Increasingly, they are volunteers that are self-seeded and tolerated by landowners. Cashews support and protect wildlife with their shade, their fruits, and their vertical and horizontal architecture. Even in large plantations, cashews are still a major food source for wildlife.

Cashew trees are very effective at retaining soil and stopping erosion, especially in coastal areas. As explained in the beginning of this chapter, this was why the Portuguese introduced cashew trees in many coastal areas of the tropical world that remain among the most important producers today. Along the coast of Orissa in India, cashew trees are still planted as shelterbelts and windbreaks. They stabilize sand dunes and protect the adjacent fertile agricultural land from drifting sand. More recently, cashews have proven useful as a species of choice for reforestation in degraded areas. They are one of the few trees that do well under such conditions and that generate both food and income for producers so that their survival is ensured.

In general, however, there are a number of important, practical ways that cashew producers, and the industry as a whole, could be made more efficient and profitable. These include:

- Increasing yields by pruning, replanting, or "topping" existing trees with new grafts in order to increase production and control pests.
- Bringing more areas into cashew cultivation, especially areas that are marginal, abandoned, or degraded.
- Undertaking value-added hand processing at the farm or community level so that more of the value of the finished product accrues to the producer or the community.
- Processing the cashew apple into juice, dried fruit, wine, liquor, and other products. The fruit could provide an excellent source of vitamins and minerals for many households that are short on both. Income from the sale of juice could also be significant given the large amount of fruit that is currently abandoned.
- Increasing the ability of local producers and shellers to sort their nuts by standard grades so they are not penalized by buyers who, in turn, capture the value (often as much as 10 to 15 percent) of sorting the nuts by grades.
- Improving local storage capacity and conditions so that cashews can be stored until hand shellers have a chance to process the entire crop. This would also allow the production to be sold onto the world market more gradually so that dumping would affect prices less.
- Increasing transparency and competition among buyers to improve producer prices.

Outlook

Cashew nuts are seen as a valued product by consumers in developed countries. Not only does this mean that consumers are willing to pay more for cashews than for other nuts, it also means that they are more likely to pay somewhat more for other cashew products as well, including fruit, honey, etc. In fact, premiums for organic and fair trade certified cashews attest to their consumer appeal.

Cashew nuts have maintained their value over the past forty years, unlike any other single commodity covered in this book. Without changing the basic price of cashew nuts, there are a number of ways that an increasing proportion of the ultimate retail value of the nuts could accrue to the producers. Recent efforts in Guinea-Bissau have shown that in-shell nut exports can be shelled locally, significantly increasing the income to the local economy. If these efforts can be replicated elsewhere, cashews have the potential of becoming the cornerstone of poverty reduction programs in many coastal tropical areas.

Such a strategy could have a positive impact on the environment as well. If cashew nut producers can make more from their nuts, this added income will take pressure off of other resources, in turn making their use more sustainable. This could have obvious impacts on other agricultural resources. In addition, many cashews are produced on coastal areas, so it is likely that increased income from nuts would take pressure off of wetland and marine resources as well.

Resources

Web Resources

International Tree Nut Council
www.inc.treenuts.org
www.inc.treenuts.org/stats_cashew_jan02.html
Cashew Nut Processing
www.itdg.org
National Research Center for Cashew, India
www.kar.nic.in
Cashew Nut:
www.botanical.com
Cashew nut market worldwide:
businessafrica.hispeed.com
Africa Cashew Articles:
www.newafrica.com
Cashew:
www.hort.purdue.edu
Cashew Kernels: King of all Nuts
www.bolacashew.com
Cashew Management: Package of Practices
www.kar.nic.in

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