

**WN** *Agroecology*

*Amazonia*

# The rain forest is a human creation



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***Access June 2015 Journal of the Royal Society Charles Clement et al here***
***Access 1992 Annals of the AAG William Denevan on The Pristine Myth here***

## Editor's note

From half a millennium ago, the 'discovery' of the two continents now known as 'the Americas' changed forever the sense that sentient humans have of being in the world and of the nature of the living world. But the notion of 'the noble savage' living in a wholly natural world is now known to be a wishful myth. The virtual extermination of the original civilisations and societies was also a crime against the nurture of nature. The Maya, Aztec and Inca civilisations developed advanced agriculture and food systems that cultivated many of the foods now part of food systems throughout the world. In common with native societies in what is now North and South America whose remains are less visible now, their food systems were overlooked, ignored or destroyed. The farms and homesteads of the white settlers have now mostly become cities or turned into industrial monoculture systems whose products feed animals and automobiles or are ingredients of ultra-processed food and drink products.

This commentary shows that the Amazon rainforest was, before the Europeans came, as extensively cultivated as forests anywhere else in the world. It includes extracts from a paper by Charles Clement and colleagues in the *Journal of the Royal Society*. *Access the paper with references here.* The paper summarises evidence accumulated for a half-century. It shows that the reports of the first white explorers of cities along the banks of the Amazon were true. It was not 'virgin'. The native people still living within the forest are remnants of highly structured societies with developed agriculture and food systems, sustained until the catastrophe of the European conquest. This revelation should revolutionise understanding of the nature and value of Amazonia. It emphasises the imperative immediate need to protect and strengthen rainforests and to realise that in agroecology is the salvation of the planet.

# Descended from farmers



*This man's ancestors over 500 years ago were quite likely to have been farmers. The notion that the native Amazonian people were 'noble savages' is a myth that fascinated and comforted the European conqueror-destroyers and their descendants*

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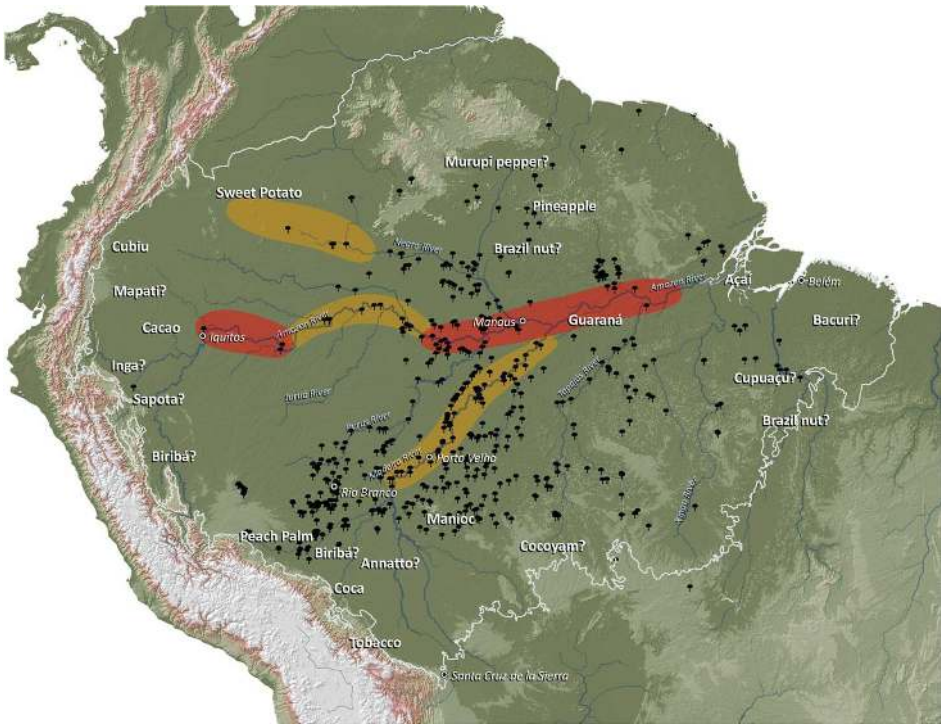
During the twentieth century, Amazonia was widely regarded as relatively pristine nature, little impacted by human activity. This view remains popular despite mounting evidence of substantial human influence for thousands of years across the region. There is convincing evidence of an anthropogenic Amazonia, in contrast to claims of sparse populations across broad portions of the region. Amazonia was a major centre of crop domestication, with at least 83 native species containing populations domesticated to some degree.

Plant domestication occurs in domesticated landscapes, including highly modified Amazonian human-made fertile dark earths (or *terra preta*) associated with large settled populations living close to the banks of the Amazon, its many tributaries, and other rivers in Amazonia. Populations and food production expanded rapidly within land management systems in the mid-Holocene around 5,000 years ago, and complex societies expanded in resource-rich areas, creating domesticated landscapes with profound impacts on local and regional ecology.

## Shaping nature




*Much of the Amazon rainforest was once farmed. This map shows centres and sites of originally ancient crop cultivation, and locations of cultivated plant foods, such as Brazil nut, guaraná, açaí, pineapple, manioc, sweet potato*

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Food production projections support estimates of at least eight million people in Amazonia in 1492. Other estimates are higher. Before the Europeans came, highly diverse regional systems had developed across Amazonia, including subsistence resources created with plant and landscape domestication, such as earthworks. The Amazonian anthrome – ecological patterns created by humans – was no less socio-culturally diverse or populous than other tropical forested areas of the world before European conquest.

The emerging multidisciplinary picture of Amazonia is one of great diversity through time and across space. Throughout the Holocene era that began around 11,000 years ago, significant anthropogenic human-created influences occurred in portions of all major sub-regions in Amazonia. The process and geographical extent of landscape domestication accelerated dramatically, with transitions to food production in village gardens, cultivated fields, orchards, domesticated forests, associated human-made soils, and earthworks. Beginning around 3,000 years ago, several major Amazonian language families expanded widely across the humid tropical forest and adjacent areas with increasingly diversified inventories of domesticated and managed plants. These societies developed complex systems of regional interaction as they adapted to and modified regional social and biophysical landscapes.

*Box 1*

## The nature and meaning of the Amazon

*Edited extract from a news feature by Richard Gray in the Daily Mail, 24 July 2015*

From 8 to a top estimate of 50 million people once lived in the Amazon basin. The Amazon rainforest is often thought to be one of the last remaining regions of unspoiled habitat left in the world. But it is not untouched, pristine. The Amazon is profoundly shaped by humans.

An international team of researchers show that it was once home to many millions of people who lived and farmed in the area now covered by trees. Parts of the rainforest have only grown back in the past few hundred years, after civilisations were wiped out by European conquest and disease. The Amazon basin was a major centre of crop domestication. People were widespread across the region from around 5,000 years ago. More evidence is discoveries of ancient earthworks on land cleared of trees, and historic accounts from the first Europeans, who told of sprawling towns that stretched for miles along river banks.

*Food systems from 5,000 years ago*

Dr Charles Clement of the National Institute of Amazonian Research in Manaus, Brazil, who led the work, says:

> Plant domestication occurs in domesticated landscapes, including highly modified Amazonian fertile dark earths associated with large settled populations. Populations and food production expanded rapidly within land management systems in the mid-Holocene, and complex societies expanded in resource-rich areas creating domesticated landscapes with profound impacts on local and regional ecology. Food production projections support estimates of at least 8 million people in 1492. By this time, highly diverse regional systems had developed across Amazonia where subsistence resources were created with plant and landscape domestication, including earthworks.

While much of the area has now returned to wilderness, the resulting forest has been shaped by human activities. The rich black soil known as *terra preta* that provides much of the fertility and allows such rich growth in the Amazon was created by humans to cultivate crops. It is thought to cover more than 154,000 square kilometres (59,400 square miles), about 3 per cent of the 5.5 million square kilometres (2.1 million square miles) of the rainforest.

*Vanished cities*

Archaeologists have also discovered the remains of dense urban centres**,** each once home to up to 10,000 people, along river banks. Ancient orchards of Brazil nuts, palm trees and fruit stretched for several miles around them. Farmers cultivated crops like maize and squash. The remains of ancient canals, graveyards and causeways have also been unearthed European explorers like Gaspar de Carvajal, who visited the Amazon in 1542, wrote: 'There was one town that stretched for 15 miles without any space from house to house.' Modern evidence shows that he was stating what he really did see, Dr Clement and his colleagues say the picture that is emerging of a 'domesticated Amazonia' contrasts strongly with the empty forests which 'captivate scientific and popular media':

> Descendant populations have intrinsic rights to this history and the places it occurred, not simply as disenfranchised groups, but as active partners. Past systems provide clues to how people responded to opportunities and challenges created by climate change, and offer ideas for present efforts to ameliorate global warming. Indigenous technologies were not only adaptations to changing forest conditions, but also intentional actions.

# The idea of domesticated Amazonia

Over the past two millennia, these diverse regional trajectories, including substantial internal variation in all areas from large, settled populations to sparsely populated areas within discrete regions, became increasingly articulated within and between regions. They promoted distinctive patterns of land use with related ecological knowledge, and also widespread interaction and connectivity in broad regional political economies.

### *A vast variety of societies*

At the time of European conquest, this variation included a patchy distribution of socio-politically complex systems, semi-intensive techno-economic infrastructure, and domesticated landscapes, set within a mosaic that also included cultural systems with 'minimalist' socio-political organisation, simple techno-economies and less domesticated landscapes. The scales of plant and landscape domestication across Amazonia are comparable with those in other tropical and subtropical regions, and they also fuelled population expansion and social complexity. Larger regional populations clearly fall into the range of medium-sized pre-Columbian polities elsewhere, with population densities well within the range of medium pre-modern urbanised forested landscapes during the late Holocene in most world areas.

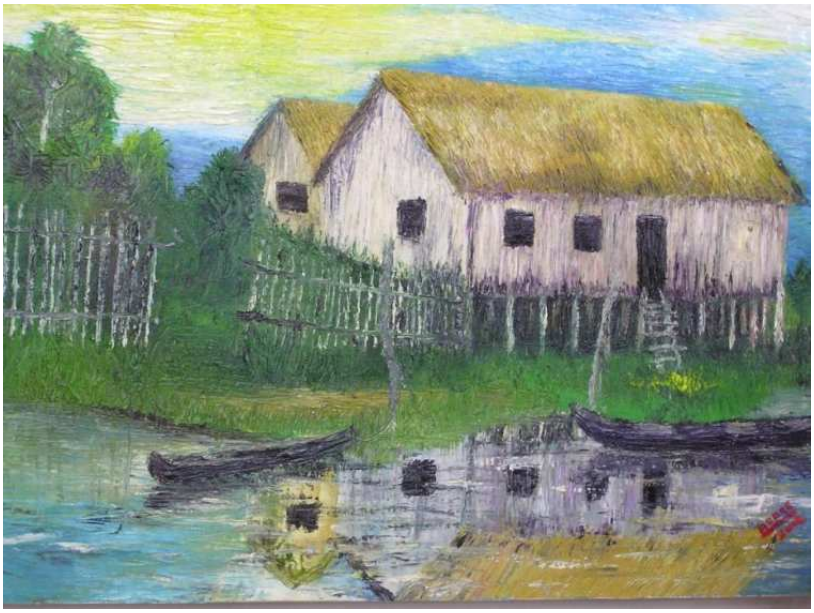
Archaeologists, ecologists and crop geneticists have studied only a small fraction of Amazonia. The apparently empty areas in our maps (like the one above) represent opportunities for research rather than assumed lack of domestication by pre-conquest peoples, as suggested recently based on a small number of phytolith and charcoal cores in western Amazonia.

Engagement with the full range of scholarship on the prehistory of Amazonia suggests that western Amazonia is no different than any other major part of Amazonia, except in its lack so far of an intensive research effort. This is especially true when considering the origins of the Arawak language family and ethno-historical reports from the region, as well as new archaeology on western Amazonian earthworks. Interdisciplinary studies of coupled natural-human systems reveal that some areas were sparsely occupied but not far away other areas were densely occupied.

### *Amazonia as farmland*

Amazonia is a major world centre of plant domestication, where selection began perhaps 15,000 years ago in peripheral parts of the basin. By European contact, at least 83 native species were domesticated to some degree, including manioc, sweet potato, cacao, tobacco, pineapple and hot peppers, numerous fruit trees and palms, and at least another 55 imported neo-tropical species. Plant domestication is a long-term process in which natural selection interacts with human selection, driving changes that improve usefulness to humans and adaptations to domesticated

## Once there were cities



*Farmers of the açaí palm and its berry who take their crop to market by boat now live in simple small houses, as here. Before the European conquest, some riverside settlements were the size of cities, with complex social and economic structures*

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landscapes. There is a continuum from incipient change to fully domesticated status, where the plants depend upon humans for their survival.

In Amazonia, plant management was a particularly important part of subsistence strategies, including 3000–5000 exploited non-domesticated species, following the expectations of cultural niche construction theory.

Small-scale societies practiced foraging and casual horticulture across Amazonia throughout the early and mid-Holocene beginning around 11,000 years ago, and substantially altered forest composition through diverse activities around villages and camp sites, along trails and in fallow fields, and by mean of the unintentional interactions and changes in local ecology precipitated by these activities. Foragers acted throughout Amazonia, and their promotion and management of forest resources – though not intensive locally – is more spatially extensive than that of farmers.

These changes favour useful plants and animals and, although subtle, this minimal level of landscape domestication results in enduring and dramatic anthropogenic footprints in a variety of settings, particularly when considered at centennial and millennial scales. While plant domestication is driven by selection and propagation,

landscape domestication concerns the demography of a variety of useful and domesticated plants, and their interactions with settlement features, soils, earthworks and fluvial works.

In Amazonia, the transition from primarily foraging to developed farming systems occurred by about 4000 years ago, as formerly casual cultivation in home gardens and managed forests was transformed by larger and more settled populations, although the timing and intensity of these changes varied significantly across the basin . As populations expanded, they accumulated crop genetic resources, creating centres of crop genetic diversity. These centres provide strong evidence that pre-conquest human populations had intensively transformed and diversified their plant resources.

***Large well-fed populations***

Large-scale human population expansions during the Holocene generally depended upon farming technologies, which often provided an adaptive advantage over small foraging groups. In Amazonia, this included fairly intensive arboriculture, as well as cultivation of staple root and seed crops. The first Amazon river chroniclers such as Gaspar de Carvajal reported an abundance of well-fed populations along the bluffs, surrounded by orchards on the uplands and seasonal fields in the floodplains.

Fully domesticated species comprised part of emerging farming systems, including arboriculture, but incipient or semi-domesticated species were often managed in forests Some forests were highly modified, such as the widely dispersed Brazil nut stands, whereas others became high-diversity anthropogenic forests. Other forests are oligarchic – dominated by a single species – and occupy extensive areas across Amazonia; some of these were managed to enhance yields. For instance, *Acáí-do-Pará*, which still dominates thousands of square kilometres in the Amazon river estuary, was a major subsistence resource for the mound-building Marajoara society. Many present Amazonian forests, while seemingly natural, are domesticated to varying degrees in terms of altered plant distributions and densities, because trees are long lived.

The degree of vegetation modification around villages varied significantly, with cultivated fields and orchards close by, surrounded by managed forests with decreasing evidence of management as distance from the village increased. Recent data from the Purus–Madeira interfluve suggest that the concentration of useful species is detectable as much as 40 kilometres from major and even minor rivers.

These interfluvial forests, which comprise the vast majority of the region, were used for foraging but were not actively managed, and are therefore viewed as essentially natural. However, such a view ignores the fact that foragers modify forests along trails and at campsites, over thousands of years of activities. Considering the dense river and stream network that covers most of Amazonia, and that tributaries often have as many archaeological sites as the main rivers, and that tributaries often have as many Brazil nut stands as main rivers, it is likely that a significant portion of Amazonian forests was modified to some degree, and remains so today.

## Amazon foods, long cultivated




*The fruits and foods of the Amazon have been cultivated for thousands of years. Açaí, babaçu, buriti, cashew, Brazil nut, guaraná, urucum, manioc (from top, left to right) are eight of dozens of products of originally ancient agroecology*

*Box 2*

## The pristine myth

*Extracted and edited from the paper by William Denevan in the Annals of the Association of American Geographers, 1992. Access complete paper with references here*

The tropical rain forest has long had a reputation for being pristine, whether in 1492 or 1992. There is, however, increasing evidence that the forests of Amazonia and elsewhere are largely anthropogenic in form and composition. This contradicts the common view that until recently, the tropical forests have been largely uninhabited, and that prehistoric people had no more influence on the vegetation than any of the other animal inhabitants

In the Rio Negro region of the Colombian-Venezuelan Amazon, soil charcoal is very common in upland forests. C-14 dates range from 6260-250 years before the present, well within human times. Most of the charcoal probably reflects local slashing-and-burning. Wild fires in prehistory, along with the more frequent ground fires, could have had significant impacts on forest succession, structure, and composition. Examples are the pine forests of Nicaragua, the oak forests of Central America, and the *babaçu* palm forests of northern Brazil.

*Shaping the forest*

The Amazon forest is a mosaic of different ages, structure, and composition resulting from local habitat conditions and disturbance dynamics. Natural disturbances have been considerably augmented by human activity, particularly by shifting cultivation. Even a small number of farmers can have a widespread impact in a relatively short period of time. About 40 per cent of the tropical forest in Latin America is secondary as a result of human clearing, and most of the remainder has had some modification. The species composition may alter the species composition of the mature forest long-term. Human environmental destruction in Amazonia currently is concentrated along roads, whereas in prehistoric times Indian activity in the upland forests was much less intense but more widespread.

Indian modification of tropical forests is not limited to clearing and burning. Large expanses are humanised forests in which the kinds, numbers, and distributions of useful species are managed by human populations. The planting, transplanting, sparing, and protection of useful wild, fallow plants eliminates clear distinctions between field and fallow. Abandonment is a slow process, not an event. The Kayapo of the Brazilian Amazon introduce and/or protect useful plants in activity areas ('nomadic agriculture') adjacent to villages or camp sites, in foraging areas, along trails, near fields, and in artificial forest-mounds in savanna. In managed forests, both annuals and perennials are planted or transplanted, while wild fruit trees are particularly common in early successional growth. Weeding by hand was potentially more selective than indiscriminate weeding by machete. Much dispersal of edible plant seeds is unintentional via defecation and spitting out.

In forests in Amazonia, species have been manipulated, often without a reduction in natural diversity. These include specialised forests (*babaçu*, Brazil nuts, lianas, palms, bamboo), which currently make up around one-eighth of the total upland forest in the Brazilian Amazon. Clear indications of past disturbance are the extensive zones of cultivated *terra preta* (black earth), which occur along the edges of the large floodplains as well as in the uplands. These soils, with depths to 50 cm or more, contain charcoal and cultural waste from prehistoric burning and settlement. Given high carbon, nitrogen, calcium, and phosphorus content, *terra preta* soils have a distinctive vegetation and are vital for farmers. Large portions of Amazonian forests appear to exhibit the continuing effects of past human interference. There are no virgin tropical forests today, nor were there in 1492.

## Domesticated Amazonia

The idea of a domesticated Amazonia, which is to say the immense diversity of social, cultural and historical processes that shaped Amazonia during the Holocene that began around 11,000 years ago, situates this vast area in the company of other world anthromes – which is to say, the ecological patterns created and shaped by humans. It contrasts strongly with reports of empty forests, which continue to captivate scientific and popular media. This view thus problematises rather than dismisses the human factor in any and all parts of the region, with the corollary that the potential of human influence requires recognition of cultural and historical continuity with many indigenous peoples today.

Descendant populations have intrinsic rights to this history and the places it occurred, not simply as disenfranchised groups, but as active partners. They provide a longitudinal view of how human populations actually adapted to changes in the past and how this effected forest composition and distributions.

Past systems provide clues to how people responded to opportunities and challenges created by climate change, and offer ideas for present efforts to ameliorate global warming. Indigenous technologies were not only adaptations to changing forest conditions, but also intentional actions to manage those changes. Further resolution of differing views through integrated fieldwork has great global significance, given the importance of Amazonia and its sensitivity to climate and human interventions.

## Status

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