Bananas and People in the Homeland of Genus *Musa*: Not just pretty fruit

Jean Kennedy

Research

Abstract

Bananas, perhaps the most recognizable of fruits, are nowhere more genetically diverse than in the southwest Pacific, where parthenocarpic fruit originated according to recent biomolecular evidence. In the wider Indo-Malesian area, homeland of the genus *Musa* L., understanding the domestication of bananas must include consideration of a much greater range of *Musa* species than just the few implicated in the parentage of the modern cultivars with seedless fruit.

Despite ethnobotanical evidence that the genus has been valued for many more products than the edible fruit, the role of other products in the process of domestication is seldom considered. As well as documenting the development and spread of seedless cultivars, we need to develop models of the fundamental Indo-Malesian practices through which the greater range of species and products, seeds and all, were managed in diverse socio-cultural and environmental circumstances.

Introduction

The natural range of the genus *Musa* L. extends throughout the Indo-Malesian region, in tropical and subtropical areas from Sri Lanka and eastern India, across south China and Southeast Asia to the southwest Pacific and northern Australia (Figure 1). There are more than 50 *Musa* species (Constantine 1999-2008, Häkkinen & Väre 2008), most of which are large perennial tropical herbs, mainly of lowland areas with high temperature and humidity.

The edibility of traditional and modern fruit cultivars traces back to parthenocarpic forms that arose in one or two subspecies of *Musa acuminata* Colla in the southwest Pacific, at the eastern extremity of the range of that species and of the genus (Carreel *et al*. 2002, Perrier *et al*. 2009). Parthenocarpy in bananas entails the development of edible pulp without pollination; it does not guarantee seedlessness, which depends on additional mechanisms that are at least partly independent of parthenocarpy (Argent 1979, Simmonds 1959: 28-9, 1962). As vegetatively propagated parthenocarpic land races spread west through the area of other *Musa* species, they were involved in complex hybridizations that produced many new land races with virtually seedless fruit (see Perrier *et al*. 2009). While some of these have been transmitted to the rest of the tropical and subtropical world, Malesia retains the highest diversity of land races, and nowhere are these more diverse than in Papua New Guinea (see Kennedy 2008, n.d. for further discussion and references).

Understandably, a great deal of attention has been given to explicating the genetics and biogeography of the process by which bananas with seedless fruit were domesticated (Kennedy 2008, n.d.; Perrier *et al*. 2009, Simmonds 1962). My argument here elaborates on points I (and others) have previously made only in passing: we need to recontextualize understanding of the domestication of bananas within the frameworks of historical ecology for the Malesian region that are emerging from multidisci-

Correspondence

Jean Kennedy, Department of Archaeology and Natural History, Research School of Pacific and Asian Studies, Australian National University, Canberra ACT 0200, AUSTRALIA.
jean.kennedy@anu.edu.au

Ethnobotany Research & Applications 7:179-197 (2009)

Published: July 30, 2009

www.ethnobotanyjournal.org/vol7/i1547-3465-07-179.pdf

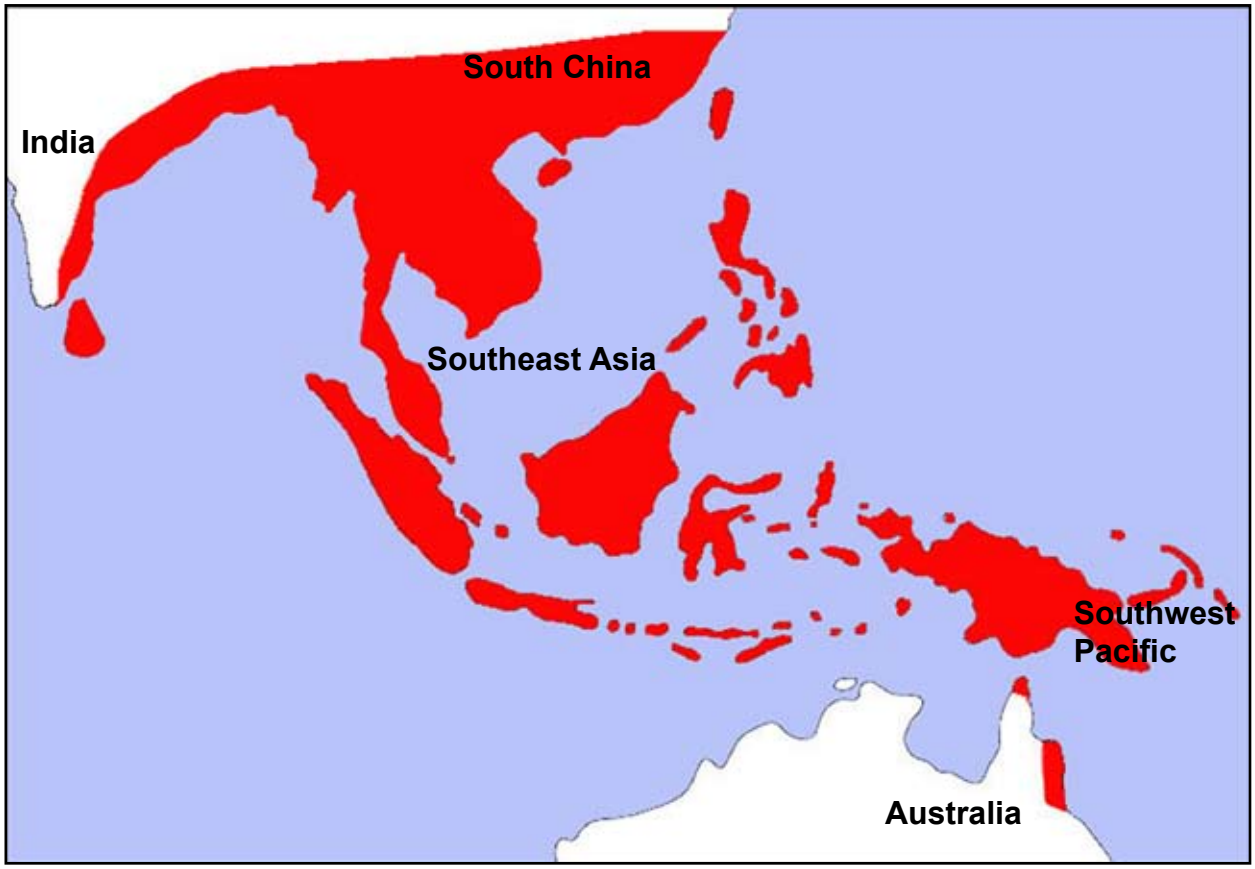

Figure 1. Distribution of genus *Musa* L. in the Indo-Malesian region.

plinary studies of environmental and cultural changes in the late Pleistocene and Holocene, and to take a broader view of banana domestication than is usual. Documenting the development of the familiar edible bananas of today has been the main focus of studies of the interactions of humans and bananas, and this focus is still reflected in most current archaeobotanical discussion. But the utility of a phylogenetic outline of the development of edible bananas for the project of improved breeding does not necessarily give it power to guide prehistoric research. We need to know more about bananas than how the fruits were made succulent and seedless.

The basic proposition of this paper is that the Musaceae as a whole, like 'cassowaries and kiwis, and big bouquets of roses' (Hays 1991:113), have high ethnobiological salience, independent of forms with edible fruit. In support of this proposition, I explore examples of the very wide range of uses documented throughout Indo-Malesia. Given that such uses are widespread and probably reflect ancient practices, it is likely that human selective pressures have affected other aspects of the plants besides the edibility of fruit. If this is correct, then the tendency to equate seediness with wildness is very misleading. In my hypothetical encounters of early humans and bananas, seediness did not matter, and the fruit was probably not the main focus of attention. To assume otherwise is teleological.

It follows that the vegetatively propagated parthenocarpic bananas from the eastern edge of Malesia spread west into a world in which other *Musa* species had already been subject to the manipulations of humans, for uses including medicine, fiber, wrapping material and ritual, as well as food. All such uses entail the possibility of selective pressures that have little or nothing to do with edibility of the fruit. These humanly modified plant populations are termed 'cultiwild' by De Langhe *et al*. (2009). As we develop better archaeobotanical tools for investigating the prehistoric world of tropical plants, we should keep these possibilities in mind.

Ecology and Ethnobotany of Indo-Malesian Musaceae

Simmonds (1962:34) described wild *Musa* species as 'jungle weeds' of disturbed habitats, such as talus slopes, unstable hillsides or forest gaps. Disturbance is an integral part of the dynamic growth cycle of the rainforest, providing niches for understory plants such as Musaceae (Argent 1979, Whitmore 1984). When *Homo sapiens* entered the world of wild *Musa* species c. 60,000 years ago, the niches of these plants and people must have overlapped substantially. A growing body of archaeological evidence shows Pleistocene human presence in forested environ-

ments of Island Southeast Asian and the New Guinea region (Barker 2005, Barker *et al*. 2005, Barker *et al*. 2007, Kealhofer 2003, Latinis 2000, Mercader 2003, Pavlides & Gosden 1994). It is highly likely that early humans were especially drawn to forest gaps and may have increased their extent (Groube 1989). The stately and often spectacular Musaceae are far too conspicuous to have been overlooked (Figures 2 and 3). Thus began a long period of interaction with humans that continues to the present.

It is well known that Musaceae are very useful. Leaves and inflorescences are prominent in many Southeast Asian food markets (Figures 4 and 5), and increasingly in metropolitan markets of the First World. The multiplicity of uses is manifest in compilations of tropical products, such as the invaluable colonial works of Burkill (1935), Heyne (1950), Ochse (1977) and Watt (1972), as well as in more specialist literature on botanical and agronomic aspects of bananas, such as Purseglove (1975), Simmonds (1959 and 1962) and publications of the International Network for the Improvement of Banana and Plantain (INIBAP) (e.g., Sharrock 1996).

All parts of the plant are useful, including seedy fruit, inflorescence, leaf, pseudostem, corm and rhizome; they furnish food, fodder, medicine, domestic materials and shelter. Plants also have ritual and ceremonial significance. Table 1 lists miscellaneous uses, other than consump-

Figure 2. Many *Musa* species grow to statuesque proportions and dominate the landscape. **A**, **B**. The largest is *Musa ingens* Simmonds, a New Guinea Highlands endemic; **C**. *Ensete glaucum* (Roxb.) Cheesman has a wide but scattered distribution from the Eastern Himalayan fringe to New Guinea. (Photos **A**, **B**. by Jeff Daniells, Queensland DPI; **C**. by Shu Suehiro, Kamisu-shi, Japan.)

Figure 3. The flowers and fruit of many *Musa* species are conspicuous and appeal to horticulturally-inclined humans as well as to birds and bats: **A**. *Musa basjoo* von Siebold ex Y. Iinuma, University of California Botanical Garden, Berkeley; **B**. *Musa ornata* Roxb., local nursery, rural central Luzon, Philippines; **C**. *Musa velutina* H. Wendl. & Drude, Royal Botanical Gardens, Kew. Photos by the author.

Figure 4 (right). In Thai food markets, many parts of Musaceae species are represented: **A**. Inner core of *Musa* sp pseudostem is eaten cooked, Chiang Mai; **B**. Terminal inflorescences are eaten cooked or raw, Chiang Mai; **C**. Immature fruit of *Musa balbisiana* Colla eaten as salad, Nong Khai; **D**. Ripe fruit of *Ensete glaucum* (Roxb.) Cheesman, also eaten raw, Udon Thani. Photos by Gianni Bertossa and Christiane Jacquat, Institute of Plant Biology & Department of Pre- and Protohistory, University of Zurich.

tion of seedless fruit, of Indo-Malesian Musaceae. Given the labyrinthine complexity of literary genres which might refer to bananas, I make no claim that this list is comprehensive in terms of uses or references; it is intended to be exemplary. I have revised the nomenclature, where possible, using the extensive cross-referencing of species names compiled by Constantine (1999-2008). For the sake of brevity, I have somewhat arbitrarily excluded African uses of Musaceae (genus *Ensete* Horan. is native there, but not genus *Musa*), while Polynesia and Micronesia are included because their cultural connec-

Figure 5. Leaves are widely used for packaging, especially for food, as in these examples of Thai takeaways. Photos by Gianni Bertossa and Christiane Jacquat, Institute of Plant Biology & Department of Pre- and Protohistory, University of Zurich.

Table 1. Miscellaneous uses of banana plants (family Musaceae) in the Indo-Malesian region.

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
Food				
terminal inflorescence/ male bud	salad/cooked	many spp/cvs, especially *Musa balbisiana* Colla, also *Ensete glaucum* (Roxb.) Cheesman, *Musa acuminata* ssp *microcarpa* (Becc.) Simmonds and var *zebrina* (Van Houtte ex Planch.) R.E.Nasution, *Musa campestris* Becc., *Musa hirta* Becc., *Musa itinerans* Cheesman, *Musa lawitiensis* Nasution & Supard., *Musa nagensium* Prain, *Musa ornata* Roxb., *Musa peekelii* Lauterb., *Musa salaccensis* Zoll., *Musa velutina* H. Wendl. & Drude, *Musa violascens* Ridl.	widespread	Arnaud & Horry 1997, Burkill 1935, Christensen 2002, Dassanayake & Clayton 2000, De Langhe *et al*. 2000, Heyne 1950, Jacquat 1990, Lentfer 2003, Noweg *et al*. 2003, Ochse 1977, Rumphius 1747, Simmonds 1956, 1959, Uma 2006, Uphof 1968, Watt 1972
male flowers	cooked	edible hybrid cvs	PNG	Argent 1979
nectar from male flowers	baby-food	Pacific plantain cvs	Hawaii	Nelson *et al*. 2006
dry inflorescence	salt	*Musa* sp	PNG	Petir *et al*. 1998

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
seedy fruit	raw/cooked	many spp, including *E. glaucum*, *M. acuminata* ssp, *Musa aurantiaca* G. Manner ex Baker, *M. balbisiana*, *Musa maclayi* F. Muell. ex Mikl.-Maclay *M. peekelii*, *Musa sanguinea* Hook.f., *M. velutina*, *M. violascens*	widespread	Anderson 1993, Burkill 1935, Häkkinen 2006, Jacquat 1990, Lentfer 2003, Nguyen 2006, Noweg *et al*. 2003, Ochse 1977, Rumphius 1747, Uma 2006, Yen & Gutierrez 1976
	raw, sieved pulp as baby food	*M. balbisiana*	N.E. India	Uma 2006
fruit peels	cooked	edible cvs	Java	Ochse 1977
immature seedy fruit	raw, cooked, pickled	many spp, including *M. balbisiana*, *M. lawitiensis*	widespread	Christensen 2002, Jacquat 1990, Nguyen 2006, Ochse 1977, Simmonds 1956 & 1959, Uphof 1968
pseudostem	cooked, processed for starch, famine food	many spp/cvs, including *M. balbisiana*, *Musa flaviflora* Simmonds, *Musa ingens* Simmonds *M. itinerans*, *Musella lasiocarpa* (Franch.) C.Y. Wu ex Li	widespread	Burkill 1935, De Langhe *et al*. 2000, Hendrickx 2007, Heyne 1950, Jacquat 1990, Lentfer 2003, Liu *et al*. 2003, Ochse 1977, Powell 1976, Rumphius 1747, Sillitoe 1983, Simmonds 1959, Uma 2006, Watt 1972
young leaf-sheath	cooked	*E. glaucum*	Java	Ochse 1977
sucker/shoot	cooked	many spp/cvs, including *M. acuminata* ssp *microcarpa* and ssp *zebrina*, *M. balbisiana*, *Musa beccarii* Simmonds, *M. campestris*, *M. hirta*, *M. lawitiensis*, *M. violascens*, *M. lasiocarpa*	Borneo, N E India, Yunnan	Christensen 2002, Häkkinen 2006, Noweg *et al*. 2003, Ochse 1977, Simmonds 1959, Uma 2006
corm/rhizome	cooked	many spp/cvs, including *M. acuminata* ssp *zebrina*, *M. balbisiana*	widespread	Bailey 1900, Burkill 1935, Massal & Barrau 1956, Mogina 2002, Ochse 1977, Rumphius 1747, Simmonds 1959
ash of whole plant	seasoning	edible *Musa* cvs	India	Watt 1972
Fodder				
whole plant	pig food	*M. lasiocarpa*	Yunnan	Liu *et al*. 2003, Long *et al*. 2008
pseudostem, stalk of inflorescence and fruit, leaf, rhizome	pig and cattle food	edible cvs, *E. glaucum*, *M. acuminata*, *M. balbisiana*, *M. itinerans*, *Musa yunnanensis* Häkkinen & Wang	widespread	Anderson 1993, Burkill 1935, De Langhe *et al*. 2000, Häkkinen & Wang 2007, Häkkinen *et al*. 2008, Heyne 1950, Lentfer 2003, Nelson *et al*. 2006, Rumphius 1747, Simmonds 1959, Uphof 1968, Watt 1972, Wu & Kress 2000
	food for captive cassowaries	edible *Musa* cvs	PNG Highlands	Sterly 1997

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
outer leaf-sheath	elephant food	edible *Musa* cvs	India	Watt 1972
fruit	food for captive cassowaries	*M. ingens*	PNG Highlands	Sterly 1997
	food for piglets	*M. nagensium*	N E India	Uma 2006
corm/rhizome	cattle food	*M. acuminata*, *M. aurantiaca*, *M. balbisiana*, *Musa laterita* Cheesman, *M. nagensium*, *M. ornata*	N E India	Uma 2006
Medicine				
juice/sap of pseudostem, stalk of inflorescence, roots and flowers	astringent, styptic, mouthwash, gargle, antipyretic, wound dressing, burns, tonic, internal complaints, treatment/antidote for diabetes, gonorrhoea, kidney inflammation, mercury poisoning, drunkenness, abortifacient, hair tonic	many spp/cvs, including *E. glaucum*, *M. balbisiana*, *Musa basjoo* von Siebold ex Y. Iinuma, *M. nagensium*, *M. lasiocarpa*	widespread	Burkill 1935, Christensen 2002, Hendrickx 2007, Heyne 1950, Jacquat 1990, Liu *et al*. 2003, Nelson *et al*. 2006, Perry 1980, Powell 1976, Reynolds & Fang 1940, Rumphius 1747, Sterly 1997, Uma 2006, Uphof 1968, Watt 1972, Whistler 1992
decoctions/ infusions of leaves, flowers, roots, pseudostem	various internal complaints, internal hemorrhage, burns, swellings	many spp/cvs, including *Musella lasiocarpa*	widespread	Anderson 1993, Burkill 1935, Heyne 1950, Jacquat 1990, Liu *et al*. 2003, Nelson *et al*. 2006, Reynolds & Fang 1940, Rumphius 1747, Watt 1972, WHO 1998
root	ayurvedic preparations	*M. acuminata*, *M. aurantiaca*, *M. balbisiana*, *M. laterita*, *M. nagensium*, *M. ornata*	N E India	Uma 2006
skin of pseudostem	insect bites	edible cvs	PNG	Powell 1976
	tonic for humans and pigs	*M. ingens*	PNG Highlands	Sterly 1997
fruit pulp and pounded skin	poultice	edible *Musa* cvs	Malaysia, PNG, Polynesia, Thailand	Burkill 1935, Jacquat 1990, Nelson *et al*. 2006, Sterly 1997, Whistler 1992
ripe fruit	diarrhoea, dysentery	edible *Musa* cvs	India	Watt 1972
seedy fruit, ripe	diarrhoea, dysentery	*Musa* sp	Mindanao	Dampier 1927
roasted fruit	diarrhoea, dysentery	edible *Musa* cvs	Indonesia, PNG Highlands	Heyne 1950, Sterly 1997
immature seedy fruit, roasted	diarrhoea, dysentery	*M. balbisiana*	Indonesia	Heyne 1950

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
fruit skin	tincture for internal complaints	*M. balbisiana*	Cambodia	Kham 2004
young flower buds	respiratory complaints	*Musa* sp	PNG Highlands	Powell 1976
leaves	dressings	many spp/cvs, including *M. aurantiaca*, *M. balbisiana*, *M. nagensium*, *M. ornata*	widespread	Burkill 1935, Perry 1980, Sterly 1997, Uma 2006, Watt 1972
	elephant medicine	*Musa acuminata* ssp *malaccensis* (Ridl.) Simmonds	Malaysia, Indonesia	Burkill 1935
	eaten as abortifacient	*Musa* spp	PNG	Powell 1976
powdered leaves	boils		China	Reynolds & Fang 1940
ash of pseudostem, corm, fruiting stalk and fruit peel	anti-scorbutic, digestive, tonic	edible cvs, *M. ornata*	N E India	Uma 2006, Watt 1972
Stimulant				
dry leaves	cigarette papers, cigars	many spp/cvs, including **Fe`i** cvs, *M. campestris*, *M. hirta*	widespread	Christensen 2002, Heyne 1950, Jacquat 1990, Lentfer 2003, MacDaniels 1947
Domestic Uses				
leaves	wrapping material	many spp/cvs, including *M. balbisiana*, *M. maclayi*, *Musa schizocarpa* Simmonds	widespread	Burkill 1935, Jacquat 1990, Lentfer 2003, Nelson *et al*. 2006, Powell 1976, Rajah 2008, Simmonds 1959, Sterly 1997, Watt 1972
	lining and covering cooking vessels and earth ovens	many spp/cvs, including *M. ingens*, *M. peekelii*	widespread	Burkill 1935, Jacquat 1990, Lentfer 2003, Nelson *et al*. 2006, Powell 1976, Simmonds 1959, Sterly 1997, Uma 2006
leaves, midribs and bracts	plates, dishes and mats	many spp/cvs	widespread	Burkill 1935, Heyne 1950, Jacquat 1990, MacDaniels 1947, Nelson *et al*. 2006, Powell 1976, Simmonds 1959, Sterly 1997
pseudostem	raft, canoe rollers	*Musa* spp, **Fe`i** cvs	N E India, Micronesia, PNG, Polynesia	MacDaniels 1947, Nelson *et al*. 2006, Powell 1976, Uma 2006, Williams 1930
	children's toy, toboggan	edible *Musa* cvs	PNG Highlands	Sterly 1997
outer skin of pseudostem	containers	many spp/cvs	PNG, Mindanao	Kocher Schmid 1991, Sterly 1997, Yen & Gutierrez 1976
seedy fruit	beer additive	Eumusa spp	N E India	Uma 2006
ash from burnt pseudostem, leaves, corm	laundry/mordant	many spp/cvs	India, Malaysia, Thailand	Burkill 1935, Simmonds 1959, Uma 2006, Watt 1972

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
juice of fruit	ink			Burkill 1935
juice/sap from pseudostem	dye/stain for bamboo/rattan, matting	edible *Musa* cvs	Indonesia, Polynesia	Heyne 1950, Nelson *et al*. 2006, Simmonds 1959, Uphof 1968
	cleaning knives	edible *Musa* cvs	PNG	Kocher Schmid 1991
Shelter				
leaves	roofing and walls, insulation and draft-proofing	many spp/cvs, including *M. ingens*, *M. schizocarpa*	widespread	Burkill 1935, Lentfer 2003, Nelson *et al*. 2006, Powell 1976, Simmonds 1959, Sterly 1997, Watt 1972
	temporary shelters	*M. ingens*	PNG Highlands	Lentfer 2003, Sterly 1997
	umbrella/raincoat	many spp/cvs	widespread	Burkill 1935, Simmonds 1959
petiole fiber	thatch	edible *Musa* cvs	Hawaii	Neal 1965
Cordage				
petiole and pseudostem	traditional cordage and string	many spp/cvs, including *Musa alinsanaya* R.V.Valmayor, *M. balbisiana*, *Musa textilis* Née, *E. glaucum*	widespread	Burkill 1935, Heyne 1950, Powell 1976, Rumphius 1747, Simmonds 1959, Sterly 1997, Uphof 1968, Valmayor 2001, Watt 1972, Yen & Gutierrez 1976
pseudostem	industrial rope	*M. textilis*	Philippines	Burkill 1935, Purseglove 1975, Watt 1972
leaves	rope	*M. lasiocarpa*	Yunnan	Liu *et al*. 2003
	string	*Musa* sp	Borneo	Christensen 2002
Clothing				
leaves	dried, shredded for skirts, capes, loin-cloths	many spp/cvs	PNG, Vanuatu	Deacon 1934, Malinowski 1935, Powell 1976, Weiner 1976
pseudostem	fiber for skirts, skin for belts	many spp/cvs	Hawaii, PNG	Nelson *et al*. 2006, Powell 1976
Textiles				
pseudostem, petiole	fiber for cloth production	many spp/cvs, especially *M. textilis* and *M. balbisiana*	Batanes, Borneo, S. China, Luzon, Micronesia, Mindanao, Ryukyus, Sangihe/ Talaud, Solomon Islands, Vietnam, Visayas	Dampier 1927, Evans 1922, Fraser-Lu 1988, Hendrickx 2007, Kuhn 1988, Lu & Huang 1986, Reynolds & Fang 1940, Rubinstein & Limol 2007, Rumphius 1747, Stinchecum 2007
juice/sap from stalk of inflorescence, pseudostem and suckers	dye/stain for yarn/cloth	edible *Musa* cvs	India, Indonesia, Micronesia	Heyne 1950, Rubinstein & Limol 2007, Rumphius 1747, Watt 1972
	dye/stain for tapa cloth	**Fe`i** cvs	PNG, Samoa	Burkill 1935, Whistler 2000

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
pseudostem/ petiole fiber, skin of petiole	resist in tie-dying	edible *Musa* cvs	E. Indonesia, Malaysia, Ryukyus, Thailand	Burkill 1935, Fraser-Lu 1988, Hendrickx 2007
skin of pseudostem	decorative element in matting	**Fe`i** and other edible cvs	Indonesia, Polynesia	Heyne 1950, MacDaniels 1947, Neal 1965, Nelson *et al*. 2006, Whistler 2000
ash from burnt pseudostem, leaves, corm	mordant	edible *Musa* cvs	India	Burkill 1935
wax from bract and leaf	resist in batik cloth production	*M. acuminata* ssp/var	Java	Burkill 1935, Heyne 1950, Nakai 1948, Simmonds 1959
Paper-making				
pseudostem	fine and coarse paper, industrial filters, tea bags	many spp/cvs	widespread	Burkill 1935, Hendrickx 2007, Sharrock 1996, Watt 1972
juice/sap of corm	varnish for paper	*M. balbisiana*	Ryukyus	Hendrickx 2007
Ornamental				
whole plant	horticultural	many spp/cvs	widespread	Constantine 1999-2008
inflorescence	horticultural	many spp/cvs	widespread	Constantine 1999-2008
flowers	garnish for food	*M. peekelii*	PNG	Lentfer 2003
leaves	body decoration	many spp/cvs	PNG, Polynesia	Lentfer 2003, Powell 1976, Whistler 2000
dried leaves	garlands	many spp/cvs	widespread	Burkill 1935
seeds	strung as beads, ornaments	*Musa* and *Ensete* spp	Philippines, PNG, N. Thailand	Anderson 1993, Burkill 1935, Lentfer 2003, Powell 1976, Simmonds 1959, Williams 1930
ash	tattooing	edible *Musa* cvs	Polynesia	Nelson *et al*. 2006
Ceremonial, Magic and Ritual				
whole plant	object of veneration, symbol of plenty, metaphor for human mortality, totem	edible *Musa* cvs	India, Madagascar, Malaysia, New Caledonia, PNG,	Endicott 1979, Kagy 1998, Keller 2008, Watt 1972, Williams 1936, Williams 1941
	marker of graves	*M. ingens*	PNG	Argent 1979
	many rituals, exorcism, garden magic, planted as hunting decoy, protective	edible *Musa* cvs	Malaysia, PNG, Polynesia	Burkill 1935, Kocher Schmid 1991, Malinowski 1935, Nelson *et al*. 2006, Powell 1976, Sterly 1997
fruiting stalk	ceremonial display	edible *Musa* cvs	India, Bali, Malaysia	Burkill 1935, Watt 1972

Category				
Part used	**Use**	**Genus/species**	**Location(s)**	**Citations**
pseudostem	peace making ceremony	edible *Musa* cvs	PNG Highlands	Sterly 1997
	funerary effigy	edible *Musa* cvs	New Ireland, PNG	Denner 2006, Peltier 2006
leaves	rituals, chewed in funeral rites, worn during dance performance, rain magic	edible *Musa* cvs	PNG	Malinowski 1935, Powell 1976, Sterly 1997
	ceremonies and offerings	*M. acuminata*, *M. hirta*	N. Thailand, Borneo	Anderson 1993, Christensen 2002, Rajah 2008
	scraped, dried bundles produced and exchanged as women's wealth	edible *Musa* cv	Trobriand Islands, PNG	Weiner 1976
leaf sheath	divination	edible *Musa* cv	PNG	Kocher Schmid 1991
fruit	offerings, in rites of passage	edible *Musa* cvs	widespread	Burkill 1935, Hla Pe 1978, Kocher Schmid 1991, Rajah 2008, Simmonds 1959, Sterly 1997, Watt 1972
stalk	surrogate human	edible *Musa* cvs	Hawaii, Tahiti	Neal 1965, Nelson *et al*. 2006
juice/sap of pseudostem	cleansing ritual for brides	edible *Musa* cvs	PNG Highlands	Sterly 1997
	paint/dye for funerary masks	**Fe`i** cvs	PNG	Lentfer 2003
skin of pseudostem	magic to strengthen pigs and children	*M. ingens*	PNG Highlands	Sterly 1997
shoot	magic	*M. ingens*	PNG Highlands	Sterly 1997

tions are unequivocally with the Indo-Malesian homeland. There is an extensive literature on African uses of *Ensete* (see Brandt *et al*. 1997, Constantine 1999-2008, Shigeta 1996, Tsehaye & Kebebew 2006 for references).

Recognition of the usefulness of Musaceae was part of the basis of Sauer's (1952) hypothesis that agriculture in Southeast Asia began with the vegetative propagation of fiber and dye plants, followed by perennial food plants. Simmonds, accepting this part of Sauer's proposal, saw the recognition of the useful properties of translocated wild bananas by early Southeast Asians as the context in which 'the first signs of parthenocarpy and sterility [were seized upon] as providing a useful addition to an already considerable repertoire of virtues', during which 'the plants were transformed from jungle weeds into a highly productive crop' (Simmonds 1962:132).

The problem with this formulation is the shift of attention away from all useful aspects of Musaceae except edible fruit. The distortion is completely explicable, given that Simmonds' enormous contribution to cytogenetic research on banana edibility was aimed at the improvement of fruiting bananas. Nevertheless, it encourages ignorance, or amnesia, about other important aspects of the long history of entanglement of people and Musaceae. When Simmonds was considering such matters, the study of Southeast Asian prehistory had neither the tools to investigate past interrelationships of people and plants, nor any expectation of the great time depth involved.

The very widespread use of *Musa* species for fiber has certainly led in some places in directions that parallel those of fruiting bananas, with clonal reproduction of selected forms as well as planting from seed. In the Philippines, production of *Musa textilis* Née (Manila hemp, **abacá**), almost certainly a complex cultigen rather than a genuine wild species, was increased by Spanish decree in the mid-eighteenth century, and developed to industrial scale under later American and Japanese occupations,

with production spreading to other countries (Hendrickx 2007, Purseglove 1975, Simmonds 1962). In the Philippines, production continues, despite the competition from synthetic fibers (Figure 6).

Production of other species for fiber has also been notable. For example, **bashōfu** cloth produced in Okinawa Prefecture was sent as tribute to China in the late sixteenth century, and is now a strong marker of a resurgent Okinawan identity (Figure 7). Popularized in Japan by a Japanese craft movement as an emblem of an idealized Okinawan past, the finest **bashōfu** cloth produced in Okinawa now commands high prices in mainland Japan — more than US$20,000 for a kimono length. The plant is not *Musa basjoo* von Siebold ex Y. Iinuma as is commonly claimed (though that species does produce fiber), but *Musa balbisiana* Colla (Hendrickx 2007, Stinchecum 2007).

Figure 6. Production of **abacá** from *Musa textilis* Née, Aklan, Panay, Philippines: **A**. Harvesting in a cultivation area; **B**. Separating layers of pseudostem; **C**. Drying fiber. Photos by Juergen Steger, SachsenLeinen, Waldenburg, Germany.

Figure 7. Winding thread of **bashō** fibre (from the inner pseudostem of *Musa balbisiana* Colla), the Okinawan weaver Yonemori Tokuko poses wearing a kimono of the same fibre, Maezato village, Ishigaki Island, Okinawa, 1983. Photo by Amanda Mayer Stinchecum, New York.

In the Trobriand Islands, Milne Bay Province, Papua New Guinea, women manufacture bundles and skirts from banana leaves by a laborious process involving scraping over carved wooden boards, producing distinctive decorative imprints, followed by sun-bleaching, drying and storage (K. Lepani pers. comm.) (Figure 8). These valuables are produced and exchanged only by women, and their labour in turning banana leaves into 'women's wealth' is central to women's control of the timeless cosmological domain which ensures the continuation of Trobriand social identity. Their role counterbalances the power of men in the quotidian world, to seek renown through the famous **kula** exchanges (Weiner 1976, 1980). The use of banana fiber in textile production is widespread in the Asia-Pacific region, and such textiles are often highly valued (Figure 9) (Fraser-Lu 1988, Hamilton 2007, Hendrickx 2007, Jolly 1992, Rubinstein & Limol 2007, Weiner 1986).

Conclusion

These examples show that Indo-Malesian uses of Musaceae other than edible fruit are neither minor, nor necessarily secondary to production of the fruit. They have not dwindled into insignificance as the fruit became globally important. In the Philippines, **abacá** production, no longer important for rope, supports a burgeoning craft industry. In India, banana stems are processed for fiber and exported to Nepal, where knitting yarn is spun for sale in the West, marketed in craft shops as 'banana silk'. The cost of Okinawan **bashōfu** escalates. In the Trobriands, women continue to produce banana leaf bundles, and young women of Fais learn to weave **machi**.

Modern industries, whether on a huge scale, like the growing of Cavendish bananas for world trade, or the high value but small-scale production of **bashōfu** cloth in Okinawa, have grown from very deep roots. The industrial separation of fruit and fiber production should not blind us to the likelihood that particular *Musa* species in the past have furnished multiple products. Nevertheless, some specialization or differentiation is also likely, and this implies that selection may have taken different directions in different places and times. The example of the Ethiopian *Ensete ventricosum* (Welw.) Cheesman, domesticated as a starch staple, is well known (Brandt *et al*. 1997, Purseglove 1975). We should not rule out the possibility that

Figure 8. Banana leaf fiber is central to women's wealth (**doba**) in the Trobriand Islands, Milne Bay Province, PNG: **A**. The strips show decorative imprints; **B**. Tying prepared banana leaf strips into bundles; **C**. Close-up of piled bundles; **D**. Preparing bundles in readiness for a ceremony; **E**. Piles of **doba** in front of a yam house during a ceremonial exchange; **F**. Young women's skirts are also produced from banana leaf strips. Photos by Mark Mosko, Anthropology Department, Research School of Pacific and Asian Studies, Australian National University.

parallel selection for starch production in the corm and pseudostem of Malesian *Musa* species may also have occurred in the past. There is at least one example of selection for enhanced starch storage in the rhizome of a New Caledonian *Musa* plant, described as having a 'glaucous, violet stem and a turnip-like rhizome which, when cooked, resembles a yam in taste' (Simmonds 1959:267 citing Baker 1894).

Figure 9. On Fais, in the western Caroline Islands of Micronesia, prestigious traditional textiles called **machi** are still woven. Fiber from *Musa* cultivars forms the warp and weft, with decorative supplementary weft of *Hibiscus* sp. fiber. The ritual value of **machi** derives from their association with chieftainship. **A**. Weaving on a back-strap loom; **B**. **Machi**. Photos by Michiko Intoh, National Museum of Ethnology, Osaka, Japan.

We should not, therefore, interpret archaeobotanical discoveries of banana parts by reference solely to what we know of the development of edibility in fruit. The cultivation of *M. textilis* and *M. balbisiana* for fiber show that seedy fruit is not necessarily an indication of 'wildness'. While parthenocarpy is the key to edibility of fruit, and its reproduction and transmission certainly depended upon vegetative propagation, other desirable characteristics of *Musa* species may also have been vegetatively propagated. There is no reason to suppose that parthenocarpic fruit alone called forth propagation by vegetative planting. Although parthenocarpy could not have spread without the reinforcement of vegetative propagation, other desirable characteristics which did not interfere so directly with fertility could also be propagated in the same way. Thus, parthenocarpic forms of *Musa* species that on present evi-

dence arose only on the eastern edge of Malesia may have spread west into areas where other useful *Musa* species were already well established in the domain of humans. The new fruit cultivars, and those that then developed from interspecific and intersubspecific hybridization, may thus have been an addition to the repertoire of banana cultivation, rather than an innovation or replacement.

Acknowledgements

Thanks to Tim Bayliss-Smith, Doreen Bowdery, Bill Clarke, David Constantine, Edmond De Langhe, Tim Denham, Peter Dwyer, Roy Ellen, James Fox, Jack Golson, Terry Hays, Robin Hide, Katherine Lepani, Peter Matthews, Doyle McKey, Mylien T. Nguyen, Rintaro Ono, Luc Vrydaghs, and Douglas Yen for their encouragement and assistance; and to Jeff Daniells, Michiko Intoh, Christiane Jacquat, Mark Mosko, Juergen Steger, Amanda Stinchecum and Shu Suehiro for their generosity in allowing me to reproduce their photographs.

Literature Cited

Anderson, E.F. 1993. *Plants and People of the Golden Triangle: Ethnobotany of the hill tribes of Northern Thailand*. Dioscorides Press, Portland, Oregon.

Argent, G. 1979. New Guinea bananas — a problematic genetic resource. Pp. 57-70 in *Biological Aspects of Plant Genetic Resource Conservation in South-East Asia. Transactions of the Fifth Aberdeen-Hull Symposium on Malesian Ecology*. Edited by K. Jong. Miscellaneous Series 21, Department of Geography, University of Hull, and Institute for South-East Asian Biology, University of Aberdeen.

Arnaud, E. & J.-P. Horry. 1997. Editors of *Musalogue: A catalogue of Musa germplasm. Papua New Guinea collecting expeditions, 1988-1989*. International Network for the Improvement of Banana and Plantain, Montpellier.

Bailey, F.M. 1900. A New Guinea food plant. *Queensland Agricultural Journal* 7:442.

Baker, J.G. 1894. Species and principal varieties of *Musa*. *Kew Bulletin* 1894:119-314.

Barker, G. 2005. The archaeology of foraging and farming at Niah Cave, Sarawak. *Asian Perspectives* 44:90-106.

Barker, G., T. Reynolds & D. Gilbertson. 2005. The human use of caves in peninsular and island Southeast Asia: Research themes. *Asian Perspectives* 44:1-15.

Barker G, H. Barton, M. Bird, P. Daly, I. Datan, A. Dykes, L. Farr, D. Gilbertson, B. Harrisson, C. Hunt, T. Higham, L. Kealhofer, J. Krigbaum, H. Lewis, S. McLaren, V. Paz, A. Pike, P. Piper, B. Pyatt, R. Rabett, T. Reynolds, J. Rose, G. Rushworth, M. Stephens, C. Stringer, J. Thompson & C. Turney. 2007. The 'human revolution' in lowland tropical Southeast Asia: The antiquity and behavior of anatomically modern humans at Niah Cave (Sarawak, Borneo). *Journal of Human Evolution* 52:243-261.

Brandt, S.A., A. Spring, C. Hiebsch, J.T. McCabe, E. Tabogie, M. Diro, G. Wolde-Michael, G. Yntiso, M. Shigeta & S. Tesfaye. 1997. *The 'Tree Against Hunger': Enset-based agricultural systems in Ethiopia*. American Association for the Advancement of Science, Awassa Agricultural Research Center, Kyoto University Center for African Area Studies, and University of Florida, Washington, DC. www.aaas.org/international/africa/enset/enset.pdf

Burkill, I.H. 1935. *A Dictionary of the Economic Products of the Malay Peninsula*. Crown Agents for the Colonies, London.

Carreel, F., D. González de Léon, P. Lagoda, C. Lanaud, C. Jenny, J.P. Horry & H. Tézenas du Montcel. 2002. Ascertaining maternal and paternal lineage within *Musa* by chloroplast and mitochondrial DNA RFLP analyses. *Genome* 45:679-692.

Christensen, H. 2002. *Ethnobotany of the Iban and Kelabit*. Denmark and Sarawak, Malaysia, University of Aarhus, NEPCon and Forest Department, Sarawak.

Constantine, D. 1999-2008. *The Musaceae: An annotated list of the species of Ensete, Musa and Musella.* www.users.globalnet.co.uk/~drc/musaceae.htm. (Last accessed 20.1.2009).

Dampier, W. 1927. *A New Voyage Round the World*. Argonaut Press, London. (First published 1697.)

Dassanayake, M.D. & W.D. Clayton. 2000. Editors of *A Revised Handbook to the Flora of Ceylon*. Volume XIV. A.A. Balkema, Rotterdam.

Deacon, A.B. 1934. *Malekula: A vanishing people in the New Hebrides*. Routledge & Sons, London.

Denner, A. 2006. Ephemeral art. Pp. 138-141 in *New Ireland: Art of the South Pacific*. Edited by M. Gunn & P. Peltier. Musée du Quai Branly, Paris & 5 Continents Editions, Milan.

De Langhe, E., L. Vrydaghs, P. de Maret, X. Perrier & T. Denham. 2009. Why bananas matter: An introduction to the history of banana domestication. *Ethnobotany Research and Applications* 7:165-177.

De Langhe, E., D. Wattanachaiyingcharoen, H. Volkaert & S. Piyapitchard. 2000. Biodiversity of wild Musaceae in Northern Thailand. Pp. 71-83 in *Advancing Banana and Plantain R and D in Asia and the Pacific*. Edited by A.B. Molina & V.N. Roa. Proceedings of the 9th INIPAB-ASP-

NET Regional Advisory Committee meeting. INIBAP-Asia and the Pacific Network, Los Baños, Laguna, Philippines.

Endicott, K.M. 1979. *Batek Negrito Religion: The world-view and rituals of a hunting and gathering people of peninsular Malaysia*. Clarendon Press, Oxford.

Evans, I.H.N. 1922. *Among Primitive Peoples in Borneo.* Seeley, Service, London.

Fraser-Lu, S. 1988. *Handwoven Textiles of South-East Asia*. Oxford University Press, Singapore, Oxford.

Groube, L. 1989. The taming of the rainforest: A model for late Pleistocene forest exploitation in New Guinea. Pp. 292-304 in *Foraging and Farming: The evolution of plant exploitation*. Edited by D. Harris & G.C. Hillman. Unwin Hyman, London.

Häkkinen, M. 2006. *Musa lawitiensis* Nasution & Supard. (Musaceae) and its intraspecific taxa in Borneo. *Adansonia* 28:55-65.

Häkkinen, M. & H. Väre. 2008. Typification and check-list of *Musa* L. names (Musaceae) with nomenclatural notes. *Adansonia série 3* 30:63-112.

Häkkinen, M. & H. Wang. 2007. New species and variety of *Musa* (Musaceae) from Yunnan, China. *Novon* 17:440-446.

Häkkinen, M., H. Wang & X.-J. Ge. 2008. *Musa itinerans* (Musaceae) and its intraspecific taxa in China. *Novon* 18:50-60.

Hamilton, R.W. 2007. Bast and leaf fibers in the Asia-Pacific region. Pp. 25-39 in *Material Choices: Refashioning bast and leaf fibers in Asia and the Pacific*. Edited by R.W. Hamilton & B.L. Milgram. Fowler Museum, University of California at Los Angeles, Los Angeles.

Hays, T.E. 1991. Interest, use, and interest in uses in folk biology. Pp. 109-114 in *Man and a Half: Essays in Pacific anthropology and ethnobiology in honour of Ralph Bulmer*. Edited by A. Pawley. Memoir 48, The Polynesian Society, Auckland.

Hendrickx, K. 2007. *The Origins of Banana-Fibre Cloth in the Ryukyus, Japan*. Leuven University Press, Leuven.

Heyne, K. 1950. *De Nuttige Planten van Indonesie*. 3rd edition. N.V. Uitgeverij W. Van Hoeve, 's-Gravenhage, Bandung. (First published 1921.)

Hla Pe. 1978. Burmese attitudes to plants and animals. Pp. 88-104 in *Natural Symbols in South East Asia*. Edited by G.B. Milner. School of Oriental and African Studies, London.

Jacquat, C. 1990. *Plants from the Markets of Thailand*. Editions Duang Kamol, Bangkok, Thailand.

Jolly, M. 1992. Banana leaf bundles and skirts: A Pacific Penelope's web? Pp. 38-64 in *History and Tradition in Melanesian Anthropology*. Edited by J.G. Carrier. University of California Press, Berkeley, Los Angeles, Oxford.

Kagy, V. 1998. The food, socioeconomic and cultural importance of banana in Kanak society in New Caledonia. *InfoMusa* 7:22-24.

Kealhofer, L. 2003. Looking into the gap: Land use and the tropical forests of South Thailand. *Asian Perspectives* 42:72-95.

Keller, E. 2008. The banana plant and the moon: Conservation and the Malagasy ethos of life in Masoala, Madagascar. *American Ethnologist* 35:650-664.

Kennedy, J. 2008. Pacific bananas: Complex origins, multiple dispersals? *Asian Perspectives* 47:75-94.

Kennedy, J. n.d. Bananas: Towards a revised prehistory. in *From Foragers to Farmers: Gordon C. Hillman festschrift*. Edited by A.S. Fairbairn & E. Weiss. Oxbow, Oxford. In press.

Kham, L. 2004. *Medicinal Plants of Cambodia: Habitat, chemical constituents and ethnobotanical uses*. Bendigo Scientific Press, Bendigo, Australia.

Kocher Schmid, C. 1991. *Of People and Plants: A botanical ethnography of Nokopo village, Madang and Morobe Provinces, Papua New Guinea*. Basler Beiträge zur Ethnologie, Band 33. Basel, Ethnologisches Seminar der Universität und Museum für Völkerkunde.

Kuhn, D. 1988. *Textile Technology: Spinning and reeling. chemistry and chemical technology. Volume 5, Part 9. Science and Civilisation in China*. Edited by J. Needham. Cambridge University Press, Cambridge.

Latinis, D.K. 2000. The development of subsistence system models for Island Southeast Asia and Near Oceania: The nature and role of arboriculture and arboreal-based economies. *World Archaeology* 32:41-67.

Lentfer, C.J. 2003. *Tracing Antiquity of Banana Cultivation in Papua New Guinea: Report on collection of modern reference material from Papua New Guinea in 2002*. Unpublished report prepared for the Pacific Biological Foundation, Sydney, Australia.

Liu, A.Z., W.J. Kress & C.L. Long. 2003. The ethnobotany of *Musella lasiocarpa* (Musaceae), an endemic plant of southwest China. *Economic Botany* 57:279-281.

Long, C., S. Ahmed, X. Wang, Y. Liu, B. Long, C. Yang, Y. Shi, X. Li & R. Guo. 2008. Why *Musella lasiocarpa* (Musaceae) is used in southwest China to feed pigs. *Economic Botany* 62:182-186.

Lu, G.-D. & H.-T. Huang. 1986. *Botany, Biology and Biological Technology. Volume 6, Part 1. Science and Civilisation in China*. Edited by J. Needham. Cambridge University Press, Cambridge.

MacDaniels, L.H. 1947. *A Study of the Fe`i Banana and its Distribution with reference to Polynesian Migrations*. B.P. Bishop Museum Bulletin 190, Bishop Museum Press, Honolulu.

Malinowski, B. 1935. *Coral Gardens and their Magic*. American Book Company, New York, Cincinnati, Chicago.

Massal, E. & J. Barrau, J. 1956. *Food Plants of the South Seas*. Technical Paper 94, South Pacific Commission, Noumea.

Mercader, J. 2003. Introduction: The Palaeolithic settlement of rain forests. Pp. 1-31 in *Under the Canopy: The archaeology of tropical rain forests*. Edited by J. Mercader. Rutgers University Press, New Brunswick, New Jersey.

Mogina, J. 2002. *Changing Knowledge of Plants in Transitional Societies at Milne Bay, Papua New Guinea*. Unpublished Ph.D. Thesis, Australian National University, Canberra.

Nakai, T. 1948. The kind of banana being wild or cultivated in west-Java, and their belongings. *Bulletin of the Tokyo Science Museum* 22:5-21

Neal, M.C. 1965. *In Gardens of Hawaii*. Bernice P. Bishop Museum Special Publication 50, Bishop Museum Press, Honolulu.

Nelson, S.C., R.C. Ploetz & A.K. Kepler. 2006. *Musa* species (bananas and plantains), ver. 2.2. In *Species Profiles for Pacific Island Agroforestry*. Edited by C.R. Elevitch. Permanent Agriculture Resources (PAR), Hōlualoa, Hawai'i. www.traditionaltree.org.

Nguyen, M.T. 2006. Insertions and deletions: Evolution in the assemblage of Vietnamese food plants. *Ethnobotany Research and Applications* 4:175-201.

Noweg, T., A.R. Abdullah & D. Nidang. 2003. *Forest Plants as Vegetables for Communities Bordering the Crocker Range National Park*. ASEAN Review of Biodiversity and Environmental Conservation (ARBEC). www.arbec.com.my/pdf/art3janmar03.pdf

Ochse, J.J. 1977. *Vegetables of the Dutch East Indies*. Australian National University Press, Canberra. (First published in Dutch, 1931.)

Pavlides, C. & C. Gosden. 1994. 35,000-year-old sites in the rain forests of West New Britain, Papua New Guinea. *Antiquity* 68:604-610.

Peltier, P. 2006. Lihir Islands. Pp. 156-157 in *New Ireland: Art of the South Pacific*. Edited by M. Gunn & P. Peltier. Musée du Quai Branly, Paris & 5 Continents Editions, Milan.

Perrier X., F. Bakry, F. Carreel, Ch. Jenny, J.P. Horry, V. Lebot & I. Hippolyte. 2009. Combining biological approaches to shed light on the evolution of edible bananas. *Ethnobotany Research and Applications* 7:199-216.

Perry, L.M. 1980. *Medicinal Plants of East and Southeast Asia*. MIT Press, Cambridge, Massachusetts.

Petir, A., D. Materem, P. Yaponmg, S. Mukarek, M. Okira & T. Platts-Mills. 1998. *Useful Plants of Salemben Village, Madang Province, Papua New Guinea*. The Christensen Research Institute Publication No 13, Christensen Research Institute, Madang.

Powell, J.M. 1976. Ethnobotany. Pp. 106-183 in *New Guinea Vegetation*. Edited by K. Paijmans. Australian National University Press, Canberra.

Purseglove, J.W. 1975. *Tropical Crops: Monocotyledons*. 2nd impression. Halsted Press, New York.

Rajah, A. 2008. *Remaining Karen: A study of cultural reproduction and the maintenance of identity*. ANU E Press, Canberra.

Reynolds, P.K. & C.Y. Fang. 1940. The banana in Chinese literature. *Harvard Journal of Asiatic Studies* 5:165–181.

Rubinstein, D. & S. Limol. 2007. Reviving the sacred machi: A chiefly weaving from Fais Island, Micronesia. Pp. 155-165 in *Material Choices: Refashioning bast and leaf fibers in Asia and the Pacific*. Edited by R.W. Hamilton & B.L. Milgram. Fowler Museum, UCLA, Los Angeles.

Rumphius, G.E. 1747. *Herbarium Amboinense*. V*olume 5, Book 8. De plantis agens domesticis, tam victui, quam medicinae, et decori inservientibus.* F. Changuion, H. Uytwerf, Amsterdam & P. Gosse, J. Neaulme, A. Moetjens, A. van Dole, The Hague.

Sauer, C.O. 1952. *Agricultural Origins and Dispersals: The domestication of animals and foodstuffs*. American Geographical Society, New York.

Sharrock, S. 1996. *Uses of Musa*. Focus Paper 3, INIBAP Annual Report. International Network for the Improvement of Banana and Plantain, Montpellier.

Shigeta, M. 1996. Creating landrace diversity: The case of the Ari people and enset (*Ensete ventricosum*) in Ethiopia. Pp. 233-268 in *Redefining Nature: Ecology, culture and domestication*. Edited by R. Ellen & K. Fukui. Berg, Oxford.

Sillitoe, P. 1983. *Roots of the Earth: Crops in the Highlands of Papua New Guinea*. New South Wales Press, Kensington, Australia.

Simmonds, N.W. 1956. Botanical results of the banana collecting expedition, 1954-5. *Kew Bulletin* 11:463-489.

Simmonds, N.W. 1959. *Bananas*. Longmans, Green & Co., London.

Simmonds, N.W. 1962. *The Evolution of the Bananas*. Longmans, Green & Co., London.

Sterly, J. 1997. *Simbu Plant Lore: Plants used by the people in the central highlands of New Guinea*. Dietrich Reimer, Berlin.

Stinchecum, A.M. 2007. Bashōfu, the Mingei movement and the creation of a new Okinawa. Pp. 105-117 in *Material Choices: Refashioning bast and leaf fibers in Asia and the Pacific*. Edited by R.W. Hamilton & B.L. Milgram. Fowler Museum, UCLA, Los Angeles.

Tsehaye, Y. & F. Kebebew. 2006. Diversity and cultural use of enset (*Ensete ventricosum* (Welw.) Cheesman) in Bonga in situ conservation site, Ethiopia. *Ethnobotany Research and Applications* 4:147-157.

Uma, S. 2006. *Farmers' Knowledge of Wild Musa in India*. FAO, Rome.

Uphof, J.C.T. 1968. *Dictionary of Economic Plants*. J. Kramer, Lehre.

Valmayor, R.V. 2001. Classification and characterization of *Musa exotica*, *M. alinsanaya* and *M. acuminata* ssp. *errans*. *Infomusa* 10:35-39.

Watt, G. 1972. *Dictionary of the Economic Products of India*. *Volume 5. Linum to Oyster*. Periodical Experts, Delhi. (First published 1891.)

Weiner, A. 1976. *Women of Value, Men of Renown: New perspectives in Trobriand exchange*. University of Texas Press, Austin.

Weiner, A. 1980. Stability in banana leaves: Colonization and women in Kiriwina, Trobriand Islands. Pp. 270-293 in *Women and Colonization: Anthropological perspectives*. Edited by M. Etienne & E. Leacock. J.F. Bergin, New York.

Weiner, A. 1986. Forgotten wealth: Cloth and women's production in the Pacific. Pp. 96-110 in *Women's Work: Development and the division of labour by gender*. Edited by E. Leacock, H.I. Safa. Bergin & Garvey, Massachusetts.

Whistler, W.A. 1992. *Polynesian Herbal Medicine*. National Tropical Botanical Garden, Lawai, Kauai, Hawaii.

Whistler, W.A. 2000. *Plants in Samoan Culture: The ethnobotany of Samoa*. Isle Botanica, Hawaii.

Whitmore, T.C. 1984. *Tropical Rain Forests of the Far East*. Second edition, Oxford University Press, Oxford.

Williams, F.E. 1930. *Orokaiva Society*. Oxford University Press, London.

Williams, F.E. 1936. *Papuans of the Trans-Fly*. Oxford University Press, London.

Williams, F.E. 1941. *Natives of Lake Kutubu, Papua*. Oceania Monographs 6. Australian National Research Council, Sydney.

World Health Organisation (WHO) 1998. *Medicinal Plants in the South Pacific*. WHO, Manila.

Wu, D & W.J. Kress. 2000. Musaceae. Pp. 297-313 in *Flora of China*. *Volume 24 (Flagellariaceae through Marantaceae)*. Edited by Z.Y. Wu & P.H. Raven. Science Press, Beijing, & Missouri Botanical Garden Press, St. Louis.

Yen, D.E. & H.G. Gutierrez. 1976. The ethnobotany of the Tasaday: I. The useful plants. Pp. 97-136 in *Further Studies on the Tasaday*. Edited by D.E. Yen & J. Nance. Panamin Foundation Research Series 2, Makati, Philippines.