

PREFACE

Soils in the humid tropical lowlands are often highly weathered and have unfavourable chemical properties for plant growth. Especially when the rainforest is slashed for agricultural use, high temperature and rainfall may lead to soil degradation within only a few years. Without large and sustained inputs of fertilizers, these constraints cannot be easily overcome. The discovery of soils in the Amazon Basin having the attributes of fertile soils, such as high nutrient availability and organic matter contents, is therefore surprising. The existence of these Amazonian Dark Earths was first described for the international scientific community as early as the mid 1870s by Cornell professor Charles F. Hartt and his student Herbert H. Smith. Locally referred to as “Terra Preta de Índio” (Indian Black Earth) these soils bear testimony to ancient human occupation in the Amazon region, and have therefore received much attention from archaeologists. Increasing and broad interest in these dark earths from a soils perspective comes from their ecological uniqueness in the Amazonian soilscape. Two main opportunities arise from the study of these fascinating soils: (1) Gaining knowledge about the functioning of soil organic matter and nutrients from artificial soil modifications in the distant past, and (2) Understanding how these extremely fertile soils came into existence and using this information to improve the production potential of highly weathered and acid soils under humid tropical conditions.

Recent studies show that Amazonian Dark Earths are much more widespread than previously thought. Additional archaeological work on these soils suggests that large civilizations may have existed in the Amazon Basin. High population densities and complex societies can only survive with productive agriculture, something hard to imagine given the constraints that the soil environment presents in the Amazonian lowlands. If areas of fertile Dark Earths were intentionally created by Amerindian populations for agricultural production in order to sustain large populations then intriguing historical and ecological implications arise. Such evidence would confirm that the knowledge gained through a careful study of the properties of Amazonian Dark Earths could help design sustainable land use systems on highly weathered tropical soils.

In the last decade major advances have been made towards a better understanding of Amazonian Dark Earths. However much of these data has not been previously integrated or presented in an interdisciplinary publication including history, archaeology, anthropology, geography, and soil science. This publication presents the first comprehensive overview of Amazonian Dark Earths and provides important perspectives for future land management emergent from recent research. In addition to presenting the current understanding of Amazonian Dark Earths, this publication also addresses the questions most relevant for future studies including research methods. These methods are based on established methodology available for the study of soils in general but must be modified for specific questions asked or specific constraints found when applying them to Amazonian Dark Earths. The final objective of our endeavour is to discuss existing land management techniques that

may provide insights into the creation of Amazonian Dark Earths and soil management of Amazonian Dark Earths themselves.

This book is divided into four sections. In the first set of chapters, we provide a historical perspective of the research on anthropogenic soils in general and the place that Amazonian Dark Earths have in it. Our current knowledge about their origin and distribution is discussed and a comprehensive classification scheme for these soils is suggested here for the first time. In the second section of the book, the properties of Amazonian Dark Earths are presented with respect to soil fertility, soil organic matter quantity and quality, carbon sequestration, agro-biodiversity from a researcher's point of view as well as the farmer's perspective of its properties. The third section provides an overview of methods relevant to research on Amazonian Dark Earths. While not intended to serve as a complete guide to methodological procedures, this overview highlights the specific opportunities created by the discussed methods, the challenges encountered when applying the methods to Amazonian Dark Earths, and how these challenges are met. Specific areas include documentary research; archaeobotanical research; methods assessing soil organic matter, soil biology, soil physics, soil chemistry; microscopic and geochemical methods. The fourth section deals with the current management of soils around homesteads and agricultural fields. These chapters discuss the creation of Amazonian Dark Earths, as well as the contemporary management of Amazonian Dark Earths. The latter includes non-agricultural soil uses, soil fertility, and weed management strategies for increasing agricultural productivity.

It is important to note that the existing sites covered by Amazonian Dark Earth are archaeological sites of the utmost historical importance. This publication and its authors do not support or suggest alteration or exploitation of these sites. Rather, this publication should aid in the preservation of this cultural heritage by increasing public awareness and providing alternatives to the agricultural use of Amazonian Dark Earths.

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