Chapter 1
Amazonian Dark Earths: The First Century of Reports

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1.1 Introduction

Amazonian dark earths are anthropogenic soils called *terra preta de índio* in Brazil, created by indigenous people hundreds, even thousands, of years ago (Smith 1980; Woods and McCann 1999). *Terra preta* proper is a black soil, associated with long-enduring Indian settlement sites and is filled with ceramics and other cultural debris. Brownish colored *terra mulata*, on the other hand, is much more extensive, generally surrounds the black midden soils, contains few artifacts, and apparently is the result of semi-intensive cultivation over long periods. Both forms are much more fertile than the surrounding highly weathered soils, mostly Ferralsols and Acrisols, and have generally sustained this fertility to the present despite the tropical climate and despite frequent or periodic cultivation. This fertility probably is because of high carbon content, which retains nutrients and moisture, and an associated high and persistent microbial activity.

The high concentrations of pyrogenic carbon in *terra preta* come mainly from charcoal from cooking and processing fires and settlement refuse burning, and in *terra mulata* the carbon probably comes from in-field burning of organic debris. Low intensity “cool” burning, what has been called slash-and-char, resulting in incomplete combustion, can produce carbon in high quantity which can persist in soil for thousands of years. Dated carbon in dark earths is as old as 450 BC (Hilbert 1968; Petersen et al. 2001:100). In contrast, slash and burn shifting cultivation fires today tend to be “hot” fires, set at the end of the dry season, which produce large releases of carbon dioxide to the atmosphere and more ash of brief persistence than charcoal.

Denevan (2001:116–119) has argued that in pre-Columbian times the use of stone axes made long-fallow shifting cultivation very inefficient, and as result probably uncommon until the European introduction of metal axes. Previously, soil fertility must have been maintained and improved by frequent composting, mulching, and in-field burning, making semi-permanent cultivation possible with only brief fallowing. Over time these activities could have produced fertile, self-sustaining dark earths.

Dark earths may occupy 0.1% to 0.3%, or 6,000 to 18,000 km², of forested lowland Amazonia (Sombroek and Carvalho 2002:130). Because their densities vary...
greatly within subregions and almost no systematic survey has been accomplished within Amazonia, variations in density projections of an order of magnitude are to be expected. The dark earths occur in a variety of climatic, geologic, and topographic situations, both along river bluffs and in the interior, with depths sometimes exceeding 2.0 m. Individual patches range from 1 ha or so to several hundred hectares.

It has only been since about 1980 (Fig. 1.1) that these soils have received intensive scholarly attention. Recent research has been multidisciplinary and international, especially by soil scientists, archaeologists, and geographers from Brazil, Colombia, Germany, and the United States. Independent work in these disciplines and countries came together in three international conferences in 2001–2002 in Benicassim in Spain (CLAG) and in Rio de Janeiro and Manaus in Brazil, resulting in two important collections of Amazonian Dark Earths papers (Lehmann et al. 2003; Glaser and Woods 2004). The topic is now of major scientific interest, of relevance both to prehistory and to agricultural development and global climate change today; hence the value of this historical survey.

When Woods began seriously looking at the phenomenon of the Amazonian dark earths in the early 1990s, a first step of course was to acquire as much of the previous literature as possible, review it, and begin a bibliography. Subsequently the bibliography has grown and has become a resource in itself that could be queried for substantive data on the development of and trends in dark earth studies. Toward that end he sent out a draft compilation to over three dozen other interested researchers asking them for comments, corrections, and additions, and he asked them to pass the bibliography on to others who might be able to contribute. Many responded, and the result reflects the combined efforts of numerous individuals.

![Fig. 1.1 Amazonian dark earth references by decades, 1870–2004 (n = 311)](image-url)