Understanding *Terra Preta*

Broader Environmental Implications of Anthrosol Use

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Introduction

Recent archaeological discoveries in the Amazon region are altering common perceptions on pre-Columbian indigenous populations as well as our understanding of Amazonian ecology. The presence of *terra preta* soil scattered throughout the Amazon Basin carries major implications – both for pre-Columbian indigenous populations of the region and for modern-day agricultural practices in the tropics. In a rapidly changing physical world, with the effects of deforestation and increasing atmospheric CO_2 levels, the potential of anthropogenic soils and biochar are incredibly valuable.

What is *Terra Preta*?

- Anthropogenic (man-made, dark soil that is found in varying volumes across the Amazon)
- Deposits range in size from less than one hectare to several hundred hectares and cover approx. 0.2% of the Amazon (1.26 million ha)[1]
- Of pre-Columbian origin and were formed between 7000 and 500 years ago according to radiocarbon dating[2]
- Still unclear whether it was intentionally made by indigenous inhabitants or not[3]

Research Questions

My goals in examining this topic are as follows:

- Understand *terra preta*'s composition
- Consider implications that *terra preta* has on modern agricultural practices
- Anticipate broader global influence of biochar technology, especially in terms of carbon sequestration

Methods

To get the most complete understanding of terra preta possible, I considered archaeological, historical, anthropological, and chemical explanations of the soil itself. I also consulted broader social, economic, and scientific information to better grasp the significance of anthrosol use.

Analysis

How was *terra preta* composed?

- Believed to have been caused by intensive human activity through the incorporation of vast amounts of organic material (animal bones, turtle shells, human excrement, plant matter, etc.)[2,3]
- Contains heightened pH and higher levels of phosphorus, calcium, magnesium, manganese, and zinc in comparison to neighbouring soils[4]

What is Biochar?

- Organic material that has been burned incompletely and results in a variety of combustion residues[2]
- Main technique for creating *terra preta*

How does Carbon Sequestration work?

- Photosynthesis requires CO_2 to create biomass[6]
- Biomass then turns into organic matter in the soil[6]

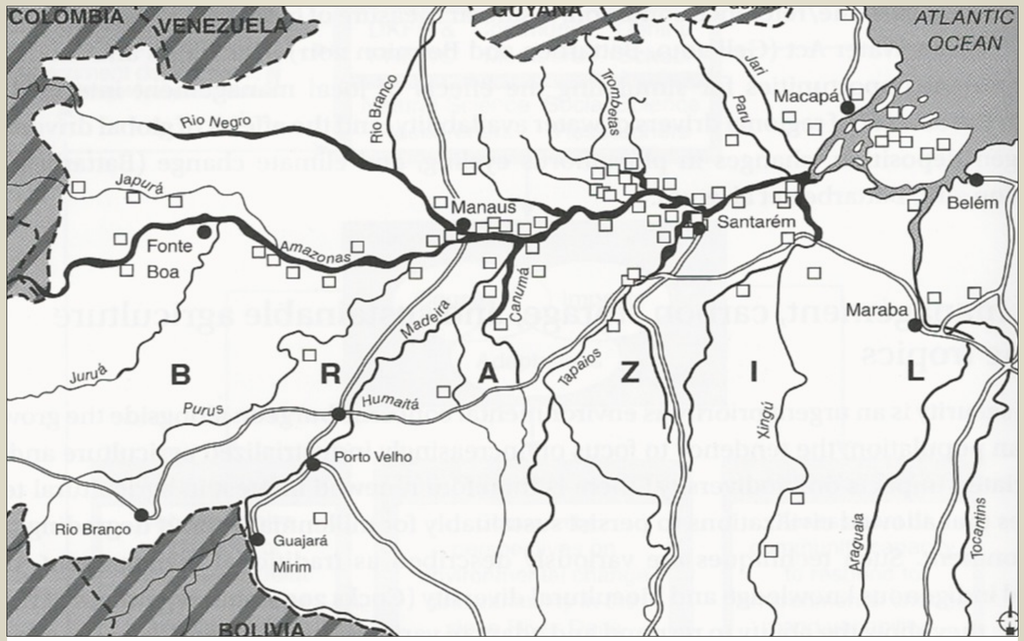

Figure 1: Map of known *terra preta* deposits across the Brazilian Amazon[2]

Results

Challenging Demographics:

- Considering *terra preta* data, pre-Columbian demographics now point to a population of 8-10 million in 1492[1]
- Evidence for large, sedentary indigenous populations at *terra preta* sites[5]

Traditional Ecological Knowledge (TEK):

- Demographic possibilities combined with implications of *terra preta* genesis, provides Amazonian indigenous peoples with a greater degree of agency and encourages more consideration for TEK

Implications of Biochar Technology:

- "the use of biochar could sequester 400 billion tonnes of carbon by 2100, leading to a reduction in atmospheric carbon dioxide of 37 ppm"[2]
- Increases quality of life for local farmers
- Stabilizes and maintains biodiversity
- Supports large-scale agriculture, thereby challenging hunger issues
- Actively battles climate change
- Helps water purification[6]

Conclusions

The discovery and analysis of *terra preta* has repercussions that can be felt throughout the world. Archaeologically, *terra preta* suggests large-scale ecological practices, while supplementing demographic information about pre-Columbian Amazonian societies. Socially, *terra preta* emphasizes the importance of considering traditional ecological knowledge in an environmentally-conscious era. Furthermore, *terra preta* and similar biochar technologies could dramatically alter agricultural practices, limit amounts of atmospheric carbon dioxide, and stem issues of hunger in developing countries. Increasing population density in combination with a challenging agricultural landscape in parts of Africa for example, could be greatly remedied by biochar technology.

Future Research

- Further excavations of *terra preta* sites in the Amazon are encouraged to better understand its creation and to determine to what degree *terra preta* was intentionally made, if at all
- Additionally, experimental archaeologists should consider re-creating *terra preta* in order to better answer questions of time, effort, intensity, and results in an agricultural setting
- On a broader scale, I would encourage individuals, organizations, and corporations to educate themselves about biochar technology and consider its implementation in their respective domains

References

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