

## **Vegecultures and the social-biological transformations of plants and people**

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### **Abstract**

The social entanglements of vegetative reproduction are considered for three neighbouring  
tropical regions that are often considered to exhibit very different histories of plant  
exploitation during the Holocene: early and independent agricultural development on New

Guinea; introduction of agriculture to Island Southeast Asia during the last 3000-4000 years; and, Australia as the 'hunter-gatherer' continent. Following recent reassessments that emphasise the commonalities of many plant exploitation practices across these three regions, the focus here is upon the shared vegetative disposition, or orientation, of people to plants. The intention is to provide insight on how people's awareness of the vegetative reproductive capacity of plants has been mutually constitutive for the production and reproduction of their social worlds, whether by groups ordinarily referred to as 'hunter-gatherer' or 'horticulturalist'.

### **Engagements of Plants and People**

The regions of Island Southeast Asia (ISEA), New Guinea and Australia are often characterized as having very different Holocene histories of plant exploitation: agriculture emerged independently in the New Guinea region (Golson 1977; Denham et al. 2003; Denham 2011); agriculture was brought into ISEA by Austronesian-speaking farmer-voyagers from Taiwan (Bellwood 2005; cf. Donohue and Denham 2010); and, people in Australia remained as hunter-gatherers, albeit, with some degree of plant management (Lourandos 1997; cf. Jones 1969; Jones and Meehan 1989). Yet within these regions, communities across tropical Island Southeast Asia, New Guinea and northern Australia appear to share many aspects of a vegetative orientation, or disposition to their world that encompasses both the social and biological domains.

It is our contention that this shared vegetative orientation towards perennials has contributed to underlying commonalities in the ways people engage with each other, domesticate their landscapes, and (re)produce their sense of identity (Figure 1). We argue that these commonalities are more fundamental, or primordial, than the apparent

differences between groups in each of these three regions – whether they be classified as horticulturalist, sago cultivator or hunter-gatherer.

In this paper we view plants as central entities that facilitate change and transformation, rather than organisms that exist on the peripheries of human decision-making; where entire plant ecologies are continually emerging from an ongoing dialogue between people and the living world. This relationship can just as readily be seen as a world from which humans and their social worlds continually emerge via the material properties of plant life. What transpires from our consideration of plant management and manipulation strategies in Australia, Island Southeast Asia and New Guinea are the inherently social relationships evident between people and vegetatively propagated plants.

Entire social histories may be written into the long-term engagements between people and plants within a particular landscape. The biological properties of plants appear deeply woven into social lives expressed within cosmological understandings of the world; expressions of 'place' as historic records of land use; land tenure; rights of resource access (often expressed through kinship); ceremonial practices; and, as places linked to birth, death and the ancestors. Head *et al.* (2012) and Hall (2011) argue that Western philosophies have clearly demarcated and subjugated the role of plants in human life, reinforcing the nature-culture dichotomy and placing humans as social beings outside the natural world (Head *et al.* 2012: 21). Head *et al.* (2012: 26) introduce us to the concept of *plantiness* as a way of refocusing our attention on the material properties of plants that involve their physicality and biological processes. In thinking about materiality, plants are rather unique in this regard because they are living organisms that transform during their life cycle. Trees, as well as many other perennials are also interesting in that they have lives that far exceed

those of a human being. The ways in which human lives become enmeshed with these extended lifetimes is quite different to the rhythms of seeded annuals that live for just a year, transforming at the end of their lives into a dormant seed and remaining in that state until conditions are right for germination and the birth of a new plant.

Our discussion involves not just consideration of the food products of a particular plant or plants that are of economic interest, but of the actual physical properties of these plants as they co-exist with people, i.e. their *plantiness*. The preference for long-lived cultivars within polycultural systems of plant management - such as tuberous roots, multi-stemmed palms and tree crops - persists in many tropical communities, even when governments have pressured people to pursue the cultivation of short-lived annuals (e.g. Hynes and Chase 1982; Barton and Denham 2011; Barton 2012; Kennedy 2012; Kennedy and Clarke 2004). Continued use of these plants alongside seeded annuals can reasonably be seen as resulting from a clear and rational, economic strategy of communities to insure against failure of a cereal crop like rice (see Barton 2012). In the wet tropics rice is difficult to grow and may produce very poor yields (Barton 2012). It is possible that rice may not even have been viable as a crop in this region without reliable fallback foods like yams, aroids and sago palms. The persistence of vegecultural strategies within this economic framework is often seen as a result of rational actors 'hedging their bets' against crop failure. The historic trajectory of rice to become a staple food though is much more difficult to explain. Why engage in such risky cultivation practices in the first place? Why replace high yielding food plants with high labour, low yielding rice (see Barton 2012 for calculations of hill rice farming against alternatives)? We have argued elsewhere (see Barton 2009; Barton 2012; Barton and Denham 2011) that the archaeological evidence of rice and its introduction into

island Southeast Asia reveals an early, mid-Holocene introduction (c.4800 cal BP) followed by abandonment for millennia until the relatively recent, historic past (Barton 2012, Barton and Denham 2011). Analyses of pollen and phytoliths from the highlands of interior Borneo continue to support this model showing no clear evidence for domesticated rice prior to 400 years ago (Jones et al. 2013, 2015; see also Paz 2002). The historic data also show the uneven uptake of rice as a crop across the region, with many groups in Borneo being relatively small-scale cultivators of rice until the 1950s (e.g. Barton and Denham 2011; Barton 2012; Blench 2013). Is this patchy uptake an evolutionary struggle of rice adapting via human induced cultivation into new environments, or might it also represent active resistance by people to this plant? How would people integrate an annual crop that dies, does not reproduce from the body of the plant and does not outlive humans into a vegetational world? Might the existence of a very different world-view result in a slow, rather than fast, uptake of such a plant and its associated propagation systems?

We are arguing here that it is equally plausible that the social and material contexts of vegetational practices created a resilience, or resistance, to the introduction of seed-based cultivation practices. In part, this resistance may be because many plants that are managed via vegetative propagation and other perennials represent more than just food; they are heritable property, often linked to apical ancestors that reinforce important lineages within particular communities and rights of access to resources (e.g. Brosius 1986, 1991; Langub 2007; Kennedy 2012: 145). This observation raises questions about the past and of the ways in which people may have responded to the introduction of new plants and ways of doing things in prehistory. The adoption or rejection of some plants may not have been solely based on economic decisions, but may have also have been influenced by social structures and cosmological understandings of the world.

The exploitation of vegetative modes of plant reproduction has long been argued to have significantly preceded the origin of cereal-based systems of agriculture in the tropics (e.g. Burkill 1952; Sauer 1952; Spencer 1963) even though many are reluctant to define such practices as 'agricultural', preferring instead more neutral terms such as 'management' and sometimes 'cultivation' (Bellwood 2005). It is only at the site of Kuk Swamp in Papua New Guinea that 'agriculture' utilising vegetative modes is now widely accepted as such (Denham 2007). Thinking about vegecultural systems as agriculture is further complicated by the fact that these systems may involve the sustained and even intensive exploitation of plants that remain genetically wild, or in some in-between state, alongside recognised domesticates (e.g. Yen 1990; Denham 2005; Scarcelli et al. 2005; Barton 2012). Use of these systems has even persisted in many places that now rely on cereals, such as rice, as their food staple, but maintain use of wild plants as key fallback and/or famine foods (e.g. Barton 2012). There are certain advantages of vegecultural systems in the tropics such as drought tolerance, low labour inputs for ongoing maintenance, high caloric outputs, and lower processing costs (particularly when cereals are involved, see Barton 2012). We maintain that this is only part of the story, and perhaps the least important and least interesting aspect of vegecultural systems and of their persistence into the present. We wish to take up the challenge of Head et al. (2012) and Hall (2011) to consider the transformative capacities of plants within the human sphere. We see that amongst vegecultural traditions what it means to be human may have emerged from long-term relations with plants and their reproductive materiality, not from economic decisions about foraging choices. Which is more important: the economics of food or the materiality of plants in shaping human lives? We will leave that for the reader to decide, but we see no *a priori* reason to privilege either at the outset.

Before we explore these ideas further, it is important to have a clear understanding of what we mean by 'vegiculture' and of the biological properties of these systems that set them apart from those of cereal and other annual crops.

### **Definition of vegiculture**

Vegiculture is a term ordinarily used to connote cultivation practices that are heavily reliant upon the vegetative propagation of plants (Hather 1996; Sauer 1952; Shuji and Matthews 2002; Denham and Barton 2014). Here this definition is tentatively extended and applied to include forms of plant exploitation that display an awareness of, and a dependence upon, the vegetative reproductive capacity of plants. Vegetative propagation is commonly associated with traditional forms of cultivation in wet, tropical environments of Africa, the Americas, Southeast Asia (mainland and island), New Guinea and the Pacific, although it occurs to some degree in many agricultural systems (e.g. Harris 1972; Yen 1990; Rival 1997; Hildebrand 2007; Clement et al. 2010).

The defining feature of vegiculture is that cultivation involves the removal and setting into the ground a part of the 'body' of the parent plant, such as a piece of root, tuber, stem cutting or sucker (Sauer 1952: 25; Nakao 1966; Hather 1996: 546). Planting a portion of the plant body involves asexual propagation, perpetuating a genetic clone that is selected for based on desirable phenotypic traits. Although commonly associated with root crops, a range of food plants may be cultivated vegetatively. Plant families commonly incorporated into vegicultural practices are generally derived from the clade of Monocotyledons including staple food plants, such as true yams (*Dioscoreaceae*), taros (*Araceae*), sugar canes (*Poaceae*), bananas (*Musaceae*), and palms (*Arecaceae*), as well as various supplementary and ritual food plants, such as gingers (*Zingiberaceae*) (Hather 1996).

There are various practices through which vegetative propagation is affected. For subterranean storage organs, a whole or substantial portion of a rhizome, corm or tuber can be dug up, moved and reburied for propagation, e.g. gingers (*Zingiber* spp.), taro (*Colocasia esculenta* (L.) Schott.) and some yams (*Dioscorea* spp.) (Hather 1996) (Figure 2A). For vines, a cutting or slip may be taken and partially buried to effect reproduction, such as for sweet potato (*Ipomoea batatas* (L.) Poir). For other plants a portion of the stem can be cut and planted, either partially or completely, in the ground, eg, manioc/cassava (*Manihot esculenta* Cranz.), sugarcane (*Saccharum officinarum* L.), paper mulberry (*Broussonetia papyrifera* (L.) Vent.), edible pitpit (*Setaria* spp.) and aibika (*Abelmoschus manihot* (L.) Medik) (Figure 2B). For some plants, new suckers that grow around the base of the parent are dug up and replanted, such as for sago and bananas (*Musa* cvs.) (Figure 3). A few plants can also be propagated by planting sections of aerial roots, such as marita pandans (*Pandanus conoideus* Lam.).

[insert Figures 2 and 3 here]

To exemplify, in New Guinea plant exploitation practices are predominantly vegetative. They are applied to a diverse range of plant types, including: pandans (*Pandanus conoideus* Lam), palms (*Metroxylon sagu* Rott.), grasses (*Saccharum officinarum* L., *Setaria palmifolia*), fruiting herbaceous plants (*Musa* spp.), leafy herbaceous plants (*Abelmoschus manihot* (L.), *Rungia klossii* S. Moore), and root crops (*Colocasia esculenta* (L.) Schott, *Dioscorea* spp.). These plants are cultivated for various edible plant parts, including efflorescences/flowers, leaves, buds, fruits, nuts, stem pith and a variety of subterranean storage organs (roots, rhizomes, tubers, corms) (Powell 1976; French 1986). Similarly, *Casuarina* tree-fallowing, a fallow system involving the planting of nitrogen-fixing trees in the highlands, is undertaken



by the transplanting of self-sown seedlings (Bourke and Harwood 2009). Although not strictly vegetative, this does involve transplantation rather than the sowing of seed. Similar arboricultural practices occur throughout the lowlands of New Guinea, where tree crops have formed a major contribution to diets, and trees are usually transplanted through the digging up, movement and planting of germinated seedlings and saplings, even though people know these plants can be reproduced from seed. A vegetative orientation to cultivation may have aided the widespread adoption of several food plants introduced to New Guinea in the last few hundred years, including sweet potato (*Ipomoea batatas* (L.) Poir), manioc/cassava (*Manihot esculenta* Cranz.) and taro *konkon* (*Xanthosoma sagittifolium* (L.) Schott). Seed propagated plants have also been integrated into vegicultural practices, including maize (*Zea mays* L.) and rice (*Oryza* sp.), and are often seen interplanted in garden plots. It has even been suggested that the practice of transplanting rice seedlings in padi systems might have derived from pre-existing systems of vegetative plantings (Koji 2002).

[insert Table 1 here]

Humans have been responsible for the spread of swamp sago palms from New Guinea and the Moluccas across the Indonesian and Malaysian archipelagoes to the most eastern parts of India (Flach 1997; Gangwar and Ramakrishnan 1990; Kjær et al. 2004; Abbas et al. 2009; Blench 2013). Sago varieties vary phenotypically in terms of starch production, starch colour, and physical features such as spiny or non-spiny trunks (Kjær et al. 2004; Ellen 2006). However, genetic studies have shown that all these varieties are clones of just one species (Kjaer et al. 2004; Abbas et al. 2009). In a similar way, paper mulberry has spread widely across Island Southeast Asia and Oceania (Whistler and Elevitch 2006; Seelenfreund et al.

2010). The plant is generally propagated from stem and/or root cuttings (Whistler and Elevitch 2006). While the plant is fertile within its natural range, plants dispersed by human agency away from mainland Southeast Asia are all male clones, presumably transported as rootstock (Whistler and Elevitch 2006). Recent research confirms that Oceanic cultivars exhibit almost no genetic variability, indicating that the cultivation practices enabling dispersal were predominantly vegetative (Seelenfreund et al. 2011).

Despite being clones, phenotypic changes can be acquired relatively rapidly in some vegetatively propagated plants, as documented in yams (Chickwendu and Okezie 1989; Dumont and Vernier 2000). These are often elastic and the plant reverts to a wild-type once the cultivated growth environment is abandoned. Similar phenotypic plasticity has been noted in tuberous plants in Australia; those subject to repeated harvesting grow larger tubers in the continuously disturbed, looser and more friable soils (Denham 2008). In some cases, these plants may revert to wild type once cultivation or harvesting pressures are relaxed. In such cases, there is little-to-no genetic or lasting phenotypic differentiation between cultivated/exploited populations and wild/unexploited populations (Scarcelli et al. 2005).

### **The (re)production of plants and people in New Guinea**

One of the most interesting aspects of these vegecultural systems is the degree to which social behaviours seem to align with the biological rhythms of clonal reproduction in these plants. People practicing vegeculture often transpose elements of the vegetative reproductive capacity of plants onto their social relations and even onto human anatomy (Chickwendu and Okezie 1989; Barton and Denham 2011). Recurring elements include cloning the 'body' or parts of the plant and the trans-generational life histories of many

vegicultural staples. The transposition of vegicultural tropes onto aspects of social life is characteristic of horticulturalists in the highlands of New Guinea, sago cultivators in ISEA, and of Australian Aborigines in northern tropical Australia.

In the highlands of Papua New Guinea, the Kawelka at Kuk are horticulturalists who articulate their kinship relationships with reference to vegetative propagation. The original people, or principal landowners, are 'ground-root-men' (*mae pukl wua* in Melpa) (Strathern 1971; Ketan and Muke 2001); they are the people who 'hold onto the ground bone' (*mae ombil amborom*) (Strathern and Stewart 1998: 87-88). The root binds the people to the ground, like plants. New generations, lineages, and sub-clans emerge from the original clan 'root' through time, as stems, shoots, and cuttings emerge; like transplants, people are adopted by or married into other groups (Muke and Mangi 2006: 42-62; John Muke, personal communication, 2007).

For Kawelka, their status as *mae pukl wua* gives them legitimacy as the rightful landholders of the wetlands at Kuk (Tim Denham fieldwork 1998 and 1999). This status asserts their identity and territorial claims from those of neighbouring groups, as well as those from transplanted non-agnates who have been invited to live at Kuk. Being Kawelka implies being part of the same root; different lineages are effectively vegetative buds of the original root. In the Kawelka case, the vegetative reproduction-production of plants is mirrored in the reproduction-production of people. The entwining of the vegetative (re)production of plants and people is also clearly seen among Miyanmin, or Min, in the lowland rainforests of East Sepik Province (Morren 1986). The Miyanmin have narratives that extend backwards in time and link the mythical realm of the earliest spiritual beings to the historical realm of apical ancestors and lineages. Miyanmin narratives also extend across the landscape to link

mythical beings, sacred sites and contemporary lineages. Effectively the narratives are cultural projections across the landscape – an inscribing of place and territory.

One Miyanmin narrative relates how Waneya started a journey, during which he visited numerous places and moved through the present-day territory of the Miyanmin. He eventually died at Ewawobip where he had a son, Oiyap, and died. As a fully grown man, Oiyap left Ewawobip and lived at various places within Miyanmin territory. When Oiyap realised he was getting old, he asked his descendants to kill him. His finger and toe bones were taken and shared among core Miyanmin clans, because of his mythical role in guarding the taro crop (Morren 1986).

Significantly, the finger and toe bones of Oiyap are said to be planted with *tanket* (*Cordyline* sp.) in gardens to help the food (taro) grow (Tim Denham fieldwork 2010). It is a traditional practice among Miyanmin – they say that when they make a garden, they take a small human bone (a finger or toe bone) of the apical ancestor Oiyap – they then make a hole in the garden, put the bone in the hole and plant *tanget* (*Tok Pisin* term for *Cordyline* sp.) on top. The bone is planted to help the food grow in the garden. They then use the taro garden, and when they abandon the garden they dig up the bone and move it too. The Miyanmin identify themselves idiomatically as the taro growers, which is their staple crop. Here, the production/reproduction of key plants and people are intimately entwined. Human bones ensure the growth of plants, which in turn enable the growth and reproduction of people.

The following extract from Pierre Lemonnier's 2012 book considers the multiple ways in which the creation and use of material culture is a socially constituting and reinforcing. In this example, the Ankave of Papua New Guinea utilise two plants, cordylines and

pandanuses, within a ritual in which new initiates are taken to a remote part of the forest and into direct contact with their ancestors.

...the association of the primordial beings with these two special plants [cordylines and pandanuses] is of utmost importance because of what the Ankave know of them...as elements of their natural environment...The very nature of these two plants, cordylines and red pandanus, is in keeping with the idea of an enduring physical link with a dead ancestor. For some reason – anthropologists are not diviners – the Ankave of Papua New Guinea have built on characteristics of this type of plant, which is their vegetative mode of reproduction, by cloning.

The case of the cordyline is particularly stunning. These are plants that can thrive even if planted as a short, grayish, dry piece of stem. There is no doubt that the particular mode of reproduction of these plants helps the Ankave imagine that the cordylines they see or the pandanus (from whose fruit they extracted the juice they use to dye the tapa, feed the novices, or smear their body) did once grow in the soil that drank the blood of various ancestors. The dark brownish-red cordylines are there, before the eyes of the participants, planted in the ground all around the bottom end of the tapa. Surely these plants contain life-forces; moreover, they are clearly alive because everyone can see that they grow again and again in the particular cordyline which is manipulated, transported to the ritual site, and brought back to the specialist's garden. (Lemonnier 2012: 89)

The biology of these plants – in particular the capacity for clonal reproduction and an ability to physically endure, seemingly indefinitely, as opposed to an annual that dies and must be reconstituted from seed – are material properties that have profound social implications for

the Ankave and other groups across New Guinea. The clonal growth forms of vegetatively-reproducing plants act as mnemonic devices to reinforce a particular world-view; immortal clonal lineages are bound to the land and are simultaneously alive in the present and in the ancestral world.

### **Sago cultivators on Borneo**

The examples from New Guinea chime with concepts of group identity practiced by the Eastern Penan (hunter-gatherers) in Borneo. Throughout the rainforest there is a chain of social linkages and places of group memory and identity. Trees mark places of burial (ancestors), managed palm groves may have names, and family groups and individuals maintain 'rights' of access to these named locations that pass through successive generations (Brosius 1986: 176; Langub 2007): 'The landscape itself serves as an idiom for the maintenance of historical and genealogical information' (Brosius 1986: 175). Plants reference people, as well as places of human occupation, birth and death, and importantly specific locations in the landscape inhabited by ancestors. Such genealogical linkages are not expressed with permanent structures, such as burial markers made of stone, stone or ceramic jars, or cysts, but with the living tissues of plants. In this way the '...biographies of individuals, both living and dead, are written in the landscape' (Brosius 2001: 134).

The Penan of Long Beruang, who live on the edge of the Borneo highlands, manage wild stands of hill sago palms, *Eugeissona utilis*, that occur at high altitudes (>1,000 m asl) above their settlement. Management of these palms is termed *molong* and represents a long-term investment. Individual stands of palms that are encouraged to produce multiple suckers have been intermittently harvested for at least 50 years (Figure 4) (Barton fieldwork 2012). The growth form of these palms is quite different from lowland stands that were under

cultivation by longhouse groups until the historic period (Barton 2012). Long-term *in situ* management of these palms, successively cutting and encouraging new starch-bearing trunks, has created plants with heavily thickened bases, quite unlike the form these palms take in 'cultivated' stands. These particular stands are special places to the Penan, named locations linked to genealogical memories; a socially constituted resource. In this way the palms becoming scarred and thickened, remembering the actions of the persons (ancestors) that once tended them.

[insert Figure 4 here]

Also characteristic of Penan systems of palm management is their insistence that plants were never moved in the past (Barton fieldwork 2012). Management of palm groves, as well as other important resources like rattan (rotan) used in many craft activities, are always *in situ*. The location of palm groves are generally on high scarps, located in difficult terrain away from water necessary for extracting starch from trunk pith. Key sources of rattan (a plant that is also managed by the process of *molong*) may be located hours or days travel from Penan settlements, yet there is no evidence of attempts to translocate those plants closer to settlements. In contrast, their longhouse neighbours (e.g. Kelabit, Kayan, Iban) are active translocators of plants, moving food plants, such as sago palms, and other resources closer to settlements. This observation raises interesting questions about knowledge, belief and practice. Are the Penan in ignorance of the reproductive capacities of the plants they manage, such that translocation has never occurred to them, or is their insistence on *in situ* management an expression of a deeper, cosmological belief, about the proper behaviour of humans and plants? In a landscape of named sago palm groves, a memorial landscape of

kinship and ancestors, might the movement of particular plants (as persons) be actively discouraged?

### **A vegetative disposition in Australia**

Multiple accounts of Australian Aborigines record that people replanted a viable portion of a plant when digging for and collecting tubers (Berndt and Berndt 1993). People may have dug up and collected the majority of tubers, but they were sufficiently aware of the vegetative reproductive capacity of plants to know that additional tubers and so on would grow if a viable portion of the plant was reburied. Rather than focusing upon the character of these practices, which are discussed elsewhere (Hynes and Chase 1982; Gerritsen 2008; Denham 2008) we focus on the social threads woven between people and plants in different Aboriginal communities of northern Australia.

Amongst the *pama malnkana* or 'beach people' of the Lockhart River histories of land use and of plant management are recognised as an expression of humanness, of kin and ancestors. Old campsites from which people have been long absent are remembered through emotional responses to old, familiar trees and shrubs (Hynes and Chase 1982: 41). Such a place without regular human-plant interaction was considered by a *pama malnkana* informant in terms of an abandoned person, of an elder left alone too long: 'Poor old country, come *wild* now. No-one to look after him' (Hynes and Chase 1982: 41). Some species, but not all, were clearly integrated into a human-plant sphere of remembered community events and ancestors. Hynes and Chase (1982) noted that some plants, particularly seedlings that sprang up around campsites from discarded fruit seeds were protected by inadvertent destruction by erecting small barriers. These plants were recognised as having human origins and children were prevented from damaging or



uprooting them. On returning to previous occupation sites, adults would point out particular species as resulting from remembered camp events (Hynes and Chase 1982: 40, 44).

Bradley's (1988, 2006) work amongst the *Yanyuwa* of the southwestern Gulf of Carpentaria is instructive. The strength and vitality of cycads as a food stems from their relationships to ancestors who also managed, processed and ate from these palms. Locations of abundant palms are known by the term *wirriwangkuma*, a term with multiple meanings expressing places where people can gather and share resources, but it also references kinship (Bradley 2006: 168). While individual palms or groves do not appear to be 'owned' access to them was regulated by senior men who could trace links to plants through paternal and maternal lines of descent (Bradley 2006: 168): 'In *Yanyuwa* and *Garrwa* life, cycads are more than sources of food. They invite particular sets of relationships between genders, between kin groups, between individuals who trace their ancestry to particular Dreamings, between land-owners and land managers' (Bradley 2006: 179):

This food *is my senior paternal grandfather*, it is my kin. My senior father's sister, she used to grind this food, her name was *a-Manankurrmara*, just like mine, just like the name of this country, these cycad palms, this food is for us." (Eileen McDinny a-Manankurrmara 1988, fieldnotes, John J. Bradley 1980-1998, italics mine)

Eileen's expression that this food is *for us* might just as easily have been expressed as this food *is of us*. In these landscapes plants are people (cf. Hall 2011), they are more than simple mnemonics reinforcing social action (see Lemonnier 2012 for a deeper discussion of this amongst the Ankave of Papua New Guinea), their existence, form and persistence in the landscape are the social outcomes of people-plant relationships.

## Materiality of plants as social resonators

There are many similarities in concepts of 'rights' of access to managed plants between New Guinea groups, Penan and Australian Aboriginal groups from the tropical north. Among the groups interviewed by Hynes and Chase (1982) germinating beach coconuts could be planted immediately above the tidemark and would then be considered 'owned' by the planter who passed on rights of resource access to descendants (Hynes and Chase 1982: 40). *Ficus* spp. were planted to provide shade at regularly used campsites and validated ownership of sites within certain families (Hynes and Chase 1982: 40). Some species of Australian *Ficus* may live more than 500 years making this tree an interesting choice for ties to family lineages amongst hunter-gatherer communities. Cycads among the *Yanyuwa* were also tied to individuals through lines of descent who could restrict or even refuse access at certain times (Bradley 2006: 169). The physical properties of the plant tied people and plants to the Dreaming where tall palms of exceptional height were seen as evidence of the power of the creative forces that brought these plants into being.

The rules associated with such Dreamings are strict, there are 'places where men can go but must be quiet, places where they can look but not stare, where they can walk but not camp...where men cannot drink the water, cannot even look at the smoke that rises from women's country' (Bird Rose 1996: 36). These rules extended into the wider behaviour of individuals and of rights of access to places and resources where 'Unless authorised, they do not burn other people's country, hunt in other people's country, or interfere with other people's Dreamings' (Bird Rose 1996: 39). In his discussions of 'domiculture' Chase (1989: 52) referred to this practice as 'spiritually authorised human action' and suggested that it was this more than any other factor that prevented Aboriginal groups in the tropics from

adoption of Melanesian-style agriculture in the past and promoted continued resistance to European agricultural practices in the historic period.

Thus from Borneo, to New Guinea and to northern Australia, people 'domesticated' their tropical landscapes (cf. Yen 1989). For the Penan, the marks left on the trunks of sago palms are physical reminders, memories of the ancestors who processed and ate this sago in the past. The physical structure of the palm itself, with thickened trunks from previous harvests, serves as a constant reminder of the ancestors.

Within these landscapes of memory, cosmological world views are expressed and social behaviour is regulated. *In situ* plant management of perennials and plants that reproduce vegetatively might have been attractive because they display or remember human activity in a way that annuals (which live and die in one year) can never do. Perennials can simultaneously be of the past and of the present, and thus can act as anchors for metaphorical concepts such as The Dreaming. In such memorial landscapes people can see immediately whether or not humans have been negligent in their 'proper' behaviours.

Whether or not places display the correct people-plant interactions. Such forms of management cannot be completed by individuals acting alone; these are cooperative activities that require coordinated group involvement. These landscapes have been shaped over time through a combination of cosmological belief, social practice and the material properties of plants: 'some objects and material actions have the capacity to reinforce a shared worldview and system of social interaction' (Lemonnier 2012: 165).

Within vegicultural systems of the tropics, groups that are visibly seen to translocate plants, recorded as doing so, and did so with greater frequency, appear to us as more 'agricultural', like the Kelabit, Kayan, Iban and other longhouse communities on Borneo. There is clear

evidence that people moved some plants over great distances in the past, and perhaps given the genetic evidence for paper mulberry, such translocations appear to have been relatively rapid. However, we now wonder if the frequency and intensity of such practices may in fact have been quite low; namely, a selective or authorized action that was highly regulated and not available to all members of the community? *In situ* plant management amongst Penan and Northern Australian Aborigines appears to be the preferred strategy in the recent and possibly historic past. Those, like the Penan and *pama malnkana*, who manage plants *in situ* and who are not visibly seen to translocate plants, though it may be an activity practiced by the ancestors (e.g. Hynes and Chase 1982: 40), appear more 'forager' than 'farmer' in Western discourses. Perhaps groups who prefer to translocate plants across space or manage them *in situ* are expressing a cosmological belief system, a way of being and acting in the world, rather than ignorance of the different ways of manipulating plants (e.g. planting annuals from seed)?

### **The social contexts of vegeculture**

Like Sauer (1952), we strongly suspect an awareness of the vegetative reproductive capacity of plants is characteristic of modern human behavior. A vegecultural orientation may have enabled humans to colonise and inhabit perhumid tropical rainforests on every continent and was a precondition for cultivation in these environments. The geographic distribution of plants capable of vegetative reproduction, particularly those with parts that can store large quantities of reserve carbohydrates, e.g. tubers, roots and palms, often focus discussion upon the tropical regions (eg, Barton et al. 2012). However, this need not have been the sole geographic distribution of these practices. By broadening our concept of vegeculture to include the social and physical engagements of people and plants through various forms of

vegetative manipulation, we also significantly expand the potential distribution of these activities spatially and temporally.

Does vegeculture constitute 'agriculture'? Not necessarily; this largely depends on the definition used. We prefer to look at the range of practices that are constitutive for multiple forms of plant exploitation, rather than becoming embroiled in terminological debate. Some may argue that what we have described here are some of the processes of environmental manipulation that we might ascribe to the activities of hunter-gatherers, not farmers. Many of the plants cultivated within vegecultural systems remain, from a genetic view point, wild, never having changed sufficiently to constitute being called a 'domesticate' (Yen 1990). Other species have become true 'domesticates', namely they have clearly accumulated phenotypic and genotypic traits that distinguish them from wild forms, including some species of yam (Lebot 2009: 184), some aroids (Lebot 2009: 279) and the major cultivar groups of *Musa* banana (Perrier et al. 2011). In most cases, the actual timing of this transformation is unknown.

While this paper does not aim to provide definitive answers regarding people-plant relationships in the past (such as an origin for agriculture in the regions discussed), we feel that the ethnographic exploration of vegeculture and associated practices provides fertile ground for rethinking the historic trajectories of people and plants in this region. What we see in the ethnographic data is a strong sense of combined social-biological transformations of people and plants, in this case involving perennials and systems of clonal propagation, often associated with *in situ* systems of plant management. As we have already argued, the *in situ* management of plants might have been attractive to communities because they display or remember human activity in a way that annuals do not. Such long-lived plants can

act as anchors for metaphorical concepts of particular ideas about what it means to be human in these worlds'. The lack of particular practices of agriculture, such as those focused on the sexual reproduction of cereals and legumes, may not be best or usefully understood as an 'absence'; rather they may represent an active expression of alternative ways of being and behaving, namely, of being human.

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### Figure captions

Figure 1: In vegicultural worlds, people and plants are entangled by more than the economics of food gathering or of cultivation. From the material properties of plants, in this case, of long-lived perennials that may be managed vegetatively; human social life and plant life are co-constituted (image devised by Tim Denham following conversations with John Muke).

Figure 2: A) A New Guinea farmer transports whole taro plants and cuttings of sugar cane for vegetative replanting (image credit: Peter Matthews). B) Trimming of sugar cane before vegetative replanting (image credit: Peter Matthews).

Figure 3: A) An African farmer transports banana suckers for vegetative replanting (image credit: Yasuaki Sato). B) Transplanting a banana sucker (image credit: Yasuaki Sato).

Figure 4: A) Heavily thickened base of hill sago palm, *Eugeissona utilis*, on ridge top at site of Bablibut (1011 m asl). Penan informants claim that some palms have been continually harvested for at least 50 years. The growth form of these palms is unusual in comparison with hill sago stands found near longhouse villages that have thinner bases and cover a greater area of land (image credit: Huw Barton). B) Heavily thickened palm base at site of Bablibut. Method of harvesting encourages new stem growth producing multi-stemmed palms with trunks in different stages of maturity, ensuring ongoing extraction of sago starch (image credit: Huw Barton).

### Table captions

Table 1: Features of vegetative versus sexually reproduced cultivars.

Table 1

Vegetative, clonal reproduction	Sexual reproduction
Genetic and phenotypic variation is dramatically reduced becomes 'fixed' through clonal propagation	Continuous genetic recombination and selection every sowing
Low genetic divergence between wild progenitors and cultivars	High genetic divergence between wild progenitors and cultivars
Low pollen and seed fertility	High pollen and seed fertility
Semi-sterile and sterile cultivars	Fertile cultivars
Variation in chromosome numbers (ploidy) allows increase of sterility and other abnormalities	Chromosomal stability; increased reproductive fitness
Decreases in seed set including parthenocarpy	Grain crops: Increases in seed size and seed numbers
Not easily adapted to new environmental conditions	More easily adapted to new environmental conditions

Data from Zohary (2004)