Chapter 3

DOMESTICATING THE LANDSCAPE, PRODUCING CROPS AND REPRODUCING SOCIETY IN AMAZONIA

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In an article he wrote at the beginning of his anthropological career, Claude Lévi-Strauss (1950) noted that native Amazonians give preference to semi-wild plant species over fully domesticated ones. Precursory of the later writings where he fully developed the concepts of 'science of the concrete' and 'untamed thinking,' and the theory of the Amerindian mythologising mind, this seminal article inspired many researchers. Philippe Descola (1994, 1996) combined Lévi-Strauss's early insights with the more materialist approaches of André Haudricourt and Maurice Godelier, and proposed a new analysis of the symbolic domestication of nature by Amazonian Indians. In a more post-structuralist stance, Eduardo Viveiros de Castro (1998) argued that Amazonian conceptualisations of humanity are not more monist than modern EuroAmerican ones. Their dualism is as radical as ours, but it sets human culture, not nature, as the prior given; nature is conceptualised as what is made or constructed by cultural subjects. Natural scientists such as the botanist Charles Clement (1999) also rediscovered Lévi-Strauss's seminal hypothesis, which has since been fully supported by the archaeological reconstruction of the origins and subsequent evolution of plant domestication in lowland South America (Piperno and Persall 1998, Bellwood 2005).[1]

The Huaorani share the Amazonian preference for semi-wild forest plants. Subsistence is more than environmental adaptation for them. The economy functions as a moral system and is part of their cosmovision. Until ten years ago, and unlike their indigenous neighbours (all cultivating groups with a strong sense of identity as horticulturalists), the Huaorani chose to cultivate manioc and plantain only sporadically, and mainly for the preparation of ceremonial drinks. Even today, many families prefer to secure their daily subsistence through hunting and gathering. Like most native Amazonians, today's Huaorani cultivate some food crops as part of their subsistence economy. Yet, they continue to define themselves primarily in terms of what they hunt and collect in the forest. Through their cycles of residential mobility, foraging activities, and daily consumption of significant quantities of forest resources, they continue to concentrate useful forest species, and enrich their habitat through marginal modifications, including, for instance, leaving behind hips of fruit seeds upon abandoning a camp or a dwelling site, or weeding around the base of a wild plant whose growth they wish to encourage. The anthropogenic forests they have helped to form through such activities are qualitatively different from those created through shifting cultivation. Experts in reading the signs of past human activity, the Huaorani selectively ascribe transformations in the forest to the deeds of a wide range of agents, be they ancestors, other indigenous groups, or supernatural forces. Whereas the occurrence of ayahuasca vine[2] is systematically attributed to the planting activities of long dead Zaparo enemies, the presence of peach palm[3] groves is invariably considered a legacy from Huaorani ancestors. The forest exists to the extent that humans in the past lived and worked in it, and by so doing produced it as it is today for the benefit and use of the living. In other words, they live their interaction with the forest as a social relation across generations. Trekking is not simply a mundane activity relating to the pragmatics of subsistence and to environmental or historical adaptation, but, rather, a fundamental way of reproducing society through time (Rival 2002).

My aim in this chapter is to show how a more holistic and dynamic perspective on the interactions between Amazonian hunter–gatherers and agriculturalists requires the treatment of ecology and culture as interdependent variables. If the natural environment conditions cultural creativity, it is also true that cultural creativity sets new environmental possibilities. Ecological and biological factors determine what particular plant species are amenable to domestication and the rates at which plants may be selected for favourable traits, as well as the kind of changes in gene frequency occurring in the domesticated plant over time. However, a forest can be transformed through

cultural creativity into a manicured manioc plantation, a multi-storey agroforestry system, or any other kind of cultural landscape. Similarly, a cultivator may choose to bring a plant under close control and propagate selected materials until the plant produces the desired characteristics; or she may prefer to manage the plant more indirectly, by encouraging its development through minimal weeding and forest clearance. I review current debates about plant domestication in Amazonia. I start with a section on research guided by the precept that plant domestication is an evolutionary question, before discussing the impact of the Conquest on the evolution of plant domestication in lowland South America. I then show that plant domestication cannot be properly understood without reference to identity politics and to contemporary interactions between foragers and cultivators. I conclude with a few remarks on the kind of holistic approach to human ecology that is needed to further our understanding of plant domestication, and, more generally, interactions between nature and society. A holistic human ecology, which we could as well term an anthropology of life, should integrate, and give equal weight to, the cognitive, historical and political dimensions of human nature.

Plant domestication as an evolutionary question

The fact that Darwin dedicated the opening pages of *On the Origin of Species* to plant and animal domestication is an indication of how important the process of selection for desirable traits by humans has been, and still is, for our overall comprehension of the workings of natural selection (Diamond 1997: 130). Contemporary evolutionary biologists and botanists see plant domestication as a co-evolutionary process resulting from the combined action of natural and human selection (Salick 1995, Elias, Rival and Mc Key 2000). Consciously or inadvertently, people exercise selective pressure on cultivated plants through a number of socio-cultural practices. They select and propagate some plants at the expense of others. Plant selection and propagation by humans are activities that result in genetic modification. Selection and propagation alter the mechanisms for seed dispersal. They also affect seed dormancy, and encourage self-reproduction, either vegetatively or through self-pollination (Diamond 1997: 119–122). There is therefore no doubt that the question 'Why and how did some prehistoric people transform certain wild plants into crops?' is an evolutionary one.

However, scientific accounts of how evolutionary principles caused the transition from hunting-and-gathering to farming differ.[4] Whereas some authors stress the symbiotic mutualism[5] that slowly

and progressively developed between humans and the plants that co-evolved with them (Rindos 1984), others prefer to restrict the process of domestication to conscious cultivation, which involves cycles of planting and harvesting in prepared fields clearly set apart from wild, natural habitats (Piperno and Pearsall 1998: 7). Some authors put much emphasis on the fact that people were forced by environmental events or historical circumstances to embark on farming. Hancock (1992), for instance, wonders why the onset of agriculture took so long, given that prehistoric hunter–gatherers had the necessary knowledge and technology to farm long before farming was undertaken. He reasoned that 'hunting and gathering was a very comfortable way of life and humans had to have a very good reason to give it up' (Hancock 1992: 151). For Diamond (1997), that very good reason was the mass extermination of large mammals by early human hunters who migrated out of Africa and colonised Eurasia, Australesia, and the rest of the world. Left with no easily accessible source of wild food, they were forced to innovate (i.e. domesticate plant and animal species), or to conquer those who had invented new food production systems. For Winterhalder (1981, 1993), decisions regarding the use of particular types of natural resources as food, as well as decisions to adopt new or different food sources, are both made on the basis of calculations of relative return rates. Thus for Winterhalder the very good reason that pushed past human ancestors to farm instead of hunting and gathering was either climate change or population growth.[6] Either of these two causes would have demanded a change in subsistence decisions in order to maintain an energetically optimal level of resource use. According to the optimal diet model, resource intensification (i.e. the adoption of agriculture) is driven largely by changes in foraging efficiency and diet breadth. Piperno and Pearsall (1998: 11), who follow Winterhalder's particular brand of evolutionary ecology and flatly deny the importance of socio-cultural factors such as religious ideologies, feasting, or prestige in the birth of agriculture, explain that diet breadth expansion occurs in response to an increasing scarcity of highly ranked resources paralleled by a decrease in the foraging return rate.

In spite of these divergent opinions, there is broad agreement on two major aspects of the overall evolutionary explanation. On the one hand, proto-farming started about 40,000 years ago (that is, during the late Palaeolithic); on the other hand, it did not give way to full-blown agriculture until about 12,000 years ago (that is, during the transition between the end of the Pleistoscene and the start of the Holocene). For Mithen (1996 and 2006) the reason why proto-farming could not develop before the late Palaeolithic is that it involves actions and modes of thought that are exclusively characteristic of

Homo sapiens sapiens. The reason why humans managed and modified the natural environment from at least 35,000 BP but did not start depending on domesticated plants and animals until the last few thousands of years is that this major shift was triggered by climate change. The transition from foraging to farming was thus part and parcel of the profound environmental changes associated with the end of the last Ice Age – between 11,000 and 10,000 years ago. According to Mithen (2006), populations capable of modern human cognition and behaviour, including forms of resource management similar to those found today among modern foragers and incipient farmers, evolved between 35,000 and 10,000 years ago. By accepting Mithen's position, we also accept the fact that previous glacial and interglacial environmental perturbations could not have led to conscious plant propagation by humans. In short, the factors necessary for the emergence of food production probably did not converge until the end of the Pleistocene (Piperno and Pearsall 1998). Piperno and Pearsall, who are the first authors to examine systematically the impact of the last Ice Age on the evolution of food production systems in the Americas, are convinced that agriculture arose in various locations across the world independently, but for the same reason, beginning at about 12,000 years ago.[7] Its sudden, scattered appearance all across the globe was triggered by environmental change, which, in turn, led to an 'important step in the evolving culture of human beings' (Hancock 1992: 151).

In their examination of the impact of the last Ice Age on the Amazon basin, Piperno and Pearsall (1998: 53) note that there have been major natural and human disturbances of the American tropical forest during the late Pleistocene and Holocene periods (*c*. 22,000 years ago to the present). They explain that these natural perturbations drastically changed wild resource density and distribution, and probably called for significant subsistence adjustments by native Americans, particularly during the transition period after the close of the Pleistocene, between 11,000 and 10,000 years ago. During that period, large portions of Amazonia were covered by open, deciduous and dry (seasonal) forest, not with rain and wet forest as it is today. The forest environment was consequently richer in natural resources available to hunters and gatherers, and there were many plant species suitable for domestication. Many important crop plant ancestors were naturally distributed in tropical deciduous and semi-evergreen forests, where the dry season is comparatively long and marked. It is also in these forests that large mammals such as giant capybaras (*Neochoerus*) and giant ground sloths (*Eremotherium* and *Megatherium*) roamed, and where human hunters lived. When the wet tropical forest reoccupied the open terrain that had expanded under the late-glacial climate, the

large mammals and open land plants disappeared. Holocene native Amazonians, now faced with expanding rain forests and diminishing foraging options, were forced to develop new food strategies; they started to domesticate available plant species (Piperno and Pearsall 1998: 90–107; see also Keyeux et al 2002).

Piperno's and Pearsall's reconstruction of the Holocene transitional forest and the beginnings of plant domestication in lowland South America is convincing, and certainly more plausible than Diamond's geographical determinism and human over-predation thesis (see in particular Diamond 1997: 96, 103–07).[8] However, they too exhibit the same problematic tendency to reduce human affairs to naturalised ecological economics, presented as the domain of pure efficiency and rationality. Ironically, Diamond is more realistic than Piperno and Pearsall in his assessment of the political tensions caused by emerging inequalities between what he calls 'History's haves and have-nots' (Diamond 1997: 87, 93–113). Although the latter recognise the past and present existence of complex and sophisticated agroforestry systems in Amazonia, they cannot easily reconcile this form of landscape management with their evolutionary continuum of types of food production. They concede that different food production systems may have co-existed after the adoption of agriculture, but envisage this occurrence as a choice forced onto human societies by limiting local ecological conditions (Piperno and Pearsall 1998: 7). The establishment and spread of what they call 'food-producing behaviour' (by which they mean agriculture, as if hunting and gathering were not forms of food-producing behaviour) is envisaged as a purely unilinear progression. The challenge, however, is to differentiate what in human action is conditioned by our common biological make-up, and what is the product of history. This is particularly important in the case of South America, where human migrations are less well understood than they are on other continents (Diamond and Bellwood 2003, Bellwood 2005, Schurr 2004), and where contact with Europeans in the late fifteenth century caused population losses and crop genetic erosion of a magnitude so far unparalleled in human history (Clement 1999, Diamond and Bellwood 2003).

Plant domestication as a historical question

In a recent synthesis of all current information on Amazonian crop genetic biogeography, Charles Clement (1999: 188) notes – conservatively – that at least four to five million people lived in Amazonia at the time of the Conquest, and that 90 to 95 percent died shortly after. He adds that by 1492 native Amazonians already cultivated or

managed at least 138 plant species, of which a substantial number were in an advanced state of domestication. He classifies 52 plant species belonging to 27 families as already domesticated, and 41 plant species belonging to 23 families as cultivated and semi-domesticated. More controversially, he inventories 45 species belonging to 17 families as being incipiently domesticated. This survey leads him to conclude that 84 per cent of the 138 crops cultivated or managed in lowland South America at contact most probably originated in the Amazon basin and adjacent lowland regions, representing almost half (45 per cent) of all the plants cultivated in the Americas (Clement 1999). Having classified Amazonian cultivated plants according to their degree of domestication (full domesticates; semi-domesticates; and incipient domesticates) and their particular life history (annuals; semi-annuals; and perennials), Clement distinguishes six plant categories. He then moves on to reconstruct the inter-related historical ecology of anthropogenic forest formations and crop genetic resources, and concludes that if a high percentage (68 per cent of Amazonian domesticates, semi-domesticates and incipiently domesticates are trees and woody perennials, this is not to be attributed to the nature of the forest ecosystem, but, rather, to the high dependence of domesticated annuals on human management. According to Clement, contact triggered two parallel processes: the physical disappearing of human populations and crop genetic erosion. This explains why diversity, especially the infraspecific diversity of cultivars, was reduced shortly after large indigenous Amazonian societies succumbed to world diseases and depopulation. Clement's comprehensive synthesis adds a new dimension to Balée's (1993) estimation that at least 12 per cent of the Amazon rain forest is of anthropogenic origin, in other words, that its present species distribution reflects some sort of human intervention. Recent archaeological studies of anthrosols (dark earth produced through repeated habitation and horticulture) and elaborate earthworks used as habitation mounds and designed to control water for food production (such as raised fields, mounds, and causeways, or tracts of reclaimed wetland savannah) point to the same long-term impact of human intervention on the Amazon's biotic and abiotic landscapes.[9]

Assessment and interpretation of the archaeological data from the Amazon basin is not, however, without difficulties. The literature is full of debates fuelled by disagreements between archaeologists on the existence and the form of pre-Columbian Amazonian chiefdoms, as well as the striking disparity between ethnographic and archaeological accounts. Archaeologists and anthropologists working in the cultural ecology tradition stress the social and cultural discontinuity between pre-Columbian and contemporary Amazonian societies, with their basic social organisation of small, politically independent and

egalitarian local groups formed through cognatic ties. They treat high mobility and foraging as indicators of historical change. The nomadic, foraging way of life of interfluvial groups does not reflect, they argue, the pattern that predominated in pre-Columbian Amazonia, where elaborate autochthonous chiefdoms developed and flourished. What is at stake in this debate is the nature of the changes that occurred before, during and after the Conquest, and how we are best to understand the interactions between the natural history of the forest and the eventful, uneven and violent history of human societies in this part of the world.

What kinds of society and what types of cultivation existed in the Amazon prior to 1492? As I have summarised elsewhere the debates on Amazonian chiefdoms (Rival 2002),[10] and as I have already commented on the theory of cultural devolution and agricultural regression, a theory which purports to explain the ecological, cultural, social, and political consequences of post-contact demographic collapse in Amazonia (Rival 2002, 2006a), I simply wish here to point to the problems of analysing the link between large-scale field systems and more complex hierarchical polities or the relationship between domestication, sedentism and social stratification from the premise that Amazonia was first and foremost a land of ancient chiefdoms and intensive agricultural systems.

While I understand the desire of many contemporary archaeologists to acknowledge and assess accurately the level of agrobiodiversity and political complexity created by humans in the Amazon region between the late Pleistocene and European contact, as well as the extent of the erosion that ensued, I lament a tendency found in authors such as Roosevelt (1998) and Heckenberger (2005) to over-generalise the power, stability, and importance of pre-Columbian chiefdoms. Given that the hinterlands were simultaneously used by indigenous populations living in sedentary, densely populated village settlements, and by small, mobile groups dispersed throughout the forest, I prefer to stress, like Denevan (1996: 159–61, 2001), the – almost certainly conflictive – co-existence of various types of society and food production systems in fifteenth-century Amazonia. Renard-Casevitz (2002: 141) uses a similar approach when she cautiously warns that 'there is no necessary connection [in the Bolivian Amazon] between the transformation of the landscape of the savanna and the existence of powerful chieftainships.' She disagrees with the evolutionary reconstruction proposed by archaeologist Clark Erikson (2000), and refuses to interpret the Bolivian earthworks as a proof of the existence of hierarchically centralised polities in this region. In her view, these earthworks were produced by 'sets of farmers settled in dispersed sites varying in size and formed by a reticular system of exchange' (Renard-Casevitz 2002: 141). Finally,

we must acknowledge that not all people follow the typically western botanical classification of plants into two distinct categories, wild and domesticated (Rival 2006a and 2006b, Clement 1999: 189).

Errors as unfortunate as those of the 1950s to 1970s[11] will be perpetuated if the assumption is made that, if it had not been for the Conquest, Amazonia's native populations would have continued to develop intensive agriculture and would have increasingly complexified. The consensual view that Europe's invasion of lowland South America caused not only the demographic collapse of native populations but also their massive cultural devolution fails to account fully for the dynamic interaction between history and ecology. Evolutionary/ devolutionary processes, which, ultimately, always imply that agricultural intensification is inherently progressive, do not offer the best explanation of the link between the physical world and human societies. If we are to analyse human/environment interactions holistically, we need to take into consideration both the physical environment and the mental world of Amerindians.

Much more promising is an approach that recognises that indigenous peoples actively manipulated the forest ecosystem, enriched the soils, managed and diversified a wide range of plant species, and, in the process, created the material and physical conditions to maintain different social formations. Only some of these were characterised by high population density levels. Moreover, the crucial question of what motivated some groups to gather in large numbers and consume greater quantities of cultivated food crops must be addressed. If we accept Piperno's and Pearsall's thesis that food crops were progressively domesticated between 8,000 and 4,000 BP in Southwest Amazonia by small, fairly mobile family units in house gardens,[12] we must recognise that the relatively sudden intensification of agriculture and the appearance of densely populated and stratified villages occurred only in some very specific areas. Such areas have recently been identified with the Arawak cultural complex (Hill and Santos Granero 2002, Hornborg 2005). I have argued in this section for a dynamic history of plant/human interaction in Amazonia, that is, a history where cultural choices matter. Foraging, incipient horticulture, and intensive, sedentary agriculture were not just alternative modes of subsistence. By choosing one mode of subsistence rather than another, people were also choosing a particular form of life, and a particular identity.

Plant domestication as an identity issue

Native Amazonians, like all peoples, are active shapers of ecological, economic, and historical forces (see Ulijaszek, this volume). Evans-

Pritchard (1940), following in the steps of Beuchat and Mauss (1979[1906]), showed a long time ago that the Nuers' deep sense of identity as pastoralists, although certainly shaped by environmental conditions, could not be reduced to resource economics or energy efficiency calculations. It is only by taking into consideration the autonomous dynamics and rhythms of social life that we are able to offer an explanation of why the Nuer valued cattle herding over all the other subsistence activities they engaged in. A similar argument was put forward by Moore and Vaughan (1994) in their historical reconstruction of Bemba life during the colonial period. Richards (1932) was right to point to the centrality of finger-millet cultivation and food production in Bemba life, but she did not see clearly enough how political the citemene agricultural complex was. A group's adoption of either hunting and gathering or intensive agriculture as the main and valued subsistence strategy represents a collective choice. Integral to the identity formation process, this choice comes to form the basis for the development of historical consciousness. Although Diamond and Bellwood (2003) may disagree, much of the comparative data they present can, in my view, be read in this light. The shortcoming of both the evolutionary and the historical mode of explanation, as argued above, is that they leave no room at all for understanding the subsistence activities of trekkers and foragers in cultural terms, that is to say, for including in the analysis their own conceptualisation of gathering and hunting in cultural landscapes, or their own discourse about their subsistence practices. Archaeologists such as Anna Roosevelt, historical ecologists such as Bill Balée, and evolutionary biologists such as Jared Diamond assume that adaptation is best defined in terms of increasing sociocultural complexity built on increasing population density and sedentariness. These authors tend to think that where the land is arable, horticulture is to be expected. The absence of horticulture, therefore, requires an explanation which automatically locates hunter–gatherers at the lowest stage of cultural evolution and progress. However, we need to ask: What does indirect reliance on past agriculture, rather than on crops cultivated now mean to the non-horticulturalists? What difference does it make, practically and symbolically, to hunt in a pristine, wild forest, or to hunt in forests modified by previous human intervention and management?

Amazonian trekkers and foragers extract semi-domesticates growing in ancient or old agricultural fallows. The issue is not so much whether trekkers and foragers develop their subsistence activities in pristine or culturally transformed forests. We know that humans have lived and survived without domesticates in rain forests (Piperno and Pearsall 1998: 55–61; Bahuchet et al 1991, Hladik and Dounias 1993). What matters, rather, is *how* they cultivate and *why*, that is, for

which purposes. What we also need to know is the extent to which the answers to these questions differ for the two groups: those who rely primarily on hunting-and-gathering, and those who produce and trade food crops. Most of the world's contemporary hunters-and-gatherers are directly or indirectly involved in other economic activities such as marginal or sporadic farming activities and wage labour. What characterises them is the way in which they engage in these economic activities, as well as the distinctive social relations they maintain among themselves and with outsiders. Hunting-and-gathering is as much a social and a cultural phenomenon as it is a form of ecological–economic adaptation (Rival 1999). If the regional context in which many Amazonian Indians live is hunter–horticulturalist, some are living according to the hunter–gatherer mode. We need to examine the social and cultural distinctiveness of the latter without starting from the dominant assumption that non-cultivating behaviour is attributable to cultural loss (Rival 2006a).

Hunting-and-gathering is a way of life that human groups may choose to adopt and maintain. Said differently, hunting-and-gathering may be a form of adaptation to the environment, but it is above all a way of life, i.e. a way of organising society and thinking about the world (Rival 2006b). Evolutionary theory and history help us understand how human action has shaped nature, but to understand how nature has shaped human action – that is, how we have domesticated ourselves in the process of domesticating the environment (Dunbar, this volume) – we need to envisage human intelligence as embodied, distributed, and social (Gosden and Ingold, this volume). As mentioned at the beginning of this chapter, palaeo-anthropologists think that the first humans colonised the far north, the Americas, and the islands of the Pacific either in the late Pleistocene or early Holocene, when the last glacial maximum came to an end. It was only in the Holocene, beginning a mere 10,000 years ago, that agricultural economies developed (Diamond 1997, Mithen 1996, 2006), and that the emergence of genetic unity and cultural diversity really started to set in.[13] The early inhabitants of the Amazon basin who first domesticated squash, maize, peach palm and manioc at *c.* 8,000 to 4,000 years ago were fully adapted to, and cognisant of, an extraordinary diversity of environments, which they were able to observe, perceive, classify, understand and discuss with as much sophistication as contemporary native Amazonians do. Moreover, they were as capable of symbolic behaviour and 'cognitive fluidity' (Mithen 1996, Carruthers 2002) as the latter. This is why the apprehension of natural history by either past or contemporary native Amazonians cannot be reduced to mere effective decision making about which resources to exploit in order to gain reproductive advantage. Amazonian environmental knowledge

combines in complex ways intuitive biology, anthropomorphic belief and ritual behaviour (Atran et al 2005, Rappaport 1999). The partial autonomy of socio-cultural phenomena is directly related to cognitive fluidity and distributed intelligence. Together, they help us understand why the action of hunters-and-gatherers on the environment is complex, and why hunters-and-gatherers transform nature even if they do not produce in the sense that farmers do, or why human choices and decisions are influenced by social considerations, political orientations and cultural values.

The population bottlenecks that resulted in the twin emergence of genetic unity and cultural diversity cannot be divorced from the ways in which ecology, economy and ethnic identity have become all inter-related to form cultural wholes. Ethnic identity, that is the recognition of a collective difference between 'my group' and 'your group' reflected or not by linguistic difference, is a form of historical self-consciousness, that is, the product between externally attributed and internally experienced qualities, including modes of subsistence, particular landscapes associated with one's mode of life, system of values, and political ethos (Leach 1954, Hornborg 2005). It is by examining the relationship between ecology, economy, and ethnic identity that we will really comprehend the dynamics of landscape and species domestication, as well as the impact of plant and animal domestication on human genetic evolution (Ulijaszek, this volume).

A vast body of ethnographic work suggests that despite clear differences in the intensity with which the Amazon forest is transformed, everywhere we find the cultural centrality of landscape domestication (Wilbert 1961, Denevan 2001). Everywhere, ecological affordances are matched by different subsistence options, and values are attached to economic activities that lead to specific environmental transformations while serving as foundations for ethnic identity construction. The many groups living in the upper Rio Negro left numerous petroglyphs and rock paintings and the Wakuenai continue to create sacred landscapes through ceremonially chanting (Hill 1993). For some groups, such as the Huitoto (Griffiths 2001), the Achuar (Descola 1994), the Curripaco (Journet 1995) or the Makushi (Rival 2001), to name just a few, gardening epitomises human work as a civilising force, which is opposed to wilderness and savagery. While food made out of processed bitter manioc serves as a prime ethnic marker for many groups in northwest Amazonia (Hugh-Jones and Hugh-Jones 1996), the production and consumption of sweet manioc beer is central to the Canelo Quichua's sense of identity (Guzman Gallegos 1997).[14] Alimentary choices (eating forest tubers or garden crops, hunted game or fish, and so forth) are used to draw the boundaries of differentiated moral economies based on, but not

reducible to, subsistence activities. In Amazonia, you become what you eat, and the opposition between forest and garden food, or game and fish is used to materialise a wide spectrum of identity positions, or to articulate a range of more or less inclusive or exclusive definitions of humanity.

The association of civilised humanity and gardening commonly found in northwest Amazonia is particularly striking, especially when compared with similar constructions opposing civilised gardeners to wild hunters-and-gatherers found in other regions of the world, particularly in central Africa. The patron–client relationship that unites Tukanoan communities of the Vaupés and the Río Negro with Makú bands is well documented. The Makú, who live deep in the forest, hunt, collect, and garden marginally. They periodically visit the sedentary, fishing, and manioc-cultivating communities of their Tukanoan trading partners, where they receive garden produce, tobacco, and manufactured goods in exchange for their forest produce (especially game), labour, baskets, and blowguns. This relationship, which has economic, political, and symbolic dimensions (Ramos 1980, Jackson 1983), is almost identical to that described by Grinker (1994) for the Efe Pigmies and Lese Bantus. The Tukanoan Indians despise the forest dwelling hunting Makú, whom they see as savages, incestuous and animal-like (Ramos 1980: 166). This moral judgement clearly shows that foraging means more than simple adaptation to the physical environment. In some villages, the Makú are partially incorporated into Tukano society as second-class, marginal citizens, and treated as dependent sons-in-law, even if a Tukano/ Makú marriage alliance would be totally unthinkable. Treated as 'owned' slaves, captives, or co-resident clients, the Makú are seen as sub-human. In fact, their structural position is identical to that of adopted pets (Erikson 1984). For the Tukanos, the Makú do not simply 'make a living;' they live like savage animals. The Makú also perceive their way of life as more than simple adaptation to the forest environment. However, ethnographers tell us much less about Makú understandings of themselves and their relational order than they do about the Tukanos, their values, and their prejudices. Within their communities, the Makú emphasise egalitarianism and the collective appropriation of resources. With the Tukanos, they choose to be elusive. On the surface, they seem to comply with the commands of their non-foraging neighbours. However, as soon as they are back in their forest camps, the Makú make great fun of the Tukanos' airs of superiority. Moreover, no obligation ties them to the latter; they come and go to the gardeners' villages as they please. Only additional research will tell us whether the Makú have yielded control over some aspects of their material and spiritual life to their agricultural neighbours (Grinker 1994). There is nevertheless sufficient ethnographic evidence to support

the thesis that subsistence and diet choices play a key role in shaping Makú and Tukano ethnic identities.

In other Amazonian societies we find a positive correlation at the level of discourse between mobility and warfare on the one hand, and peace, gardening, and village life on the other. Journet (1995) notes that the Curripaco, who identify horticulture with peace and the foundation of society, equate the nomadic style of the Makú, seen as antithetical to culture and anterior to civilisation, with warfare, hunting, and autarky. Although the Curripaco were as ready to wage war as the neighbouring groups that they represented as warlike and fierce forest dwellers, they condemned violence morally, and saw themselves as being forced to resort to violence. Fausto's study (2001) of two Parakana groups who chose, after splitting, to live according to two divergent ways of life – nomadism and sedentism – illustrates the same association between pacific village life, horticulture, and sedentism on the one hand, and foraging, warfare, and nomadism on the other. However, the Parakana do not hold the same negative moral judgement on violence. The Tupi–Guarani 'mystical' wars, the more strategic violence practised by Arawakan groups, and the forms of warfare and violence induced by colonial politics are profoundly different. Fighting an enemy recognised as a complete other is not the same as fighting an enemy perceived as a recognisable other (Descola 1993). The volume edited by Hill and Santos Granero (2002) contains numerous references to the moral condemnation of violence as an important Arawakan ethnic marker. The prohibition of endowar, coupled with a strong ethnic prejudice against wild Indians, was central to the development of an Arawakan pan-ethnic ethos. Moral barriers existed not between the lowlands and the highlands of Peru, Ecuador and Bolivia as previously thought, but, rather, between traders and warriors. As Lévi-Strauss (1943) pointed out some time ago, different visions of humanity are implicated in the 'commerce or war' dialectics. What is at stake in the Amazon warfare complex is the definition of humanity. The human condition, as portrayed in Amazonian myths, is essentially a process of humanisation, or, in other words, of domestication. Today, the dual classification nomadic foragers/sedentarised gardeners is no longer closely associated with the opposition between warmongering and peace, but, rather, with the contrast between integrated indigenous communities and communities refusing all contact with outsiders.[15] There are today throughout the Amazon basin individuals and communities who consider themselves 'civilised.' Not unlike their pre-Columbian Tukanoan predecessors, they appropriate the modern discourse of peace and civilisation to force contact with nomadic groups and bring them to their villages to teach them 'how to live as real humans.'

This usually involves educating them in the arts of sedentary village life and horticultural production. The ethnic antagonism between opposing societies that refuse to submit to the authority of chiefdoms and favour autarky over trade and inter-ethnic exchange, and those who accept their incorporation and historical transformation is, as this most recent form of denigration shows, very old indeed.

Amazonian landscapes: Wild, tamed, and humanised forests

I started this chapter by noting the continuing validity of Lévi-Strauss' perceptive remark on the Amazonian propensity to domesticate forest landscapes, rather than plant species. I then argued that if Clement is right to stress the enormous historical disruptions caused by the Conquest, reliance on semi-domesticates should not be explained away as cultural loss. The intensification of plant domestication, far from being systematic, was highly localised, and conditioned by cultural values. Some authors have attempted to identify historical continuities in the ethos and subsistence practices of socially stratified traders such as those pertaining to the Arawakan diaspora (Honborg 2005). I have similarly argued that some Amazonian trekkers and foragers, far from being devolved agriculturalists, may be characterised by comparable historical continuities expressing values that stand in contrast to those held by their cultivating neighbours. By choosing to contribute to transforming the forest without intensifying the selection and the propagation of fully domesticated plant species, native Amazonians who choose to remain mobile and rely more on hunting and gathering than on cultivation, also choose to transform human society in a way that is not conducive to the reproduction of political hierarchies or economic inequalities.

Ecology cannot be defined with sole reference to the natural environment. A biocultural phenomenon such as plant domestication needs to be placed within its full historical and political context. In Amazonia, the interactions between foragers and cultivators, as well as the dynamics of social change, both historically and in the contemporary context, have involved contrastive and co-existing modes of sociality. As Winthrop (2001) puts it, patterns of economy and belief guide human action with regard to the environment.[16] Politics in Amazonia is characterised by undeveloped hierarchies, weak links between chiefs (hosts) and followers (guests), the importance of ceremonial life and feasting, and the prestige of having large quantities of food to offer. All these aspects have played a significant role in driving food crop domestication. They have also played a part in the use of foods – selected

for their nutritional and symbolic importance – as ethnic markers. But it is also true that in many communities, indigenous ideas about space, time, the human condition, and wilderness as the potentially transformable have been used to resist political pressures to develop and increase productivity. Adding to this play of contradictory forces, the needs of long distance trade, and, after the Conquest, European influences, also favoured the evolution of subsistence systems in the direction of agricultural intensification, for instance the extension of manioc or maize monocultures (Steward and Faron 1959: 293). These are precisely the trends that are rejected by those who choose to isolate themselves, and to become 'uncontacted' foragers. In short, there is more to landscape domestication than a linear move towards full agricultural development in a region where dual oppositions of the type fierce/tame abound, and where nature is constructed in terms of its domesticability, that is, its unrealised potential for civilisation.

Plant domestication is an evolutionary, historical and cultural process, which needs to be viewed through the holistic lens of the new ecological anthropology paradigm. Its proper analysis requires the development of a unitary analytical framework that integrates relations between biology, ecology, economy, material culture, language and identity. Whereas ecological studies are concerned with relations between living organisms belonging to different species and their environment, ecological anthropology focuses on the complex relations between ecosystems and social groups. As such, it directs our attention to the ways in which a particular group of people purposely or unintentionally shapes its environment, as well as to the ways in which relations with the environment shape a population's social, economic and political life – in one word, its culture. Put differently, ecological anthropology explores the ways in which the environment is historically and culturally produced through human/nature interactions. Building on Roy Rappaport's (1999) interpretation of culture as a system regulating relations between people and their environments, the new ecological anthropology focuses on the interface between cultural and biophysical factors in terms of integrative, biocultural processes. Given that material factors, tools, technology, knowledge, and productive organisation equally act as powerful mediators between the biophysical environment and human culture, ecological adaptations are never purely 'natural.' Biophysical factors, which are shaped by humans in a material sense, are also culturally perceived. As such, they form part of the ongoing relations of mutual adaptation between culture and material context. Given that the environment is always more than just a set of things to which people adapt, the influences of the biophysical factors on human behaviour are never purely material.

It is now widely accepted that we all share the same biological intuitions (Atran et al 2005, Mithen 2006). Mithen argues that if early humans such as *Homo habilis* already possessed an evolved capacity for ethnobiological knowledge, modern humans alone developed, some 170,000 years ago, a capacity for language and general intelligence. When groups of *Homo sapiens sapiens* started to domesticate plants 15,000 years ago, their minds could process highly metaphoric knowledge, which complemented rather than replaced the previous intuitive physics, psychology and biology that they had inherited from their predecessors. Therefore, the humans who first domesticated plants were capable of cognitive fluidity and creative imagination; they had religious beliefs and expressed their emotions through art forms. Domestication was, and still is, a conscious process. The actions of observing and experimenting, like those of selecting and propagating, are guided by cultural representations. The motivations underlying the actions involved in reproducing plants – or any other form of life, for that matter – are neither purely pragmatic, nor simply aesthetic. Intellectual and scientific curiosity plays a role as well.

Reproductive processes raise a host of questions that directly involve the perception of life. When it comes to plants, where the individual's functional unity is not as straightforward as it is in animals, the observation of morphological differences, the recognition of individual differences, or the capacity to recognise biological variation, whether based on genetic mutation or not, become very complex actions. It is much more difficult[17] to understand the mechanics of heredity in plants than it is in animals. It is perhaps this complexity that led Canguilhem to reflect that:

> [I]t is too easily admitted that there exists a fundamental conflict between knowledge and life, and that their reciprocal aversion can only lead to the destruction of life by knowledge, or to the mocking of knowledge by life. But this fundamental conflict does not lie between thought and life within man; rather, it lies between man and the world within our human awareness of life. Intelligence can be applied to the living only if the originality of life is acknowledged. Thoughts about what lives must be formed from within life itself' (Canguilhem 1975: 4).

For Canguilhem, only a holistic approach to the unity of life will restitute the human shared apprehension of life as a biological fact. The anthropologist who wishes to engage with evolutionary thinking accurately and without any reductionist agenda recognises herself in Canguilhem's position. In a similar fashion, Piña-Cabral (2005) recently called for anthropology to re-encounter its universal claims and reaffirm its common ground.[18] As David Parkin (this volume)

reminds us, to reclaim anthropology as meta-tradition, we need to start by recognising the openness of social life. In addressing the challenges that face contemporary human societies, we need to acknowledge them as biocultural in part, without loosing sight of the fact that they are moral challenges as well.

Notes

1. See also Lathrap (1970). Both Lathrap and Lévi-Strauss were influenced by the cultural geographer Carl Sauer (1936, 1947).
2. *Banisteriopsis muricata* or *B. caapi, mïi* in Huaorani.
3. *Bactris gasipaes, daguenkahue* in Huaorani.
4. For a review of some of the most influential explanations advanced for the transition from foraging to agriculture in the tropics and neotropics, see Piperno and Pearsall (1998: 10–26).
5. For Doyle Mc Key (pers.comm. June 2005), domestication is a co-evolved mutualism, where co-evolution is not purely genetic, but the result of dynamic interactions between genes and culture. Mc Key's model is closely related to Rindos' Darwinian explanation, as summarised by Piperno and Pearsall (1998: 11). Rindos envisages forms of co-evolution which do not involve directed human selection.
6. For Piperno and Pearsall (1998: 12), who note that 'lowland Neotropics may have had the lowest population densities of any region shown to have supported the emergence of food production during the early Holocene,' changes in food production and diet were not responses to population pressure, but, rather, to natural shifts in the abundance and distribution of resources.
7. And perhaps 1,000–2,000 years later in the New World, as humans arrived in North America by around 20,000 BP. By 12,000 BP, they had migrated to the tip of South America. By 9,000 BP, they had domesticated the first American plant in MesoAmerica, the *Cucurbita pepo* squash (Piperno and Pearsall 1998: 168). 'Systematic cultivation of back yard gardens was under way 10,000–9,000 BP in the humid, tropical lowlands of Panama, Peru, Ecuador and Colombia. By at least 9,000–8,000 BP evidence of morphological and other changes (such as larger seed size) associated with systematic cultivation and probably indicating domestication is apparent in some economic plants' (Piperno and Pearsall 1998: 259).
8. Diamond, who does not accept that climate change caused the extinction of large mammals (previous glaciation ages did not bring about the same loss of species), favours the thesis of over-hunting by recently migrated humans. It is only in Africa that large mammals co-evolved with humans, hence evolving defence mechanisms to protect themselves from human predation. Winterhalder, Piperno and Pearsall would not find Diamond's explanation satisfactory, for it assumes human population densities far higher than what they actually were in most parts of the world, that is, except for the Easter Islands on which Diamond bases his generalisation.
9. See in particular Denevan (2001), Petersen et al (2001), Erikson (2000), and all the contributions to Lehman et al (2003).
10. For a contrastive interpretation, see Heckenberger (2005).
11. When the existence of Amazonian chiefdoms was either denied or explained away as failed or short-lived attempts by Highlanders to establish civilisation in

the lowlands. See Rival (2002) for a review of these arguments. See also Wolf (1961).

12. Of proto-Arawak and proto-Tupí stock, according to Clement (person. comm. August 2005). Proto-Arawak groups then moved north and west, and continued to perfect the domestication of sweet manioc and peach palm. Proto-Tupí groups moved east and south, specialising in the domestication and improved diversification of bitter manioc.
13. Mithen (2006: S48) usefully reminds us that '[H]uman genetic diversity is highly constrained, with significantly greater differences between chimpanzees separated by a few kilometres in Africa than between humans living at the opposite ends of the earth and engaged in quite different lifestyles.'
14. Similarly, changing alimentary markers are used to signify the choice of new political and economic alliances, particularly inter-ethnic trade. For the Matsigenga who have controlled an important long distance trade route for several centuries, to consume salt is to be human. Salt has also become an important ethnic marker among Ecuador's lowland Quichua and Shuar speakers. And when the missionarised Huaorani speak of 'civilising' uncontacted Huaorani groups such as the Tagaeri, they always mention that these wild Indians must now eat proper food like sugar and rice. Traditionally, the Huaorani identified as eaters of boiled monkey meat. Old Huaorani still refuse to eat salt, or meat other than monkey and forest bird.
15. See *The Belem Declaration on Isolated Indigenous Peoples* signed on 11 November 2005, and the creation of the International Alliance for the Protection of Isolated Indigenous Peoples.
16. '[T]he economy of any society always defines an important aspect of human relationships with the environment. Beliefs and values regarding the natural world and humanity's place within it provide powerful motivations both with regard to economic practices and other types of human actions' (Winthrop 2001: 205).
17. Or, rather, it was, at least until the advent of Mendelian science.
18. 'All human "others" can only be "others" to the extent that they are the same in a very important way. But the search for that sameness involves us in a whole range of theoretical wrangles that most of us prefer to avoid. The result has been a single-minded emphasis on "difference" as the factor defining our field' (Piña-Cabral 2005: 126).