

3 CURRENT PALM PRODUCTS

The emphasis in this and subsequent chapters will be on products currently known to be derived from palms. (Examples of the array of artisanal palm products are shown in Figure 3-1, Figure 3-2 and Figure 3-3.)

With respect to more important economic species, some production statistics are available; however, as regards most of the minor palms no data are obtainable and anecdotal information must suffice. Focusing on present-day usage screens out exotic and outdated utilizations and permits a closer look at those palm products which have stood the test of time and remain of either subsistence or commercial value and hence have the greatest economic development potential. It needs to be stated that keeping a focus on palm products promotes re-examination of the current species as product sources as well as encouraging assessment of new potential species not currently being exploited.

At this point, some observations regarding contemporary palm products are appropriate and some terminology needs to be introduced to give clarity to the discussions in this and future chapters. Obviously, not all of the possible products can be derived from a particular palm all of the time because one product typically precludes another in practical terms, or some products are mutually exclusive. All of the major domesticated palms, for example, are chiefly cultivated for products derived from their fruits; also, fruits are the most important product of a number of wild palms. Therefore, if fruit production is the prime objective, any other product extraction from the same tree that would retard or reduce fruit production should be avoided.

A clear example of a practice that will directly and adversely affect fruit production is tapping the inflorescence for sap; also, cutting leaves for basketry can impair the normal growth of the tree and reduce its resistance to pests and diseases.

Palm Product Categories

In assessing and evaluating palms for the many products they can and do provide it is instructive to consider the individual products as falling into three different general categories: primary products, secondary or by-products and salvage products⁴.

Primary Products. These are the chief commercial, or in some cases subsistence, products derived from a palm. Generally, primary product processing occurs at a point removed from actual harvesting. Vegetable oil obtained from a palm fruit, for example; or palm stem starch. An entire plant can represent the primary product when a palm is dug up in the wild and sold as a live ornamental plant.

Secondary and By-products. As defined and used here, by-products refer to useful items directly generated by processing of the primary product. Secondary products are those which require one step of processing from the primary product to reach the desired end product. Examples of by-products are coir fiber from the coconut mesocarp and press cake remaining after extracting seed oil, which can be fed to livestock. Some by-products, however, are of

⁴ An alternative more detailed classification method has been devised by Chandrasekharan (1995) to cover forest products in general other than wood.

little if any economic value and even pose disposal problems if unsuitable for use as fertilizer or fuel. Arrak is an example of a secondary product; naturally fermented palm wine, the primary product, must first be produced before it can be distilled to produce arrak.

Salvage Products. This terminology characterizes those palm products that are indirectly generated as a result of harvesting the primary product. Products in this category are typically discarded at the harvesting site and are not transported to another location as part of primary processing. Extracting a palm heart from a wild tree kills it; any products subsequently used such as stem wood or leaves, are by this definition salvage palm products.

Salvage palm products may also derive from other activities such as the cutting of palms for some land-use related reason, replacement of senescent palms in plantations or palm damage or destruction due to natural causes such as a tropical cyclone. Living ornamental palms removed from a site to be cleared to save them from being destroyed would, under such circumstances, be considered salvage products.

As revealed in the foregoing discussion, either a primary product or a by-product may be considered to be a salvage product if it was indirectly generated. Distinctions of this type are worth making because of the information they provide about the origin of the raw material and the stability of their supply.

A second group of palm product terms is proposed to characterize the extent of processing a newly-harvested raw material requires to transform it into a commercial item. From the simple to the most complex, four stages of raw material processing were chosen for use in this study: immediate use, cottage-level processing, small-scale industrial processing and large-scale industrial processing.

Immediate Use. Products in this category require little if any processing before being utilized. Examples include palm fronds cut for use in thatching, coconut water drunk from the nut, palm heart consumed fresh and entire palm stems used in construction. The only tools needed to generate immediate-use products is an ax or machete.

Cottage-level Processing. Those products requiring a modest amount of processing fall into this category so-named because the activities typically are carried out in or near the residence of the individuals involved. The physical location where palm processing activities is carried out also functions as living space or for other purposes when the processing is not actively being carried on; there is no designated processing area exclusively devoted to cottage-level processing. Traditional extraction of palm mesocarp oil, weaving of mats and other leaf products, drying of date fruits and carving of vegetable ivory into toys are examples. Very few tools are required for this level of processing.

Small-scale Industrial Processing. The use of the term "industrial" in designating this category connotes some specialized equipment, a dedicated locality or structure where processing takes place and a number of skilled or trained workers. Actual processing activities may be manual, semi-mechanized or mechanized depending upon their requirements and the level of investment. Canning of palm hearts, distillation of palm wine to produce arrak and extraction of coconut oil from copra exemplify this category.



Figure 3-1 *Artisanal Palm Products I. A. Hat woven from palmyra palm (*Borassus flabellifer*) leaf fiber, Tamil Nadu, India. B. Spider figure carved from seed of South American vegetable ivory palm (*Phytelephas macrocarpa*), Ecuador; 7.5 cm in diameter. C. Palm climbing belt made from African oil palm (*Elaeis guineensis*) petiole and leaf fiber, Guinea-Bissau; 108 cm long, 30 cm wide as illustrated. D. Shoulder bag with strap woven from chambira palm (*Astrocaryum chambira*) leaf fiber, Ecuador; 38 cm wide, 25 cm high.*



Figure 3-2 *Artisanal Palm Products II. A. Woven basket with attached overlapping lid, made of palmyra palm (*Borassus flabellifer*) leaf fiber, Casamance, Senegal; 20 cm high (closed), 24 cm wide. B. Head figure (a sadhu, a devotee who has renounced the world and gone to live in a remote area) made of the carved seed and mesocarp fiber of palmyra palm (*Borassus flabellifer*), Tamil Nadu, India; 10 x 10 cm. C. Chopsticks and case, chopsticks made of palmyra palm (*Borassus flabellifer*) stem wood, case raw material undetermined, Thailand; chopsticks 23 cm long. D. Turned bowl made of coconut palm (*Cocos nucifera*) stem wood, Philippines; 7.5 cm in diameter. E. Palm leaf writing (Buddhist bible), made of talipot palm (*Corypha umbraculifera*) leaflets, Thailand; 51 cm long, 4.5 cm wide.*

Large-scale Industrial Processing. This category is distinguished from the preceding in terms of the greater physical size of the processing facility, a higher level of sophistication in the processing itself through more complicated mechanical devices and certain highly skilled workers to operate and maintain equipment. Examples which can be cited are African palm oil factories, the processing of export quality sago starch and integrated processing of fresh coconuts.

A number of palm products are associated with more than one of these four categories, depending upon local traditions and economic conditions. Salak fruits (*Salacca* spp.) are sold as fresh fruit (category 1) and preserved in tins or jars (category 3); rattan furniture making can be done on a small scale in the home (category 2) or in a small industrial facility (category 3); palm oil extraction can take place in the home (category 2) as well as in small- or large-scale factories (categories 3 and 4).

At this juncture, it is worthwhile to return to the major classes of palm products developed by Balick and Beck (1990) and discussed in Chapter 2. The authors presented a list of 388 palm products, which they broke down into 12 major classes. Selecting the leading palm products from the longer list permitted a reduction of the number to 97 principal products. Adhering to the organization into 12 major classes, they are presented in Table 3-1.

Table 3-1 lists palm products which are not far removed industrially from the original raw material and are most likely to be encountered in natural resource management and development activities. A linkage exists between the product and the palm. Many manufactured products are omitted which have in their makeup some palm raw material, but the raw material has ceased to be recognizably from a palm. Palm oils, for example, are ingredients in the manufacture of hundreds of food and industrial products. To include such a wide spectrum of products in the current discussion would diverge from the intended focus on palms themselves as providers of useful commodity, in the original sense of the latter term.

Table 3-1 Principal Palm Products

<p><u>Beverages</u> arrak (distilled spirit) milk substitute palm wine (toddy) soft drink flavorings sweet sap</p> <p><u>Building Materials</u> fiber parquet flooring rattan thatch timber weaving material wood</p> <p><u>Chemicals/Industrial Products</u> activated charcoal dye/resin fiber (coir) industrial oils paper pulp particle board polishes textile finishes upholstery stuffing vegetable ivory wax</p> <p><u>Cosmetics/Hygiene</u> hairdressing soap</p>	<p><u>Feeds</u> fodder forage press cake</p> <p><u>Fertilizer</u> biofertilizer</p> <p><u>Food</u> antioxidant (açai, etc) candy edible oil fruit ice cream/sherbet inflorescence (pacaya) kernels palm hearts preserves starch/sago sugar/jaggery syrup vinegar</p> <p><u>Fuel</u> charcoal fuel oil fuelwood</p> <p><u>Handicrafts Agricultural Implements</u> nets ropes</p>	<p><u>Clothing</u> clothes hats</p> <p><u>Furniture</u> hammock lamp shades mats rattan wickerware</p> <p><u>Games/Toys</u> balls (rattan) chess pieces palm leaflet balls</p> <p><u>Household Items</u> bags baskets brooms brushes cigarette papers coat hangers cups fans ladles purses twine walking sticks</p> <p><u>Weapons/Hunting Tools</u> bows spears</p>	<p><u>Jewelry</u> beads miniature carvings bracelets, rings and ear rings</p> <p><u>Medicines/Rituals</u> dragon's blood folk medicines masticatory religious symbols/totems</p> <p><u>Ornamental Use</u> cut foliage houseplants ornamental tree seeds shade tree</p> <p><u>Structure/Shelter</u> bridges canoes coffins fences floors nursery shade pilings posts rafters roofs utility poles walls</p>
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Source: after Balick & Beck, 1990, with modifications.

Palm Product Matrix

A matrix of principal palm products is presented in Table 3-2. The contents of Table 3-1 were evaluated in terms of the general product categories and the processing categories to construct the matrix. Products were entered into the matrix in the same order as they appear in Table 3-1. Roman numerals across the top and letters along the left side permit shorthand reference to the products. The decision as to where within the matrix to place each product was made by taking into account the most common type of processing currently in practice; in a number of cases a product is placed in more than one box. For example, fiber is included in I-A, I-B, III-A and III-B, depending upon its source and end use; palm timber is placed in III-C and III-D since it is typically a salvage product requiring a small or large mill; edible oil appears in I-B, I-C, and I-D because it can be processed by various means depending upon the end use.

This matrix is provided with the hope it can serve to highlight the respective products in a way which conveys the relationship between product and processing levels.

Recent Related Development Trends

Beginning in the 1980s three new international development approaches arose which have fortuitously directed more attention to palm products. The three subjects are: agroforestry, non-wood (or non-timber) forest products and integrated product development. Because the future development of palm products needs to be linked to such broader issues, a brief discussion of each is appropriate.

Agroforestry

The emergence of agroforestry as a new international development approach is to help small farmers. It involves working to improve the overall productivity of mixed production systems which include various combinations of annual crops, perennial crops and livestock. Palms are common tree species in mixed small farming systems and agroforestry tends to favor such multipurpose trees; agroforestry's multidisciplinary approach has also been effective in emphasizing the broadest possible product use of palms (as with all plants and animals within the particular systems) for subsistence and commercial end uses.

Palms and their potential within agroforestry have been the focus of a number of research studies. Among them, Johnson (1983) did a general assessment of 52 multipurpose palms suitable for agroforestry systems; Liyanage (1983) studied the agroforestry role of the coconut palm in Sri Lanka; May *et al.* (1985) examined the babaçu palm's (*Attalea speciosa*) potential in Brazil; Clement (1989) produced a study of the pejibaye palm (*Bactris gasipaes* var. *gasipaes*) in agroforestry systems; and Flach and Schuiling (1989) reviewed the cultivation of the sago palm (*Metroxylon sagu*) as an agroforestry tree.

Table 3-2 Matrix of Principal Palm Products

General Categories Processing Categories	I. Primary Products	II. Secondary Products/ By-Products	III. Salvage Products
A. Immediate Use	palm wine, sweet sap; fiber; thatch; fruit; kernels; bridges; nursery shade; pilings; posts; rafters; roots; utility poles	fodder; forage; press cake; biofertilizer; fuelwood; fences	fiber, thatch; fuelwood; house plants; shade trees; bridges; fences; pilings; posts; rafters; roofs; utility poles
B. Cottage-level Processing	milk substitute; folk medicines; fiber; rattan; weaving material; wood; upholstery stuffing; edible oil; fruit; kernels/copra; nets; ropes; hats; hammocks; lamp shades; mats and rugs; rattan balls; chess pieces; bags; baskets; brooms; cups; fans; ladles; purses; twine; walking sticks; beads; miniature carvings; bows; spears; masticatory; cut foliage; religious symbols; seeds (ornamental); floors; walls	sugar/jaggery; syrup; charcoal	fiber; weaving material; wood; floors; walls
C. Small-scale Industrial Processing	Soft drink flavor; antioxidants (açai, etc.); industrial oils; upholstery stuffing; vegetable ivory; wax; hairdressings; soap; edible oil; edible inflorescence (pacaya); palm hearts; preserves; starch/sago; sugar/jaggery; syrup; hammocks; lamp shades; rattan wickerware; brushes; cigarette papers; coat hangers; bracelets; finger rings/ear rings	arrack (spirits) ; parquet flooring; activated charcoal; sugar/jaggery; syrup; charcoal; fiber (coir); candy; ice cream/sherbet; vinegar	parquet flooring; timber; palm hearts
D. Large-scale Industrial Processing	dye/resin; industrial oils; paper pulp; particle board; polishes; textile finishes; wax; soap; edible oil; starch/sago; fuel oil	fiber (coir)	parquet flooring; timber

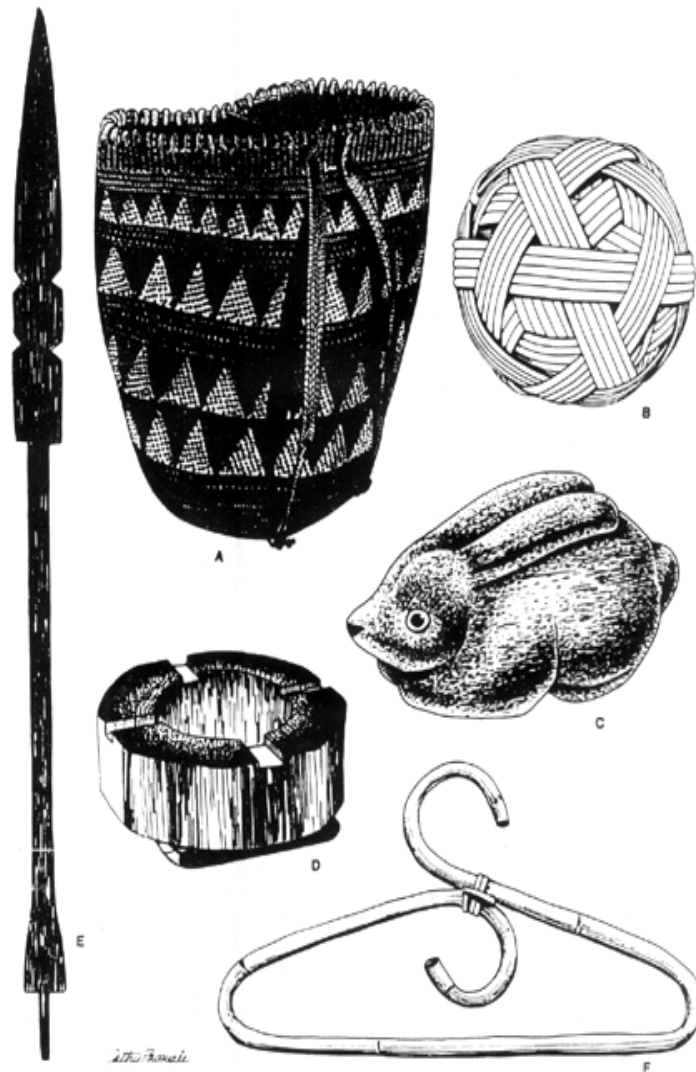


Figure 3-3 *Artisanal Palm Products III. A. Rattan palm (likely Calamus sp.) shoulder bag, Sarawak, Malaysia; 36 cm high, 21 cm in diameter. B. Rattan palm (likely Calamus sp.) ball, Peninsular Malaysia; 12 cm in diameter. C. Coco bunny, made of coconut palm (Cocos nucifera) husk, Guyana; 17 cm long. D. Ashtray, made of Bactris sp. stem wood, Ecuador; 12 cm in diameter. E. Spear made of Bactris sp. stem wood, Peru; 102 cm long. F. Rattan palm (likely Calamus sp.) coat hanger, country of origin unknown; 41 cm wide, 23 cm high.*

Non-Wood Forest Products

Non-wood forest products as an international development issue derives from attempts to transform traditional high grading of tropical timber into sustainable forest management. Sustainable forest management is only feasible if wood and non-wood products are given full consideration and local needs are acknowledged to be as important as timber or lumber

exports. Although the designation "non-wood" appears to exclude them, palm wood, rattans, and bamboo are typically included among non-wood forest products because they are not considered by foresters to be either traditional wood or timber.

Pantropically, non-wood forest products are of local importance as food and raw material sources. An excellent overview of the subject can be found in Nepstad and Schwartzman (1992). Palms represent one of the most important plant families of non-wood forest products. Two examples of studies containing good information on palms as forest products are by Beer and McDermott (1989), who point out the importance of rattans and edible palm products in Southeast Asia; and Falconer and Koppell (1990) who document the significance of palms among the forests products in West Africa.

Integrated Product Development

Integrated product development, as used here, refers to an industrial approach which views primary products, by-products (including waste products) together in seeking ways to achieve greater overall productivity and profit.

As demonstrated in this chapter, individual palm parts are sources of one or more raw materials which can be used in various ways for commercial purposes; therefore, an integrated approach to product development and processing should follow a whole fruit processing approach and include the valorization of by-products to the greatest extent possible. To a major degree, attention has been drawn to integrated product development for practical reasons, with the agroindustries associated with the major domesticated palms taking the lead.

Processing the whole fruit of any of the cocoid palms, the oil palms⁵, is an excellent case in point because oil extraction has the potential of generating several useful end products. Depending upon the individual species of oil palm, products include: edible oil, edible starch, mesocarp pulp, edible kernels, industrial oil, dry distillation of husks to obtain acetates, press cake for livestock and shells for conversion to activated charcoal or directly for fuel.

A model of potential applicability to certain of the other oil palms is represented by modern coconut processing technology. This technology takes a whole fruit approach and adopts a wet processing procedure for coconut endosperm which eliminates the traditional intermediary step of making copra prior to producing coconut oil (Hagenmaier, 1980).

In Malaysia, the African oil palm industry is going a step farther and considering the entire palm. In the late 1990s, as Malaysia began replanting extensive areas oil palm, the industry has had to deal with huge quantities of dead oil palm stems and fronds resulting each year from replacement of ageing palms. Studies have been done on their conversion into lumber, fuel, pulp and paper, reconstituted board and animal feed (Khoo *et al.*, 1991; Shaari *et al.*, 1991). Technologies developed to solve this problem of the African oil palm will have implications throughout the palm family.

⁵ Cocoid palms are those which, according to Dransfield *et al.* (2008), belong to the Cocoseae tribe within the Arecoideae subfamily. All of the key oil-bearing palms are included, among them the coconut (*Cocos nucifera*), African oil palm (*Elaeis guineensis*), pejibaye (*Bactris gasipaes* var. *gasipaes*) and babaçu (*Attalea speciosa*).

Major date growing countries are also considering date palm cultivation in a broader product context. The book by Barreveld (1993) on the date palm devotes an entire chapter to traditional palm products other than date fruits.

To conclude this discussion of recent development trends relative to palm products, it can be restated that numerous palm tree species already provide, or have the potential to provide, more than one subsistence or commercial product; such trees are appropriately referred to as multipurpose palms. Within the framework of natural resource management, sustainable forest management or regional development efforts, it is imperative that the full spectrum of useful palm products from any one palm tree species be taken into account. In that way commercially-valuable and subsistence products can be generated for industrial enterprises and for the benefit of local peoples.