8 PALMS WITH DEVELOPMENT POTENTIAL

To assess the potential for development of economic palm species it is worthwhile to consider whether individual species currently have either greater domestication potential or management potential. These two categories are established for analytical purposes; they are not mutually exclusive. In fact, in some cases palm management is a useful initial step toward palm domestication.

Domestication potential implies that the products of a palm have enough promise of becoming commercialized at a scale sufficient to justify the costly and lengthy effort involved. Certainly that was and is the case of the five fully domesticated palms (arecanut, coconut, date, African oil palm and pejibaye) discussed in Chapter 2.

The chief obstacle to palm domestication is that many years are required to select and breed a superior palm for a particular product or set of products. The age of sexual maturity among the palms varies considerably from species to species, ranging from about 3-40 years. An essential part of any new palm domestication effort would include detailed studies of the reproductive biology of the candidate species, because so little is known about this aspect of wild palms. A domestication program would also need to have a clear definition of its objectives in terms of the chief commodities to be produced. If the candidate palm for domestication is a multipurpose species, there must be consideration of primary as well as secondary products. Secondary products can play an important role in providing employment and income to local people.

Coradin and Lleras (1988) reviewed research directed at domestication of New World palms with economic potential. The authors also presented a model of how to characterize native populations in order to design successful domestication or management strategies. The model is applicable to palms in Asia and Africa.

Breeding and domesticating a palm is one thing, propagating an improved palm quite another because of the time necessary to the initiation of flowering and fruiting. Any palm which can be vegetatively propagated, such as most species in the genus *Phoenix*, has a major natural advantage over palms which can only be grown from seed. However, three of the five domesticated palms mentioned in the previous paragraph are seed propagated, i.e. arecanut, coconut and African oil palm. Tissue culture is a technological alternative to seed propagation but research on palms has not yet solved all of the problems that would permit large-scale reproduction by this means at a reasonable cost.

Management potential is possessed by many more palm species because costs are significantly lower, the time required is much shorter and production continues as management practices are adopted. In addition to wild species, also included in this category are palms which are often referred to as being "semi-domesticated." This term implies that selection of wild seed or suckers for informal cultivation has taken place, but no actual breeding program undertaken. Semi-domesticated species in most cases are very promising candidates for a formal domestication effort.

Promising Palms

Reviewing the material presented within this report, a global list of palms with development potential was compiled. Table 8-1 presents information on 18 palms; the list is not exhaustive. As can be seen, most often a palm is represented by a single species, but in some instances it is represented by two species, or all or most species in a genus. This is simply a reflection of the differing circumstances from one palm to another. The palms in Table 8-1 were selected without regard for their native areas. Nevertheless, the palms included do reflect the Asian region as being foremost in economic species, with Latin America a strong second and Africa a distant third.

Discussion

The candidate palms in Table 8-1 are annotated as to whether they have more management or domestication potential. The approach taken with respect to realizing the development potential of individual palms will be determined to a significant degree by the magnitude of the economic potential of the product or products to be realized. Whether the option chosen is domestication or management, these palms should be developed within a broad context to benefit local people as well as financial investors.

Palm domestication highlights the importance of wild genetic resources in selecting genetic material for an initial breeding and improvement effort. Conservation of wild germplasm has equal value in maintaining and further improving domesticated palms. The African oil palm is a perfect example.

Comparing the palms in Table 8-1 reveals that sap and seed oil are major products common to several species. From a practical standpoint, an expensive and lengthy domestication program cannot be mounted for each palm. Instead, it will be necessary to evaluate the sap-producing palms and select one of them for possible domestication; the species not selected should be considered for management improvement. A similar approach could be used for seed oil and other major products.

The ideal mechanism for deciding which palms should be given priority for domestication or management development would be to convene a technical panel of palm specialists to make recommendations.

A key factor in palm development is that it should be done so that management and domestication efforts are not narrowly focused on individual species. There is much to be gained from a palm development program which consists of management and domestication efforts involving several palms in different countries. Major benefits would include an integrated research strategy, sharing of results from several locations on different palm species, as well as the advantage of sharing of general costs.

Table 8-1 Candidate Palms for Domestication or Management

Scientific Names Common Names	***Native Distribution and Habitat***	***Major Products.***	***Minor Products***	***Comments and Selected References***
Arenga pinnata sugar palm	*S. & SE Asia tropical rain forest into dry forest, to 1,200 m*	*sap to make sugar. wine, alcohol, vinegar, sap yield 3-6 liters/tree/day, starch from stem, yield 75 kg/tree*	*leaf sheath fiber; edible heart; etc*	*solitary, terminal flowering feather palm; traditional multipurpose palm with a history of cultivation; strong candidate for domestication; agroforestry potential: Miller 1964; Mogea et al., 1991; Sastra et al., 2006.*
Attalea funifera piassava	*S. America: Atlantic Forest, Brazil tropical rain forest, coastal areas*	*leaf base fiber*	*leaves for thatching*	*solitary feather palm; narrow range of products; over-exploitation of natural stands, experimental planting; management could stabilize fiber supplies& sustain markets; Monteiro 2009; Voeks, 1988*
Attalea speciosa babaçu	*S. America tropical rain forest, upland sites*	*edible oil, yield 40 kg/tree/yr, potential biofuel*	*edible mesocarp pulp: leaves for thatching; shells to make charcoal; press cake for livestock feed*	*solitary feather palm; multipurpose palm with many commercial & subsistence products; some management already being done, could be improved & domesticated if processing of fruits adopted; good agroforestry potential; Anderson et al., 1991*
Borassus flabellifer, B. aethiopum & B. akeasii palmyra, ron	*S. & SE. Asia; Africa tropical dry forest into savanna, to 750 m.*	*sap to make sugar, wine, alcohol, vinegar, sap yield 11-20 liters/ tree/day*	*leaf stalk fiber; leaves for thatching & basketry; edible immature fruit*	*solitary fan palms; multipurpose species of major utility to local peoples: incipient management already in practice in S. & SE. Asia: candidate for domestication, agroforestry ; Davis & Johnson,1987; GRET, 1987; Khieu, 1996*

Scientific Names Common Names	***Native Distribution and Habitat***	***Major Products.***	***Minor Products***	***Comments and Selected References***
Calamus spp. rattan	*S. & SE. Asia tropical rain forest to 1,000 m; 1 sp. In Africa*	*canes for furniture making, yield to 6 t/ha*	*edible fruit & heart in some spp.*	*climbing solitary or suckering feather palms; several under study for cultivation, cane industry-driven research & development as well as coordination by INBAR; Dransfield & Manokaran, 1993; Dransfield et al., 2002; Wan Razali et al., 1992.*
Caryota urens toddy palm	*S. & SE. Asia tropical rain forest to 1,500 m*	*sap to make sugar, wine, alcohol, vinegar, sap yield 20-27 liters/ tree/day; starch from stem, yield 100-150 kg/tree*	*leaf sheath fiber; edible heart; etc.*	*solitary, terminal flowering feather palm; numerous products; informal cultivation practiced; domestication potential in agroforestry systems; De Zoysa 1992*
Chamaedorea spp (ornamental spp.).	*Mexico, C. America, N. South America understory of tropical rain forest to 3,000 in.*	*seed for commercial growing of ornamental plants & foliage for cut flower arrangements*	*none known*	*solitary or suckering feather palms; a few major ornamental spp. under cultivation for seed in Belize, management potential of wild palms for cut foliage; Bridgewater et al., 2006. Hodel, 1992*
Chamaedorea tepejilote pacaya	*Mexico, C. America, N. South America tropical rain forest to 1,600 in.*	*edible immature male inflorescence*	*edible palm heart; leaves fed to livestock*	*solitary (sometimes suckering) feather palm already under informal cultivation, could be managed for pacaya & palm heart; agroforestry potential; Castillo Mont et al ., 1994*

Scientific Names Common Names	***Native Distribution and Habitat***	***Major Products.***	***Minor Products***	***Comments and Selected References***
Corypha umbraculifera C. utan talipot buri	*S. & SE. Asia tropical rain forest to 600 m.*	*sap to make sugar. wine alcohol, vinegar, sap yield 20 liters/tree/day for 3-4 months for C. utan; starch from stem petiole to make hats; leaf midrib used to make furniture*	*leaves for thatching & weaving various products, edible heart; etc.*	*solitary, terminal flowering fan palm multipurpose palm with good mix of commercial & subsistence products; strong candidate for management or domestication, also agroforestry potential; Madulid, 1991a*
Euterpe oleracea E. edulis açaí, juçara	*S America Tropical rain forest, açaí in seasonally flooded lowland sites; juçara in upland sites to 1,000 m.*	*commercial palm heart production, yield up to 1 kg/tree; juice being promoted as health drink rich in antioxidants*	*edible fruit mesocarp, leaves for weaving & thatching*	*suckering(E. oleracea) solitary (E. edulis) feather palms; açaí has excellent management potential as palm heart source, juçara of use for future breeding program for domestication; Anderson, 1988; Schauss, 2006.*
Hyphaene spp doum	*Africa Semi-deserts/deserts, to 600 m. Few spp. in Arabia and W. India.*	*edible fruit; sap for wine, alcohol*	*leaves for thatching & weaving*	*solitary branched fan palm; management of wild stands would provide sustainable sources of commercial & subsistence products in dry areas; Kahn & Luxereau, 2008; Tuley 1995*
Mauritia flexuosa moriche	*S. America tropical rain forest, seasonally flooded lowland sites*	*edible fruit mesocarp; edible oil; starch from trunk, yield to 60 kg/tree*	*leaf fiber for making rope trunk for wood; petiole for "cork"*	*solitary feather palm; extensive dense stands have management potential for multiple products; Manzi & Coomes, 2009; Padoch, 1988*

Scientific Names Common Names	***Native Distribution and Habitat***	***Major Products.***	***Minor Products***	***Comments and Selected References***
Metroxylon sagu sago	*SE. Asia tropical rain forest, fresh water swamps*	*starch from stem, yield 300 kg/tree*	*leaves for thatching*	*suckering feather palm; palm is cultivated & managed successfully; research progressing well; Ellen, 2004; Flach, 1997; Flach & Schuiling, 1989; Schuiling, 2009*
Nypa fruticans nipa	*S. & SE Asia tropical rain forest, brackish water swamps of tidal rivers*	*sap for sugar, alcohol, sugar yield 3,000kg/ha/year; leaves for thatching (atap)*	*edible fruit; powdered dried leaves studied as corrosion inhibitor of zinc*	*suckering feather palm; incipient management in practice, could benefit from improved practices & broader utilization of products, especially in Papua, New Guinea; Hamilton & Murphy, 1988; Orubite-Okorosaye & Oforka, 2004*
Oenocarpus bataua batauá	*S. America tropical rain forest, upland sites to 1,000 In.*	*edible oil, fruit*	*stem wood. leaves for thatching & weaving; possible biofuel*	*suckering feather palm: high quality seed oil gives this palm potential for domestication, also good agroforestry species; Balick, 1988*
Phoenix sylvestris wild date	*S. Asia tropical rain forest to dry forest, to 1,500 m*	*sap for sugar, wine, sugar yield 40 kg/tree/year; edible fruit*	*leaves for weaving & to make brooms; stem wood for fuel; etc.*	*solitary feather palm; already under management & informal cultivation; good multipurpose palm with domestication potential within agroforestry systems; Davis 1972; Chowdhury et al., 2008*

Scientific Names Common Names	*Native Distribution and Habitat*	*Major Products.*	*Minor Products*	*Comments and Selected References*
Raphia spp raffia.	*West Africa tropical rain forest, seasonally flooded lowland sites*	*commercial leaf base fiber (African bass fiber) for brushes & brooms; sap for wine. alcohol*	*petioles as poles, leaves for thatching & weaving; etc-*	*suckering (most spp.) terminal flowering feather palm; R. hookeri & R. palma-pinus are main brush fiber sources. also tapped for sap; one or more spp could be managed for multiple products; Tuley, 1995*
Salacca zalacca salak	*SE Asia understory of tropical rain forest, to 300 m.*	*edible fruit (fresh, canned, pickled)*	*leaves for thatching & weaving; antioxidants in fruit have potential health benefits*	*suckering feather palm fruit production from wild. semi-wild & cultivated plants; more than a dozen local variety names; strong candidate for domestication using germplasm of other promising sp. such as S. wallichiana; Aralas et al., 2009; Ashari, 2002; Yaacob & Subhadrabandhu, 1995*

Source: In addition to selected references cited, compiled from information provided elsewhere in this report.

Coordination of Activities

Informal and formal information networks exist for research and development of the five domesticated palms (African oil palm, arecanut, coconut, date and pejibaye); as well as for the sago palm and rattans. In some cases formal organizations exist such as the International Network for Bamboo and Rattan; in other instances information networking is achieved through technical conferences and journals, as with the African oil palm.

Another important source of information on specific palm products comes from looking at a particular product from an industrial point of view. An excellent example is the palm sugar workshop organized by the Asia Regional Cookstove Program and held in Indonesia in 1994 (ARECOP, 1994). Participants from six Asian countries shared experiences and discussed ways in which small scale industries could be promoted. These types of industrial activities need to be linked to enhancing production through management and domestication.

An information networking mechanism is needed for all of the economic palms not yet covered in some way. This would serve to coordinate and bolster efforts to realize their full development potential. There is considerable benefit to be derived from an exchange of ideas and examples from region to region (Johnson, 1992).

The IUCN, Species Survival Commission, Palm Specialist Group represents a means to fulfill this networking need. The Palm Specialist Group has published its Action Plan (Johnson, 1996) which is aimed at both palm conservation and utilization. The Group is headquartered at the Royal Botanic Gardens Kew, which possesses palm library and herbarium resources that can answer any question. With an outside source of funding, the Palm Specialist Group could take on the role of coordinating palm development activities in an efficient manner. In support of such an effort, there should also be formed a sub-network of institutions (other botanic gardens or research organizations) located in the Asia, Pacific, Latin America and Africa regions, to serve as local points of contact.