

# Intimate Relations: multispecie stories of manioc social life

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## Abstract

Manioc (*Manihot esculenta* Crantz) is a way of life that gives us the opportunity to rethink agricultural production and thus provides a divergent understanding of the human domestication of plants. In the traditional literature about manioc, its evolution has been recognized as a process of domestication, the control of a biological species by humans or through “the paradigm of human exceptionalism.” In this paper we seek possible ways to tell another story about manioc and its human and non-human companions: a partial and modest testimony among many possibilities found between the biological and anthropological worlds. We argue that the domestication model is only a particular Western mode of telling the story and forming relations with manioc. To contrast this we see the possibility of opening our minds to another story, to describe the human-manioc relation as an intimate relationship in which all elements are agents, and simultaneously objects of action. Manioc is bodies-in-movement, growing and developing in the formation of multi-species landscapes. We understand this intimate relationship, as Donna Haraway explains, as a sym-poietic story, a process of “becoming-with” that occurs in the flow of life.

**Keywords:** manioc, symbiosis, domestication, human exceptionalism, indigenous peoples.



# Relações íntimas: histórias multiespécie da vida social da mandioca

## Resumo

A mandioca (*Manihot esculenta* Crantz) é um modo de vida que nos dá a oportunidade de repensar a produção agrícola e, assim, proporciona uma compreensão divergente da domesticação humana das plantas. Na literatura sobre a mandioca, sua evolução tem sido reconhecida como um processo de domesticação, o controle de uma espécie biológica pelo homem ou “o paradigma da excepcionalidade humana”. Neste artigo, buscamos formas possíveis de contar uma outra história sobre a mandioca e seus companheiros humanos e não humanos: um testemunho parcial e modesto entre tantas possibilidades entre os mundos biológico e antropológico. Argumentamos que o modelo de domesticação é apenas um modo particular de contar a história e estabelecer relações com a mandioca. Para contrastar, vemos a possibilidade de abrir nossas mentes para proliferar outra história, para descrever a relação humanos-mandioca como uma relação íntima, um enredamento em que todos os viventes são agentes e, ao mesmo tempo, objetos de ação. A mandioca é um corpo em movimento, crescendo e se desenvolvendo na formação de paisagens multiespécies. Entendemos essa relação íntima, como explica Donna Haraway, como uma história simpoiética, um processo de “tornar-se-com” que ocorre no fluir da vida.

**Palavras-chave:** mandioca, simbiose, domesticação, excepcionalismo humano, povos indígenas.

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## Introduction

For the biological, agronomic, and anthropological sciences, manioc (or cassava, *mandioca*, *aipim*, or *macaxeira* in Portuguese, and *yuca* in Spanish-speaking countries)<sup>1</sup> is described as a domesticated species that emerged from selective cultivation processes from its wild ancestors. The manioc is considered to belong to a biological population created through an evolutionary history of human selection with hundreds of different cultivars or varieties distributed throughout the Americas. Manioc emerged over millennia in close association with South American Indigenous peoples and is currently cultivated in Indigenous and peasant agricultural systems around the globe (Piperno, 2011; De Bruijn and Fresco, 1989; Rogers, 1965; Cock, 1985). Transported from South America to plantations in Africa and Asia and then to Europe and the US, manioc has recently become a commodity (FAO/IFAD 2000), as we will see below. This is the neo-evolutionary story that has emerged in scientific studies from colonial times until recent developments - a story of plants domesticated by humans.

In this paper, we seek possible ways of telling an alternative story about manioc social life and its human and non-human companions, and thus offer a partial and modest testimony about multispecie relationships and the various compositions of manioc on different landscapes. We affirm that domestication models are only a particular Western mode of telling the story and constructing relations with manioc. Faced with the dominant realist or constructivist Western narrative of one nature versus multiple cultures in the larger domestication story, we can open our minds to the emergent natureculture perspective. Our objective here is to question our conceptions of where species exist (Kirksey, 2015; Gilbert et al., 2012) (separated from the environment) and their evolution (submitted to two distinct forces: natural and cultural selection) since we consider these issues to be central in rendering problematic the concept of domestication. The notion of species here must be rethought, not to proclaim its end, but rather to think with manioc and stories of its emergence, entangling and sympoietical differentiation<sup>2</sup>. To do so it is necessary to provincialize humans and denaturalize the idea of domestication (*domus*) which is based on the dominant enlightenment narrative of human exceptionalism.

It is also necessary to understand domestication as a set of practices that emerged during colonialism and capitalism after 1492 and determined the agricultural practices of colonial and imperial plantations, but which also took shape with the universal idea of transformative processes from the wild to the domestic, in civilizing processes coordinated by human techniques on the bodies of other species (Tsing, 2012; Cassidy, 2007; Swanson et al., 2018). In contrast to the human exceptionalist idea of domestication, we will present a story that can depict the life of manioc, its agency in human and non-human life and its intimate relationships with humans in biodiverse agricultural systems.

1 This new world plant is classified as *Manihot esculenta* Crantz and belongs to the *Manihot* genus in the Euphorbiaceae family.

2 There are dozens of ways to deal with the concept of species depending on whether we consider ecological, evolutionary, biological, phylogenetic, morphological or taxonomic aspects, with concern for the biological dimensions such as sexuality and the production of fertile offspring as one of the central issues (Mayden, 1997; Stamos, 2003).

While questioning the concept of domestication, we have sought to follow the proposal of Thom Van Dooren (2012) in an effort to conceptualize the evolution of tropical agricultural landscapes in which all parties, human and nonhuman, are involved and influenced by their interactions. Following Anna Tsing (2018), we bring a feminist awareness to the work of “domus” in multi-species narratives. This allows us to look at domestication as a concept of linear progress, human mastery and one of many ways that humans can live with other beings. Tsing encourages us to explore domestication not just as a narrative or ideology but also as a particular Western form of human shaped worlds and proposes ethnographic tools that can help distinguish between resurgent landscapes and multispecies encounters. Inspired by Amerindian ontologies, we can explore the narratives in which plants are not perceived as natural objects, but as animated lives (Oliveira et al., 2021; Descola, 2004; Emperaire et al. 2001; Carneiro da Cunha, 2017) that have relations that make them part of human *familiarisation* (Fausto and Neves, 2018). We are grateful to these authors for providing us with conceptual tools for thinking about manioc social life in all of its complexities.

Furthermore, to deal with manioc and humans, we are inspired by the concept of intimate relations or sympoiesis to notice manioc assemblages and to think of manioc as a *companion species* (Haraway, 2003; Tsing, 2012), with the visceral idea that organisms are never alone but become what they are in a meshwork of interconnected histories of multiple living and nonliving beings. Such assemblages provide openings to emergent and contingent processes, which point to stories of more-than-human socialities and assemblages rather than individuals, leading us to the guiding concept of symbiosis (Margulis and Fester, 1991). We understand this intimate relationship, as Donna Haraway explains, as a sympoietic story, a process of “becoming-with” that occurs in the flow of life. Sym-poiesis here, is a simple word, which means “making-with” (Haraway, 2017). In this way, we relate to manioc as it transforms through the power of multiple histories of multispecies entanglement, co-domestication, and co-development, in which manioc is both an agent and immersed in a meshwork of animacy. This is an invitation to look at manioc as a mode of life rather than a species; as assemblage rather than individuals; as sympoetic rather than domesticated. We hope that this effort can inspire research agendas that are neither against nor in favor of using the concept of domestication, but seek to go beyond this concept (Tsing, 2018).

In this sense, we provoke a reflection inspired by Indigenous practices and conceptions and our ethnographic experiences with multispecies ethnography to become aware of stories and relationships involved in manioc cultivation. We engage in manioc social life as we have intimate, emotional and affective ties to this plant, which is highly present not only in Brazilian lives but also in the lives of many people throughout the globe today, and because it is a part of our everyday life and academic trajectory alongside Indigenous peoples in Brazil (Cardoso, 2018; Arruda Campos, 2016). Furthermore, manioc is a plant of fundamental importance to the conformation of the socio-natural landscape of tropical regions. In addition to the utilitarian arguments that we can evoke, we recognize that manioc plants are organisms interconnected with land, forest, water, wind, animals, other plants, insects, fungi, the moon, as well as protective spirits, as established in agronomic studies of this plant and stories told by many peasants and Indigenous peoples and recorded by anthropologists and ethnobotanists.

### **Becoming a domesticated plant**

The act of telling stories always involves more than simple descriptions. Narratives are discursive and material dynamics that historicize the world, and are completely inseparable from lived experiences and are thus vital contributors to the emergence of what “exists.” As Thom Van Dooren (2014) affirms, “even a story that purports to be purely mimetic, is never just a passive mirror of reality.” Stories are part of the ecologies of life – whether of domestication or others – they participate in the formation of the world, and as a result,

telling stories has consequences, and one of them is that we are inevitably led to new connections and with them to new responsibilities and obligations.

In the Encyclopedia of Life<sup>3</sup>, manioc is described as a perennial woody shrub in the Euphorbiaceae family, native to South America, but now grown in tropical and subtropical areas around the world for the production of its edible starchy roots (tubers), propagated annually from cuttings from its stem. Its body is composed of fibrous and tuberous roots, a main stem, lateral branches, bifurcations or reproductive branches, leaves and inflorescences. It is a shrub that can reach 2.75 meters in height, with leaves deeply divided into 3 to 7 lobes, with small fruits, about 1 cm in diameter. The root tubers of cultivated varieties can be 5 to 10 cm in diameter and 15 to 30 cm in long. Fresh roots and leaves contain cyanide compounds, including linamarin (cyanogenic glucoside) and hydrocyanic acid at levels that can be toxic. Varieties called “bitter” contain more of these compounds than so-called “sweet” varieties.

Manioc is considered to belong to a population created through an evolutionary history where human selection had and has a central and dominant role that led to the current phenotype. In this relationship, hundreds of different cultivars or varieties have been generated and distributed throughout the Americas (Clement et al., 2010). In the dominant and hegemonic story of evolutionary biology, manioc is conceived as a domesticated species: a population of individuals related by a fundamentally clonal transmission, which retained its capacity for sexual reproduction, for example by inbreeding and hybridization with wild species. The current premise is that, unlike wild species that live and diversify under the effects of natural selection, domesticated species are those that have been evolutionarily modified due to human activity, that is, as Charles Darwin affirmed: by artificial selection. In general, for the biological sciences, domestication is an evolutionary process led by people with the objective of adapting plants and animals to human needs. A fully domesticated species would be completely dependent on humans for its survival: a form of human mastery.

In evolutionary biology, manioc is considered an example of the marks of human evolution on the New World and its domestication is considered central to the emergence of agriculture in the Americas (Piperno, 2011), together with the domestication of landscapes (Clement, 1999). Managed in nature by the Amerindians, this species is understood to have passed from its wild to domesticated state at the same time as the landscapes transformed. This modernist story of the domestication of manioc and landscapes combines a number of other stories about the people of the Americas, such as the passage from a wild to a domesticated state, from the Paleolithic to the Neolithic and from nomadic hunter-gatherers to sedentary farmer-producers, and from the forest to the house, between outdoor space and domestic space, between the masculine and the feminine, in short, between nature and culture.

In this context, among current lines of neo-Darwinist research related to the scientific study of manioc, the evolution and domestication of this plant has been approached by using genetic research with molecular markers to examine its evolutionary and geographical origins (Allem, 2002; Schaal et al. 2006, Olsen and Schaal, 2006; Olsen and Schaal, 1999). Another research approach includes, in addition to genetic studies, a complementary look that compares manioc biology with that of its wild ancestors to understand the connections among them (Rival and Mckey, 2008). In this sense, the current story is that through natural selection, by artificial means, manioc had been domesticated initially in South America 8,000 -10,000 years ago (Olsen and Schaal, 2006) along with landscape and human evolution. However, the issue is controversial among evolutionary biologists on some specific points. There is debate in the literature about the exact place of origin of the species and of its passage from the wild to the domesticated (Piperno, 2011). On the other hand, there is consensus about the central role of the agency of Indigenous peoples of the Americas in the domestication of manioc by selecting organisms from wild species (Rival and Mckey, 2008).

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3 See: <https://eol.org/pages/1154718>

As anthropologist Laura Rival and her collaborators (Rival and Mckey, 2008) point out, manioc is now widely cultivated in the tropics, while Indigenous peoples in the Amazon actively transform ecological conditions of the environment to amplify the collection of a variety of cultivated plants'. This assertion is expressed in a broad field of studies from the humanities interested in understanding the human role in the evolutionary processes that involve the variation and evolution of manioc in the tropics, as well as the forms of cultivation and management carried out by Indigenous peoples and peasants. Another approach, like human ecology, indicates that manioc emerged from its wild ancestors through rational and utilitarian choices made by Indigenous peoples, in a selection process that prioritized the accumulation of starch in the root and a reduction of cyanide compounds (Wang et al. 2014), leading to a distinction between bitter and sweet varieties of manioc. Clonal propagation by cutting should then have conferred a strong agronomic advantage. During this process, the seeds and seedlings of wild ancestors were also transferred without modifications to domesticated manioc. Cultivation produced at least one evolutionary change reflected in manioc morphology that made it even more suited to tolerate environmental risks than its wild ancestor. It was through this technology and with traditional knowledge that Indigenous agriculture maintained and still maintains high levels of genetic and varietal diversity of manioc.

The assumptions that permeate these studies are that both 'cultural' and 'natural' selection produced manioc diversity through a broad cultivation system. This system was highly adapted to environmental pressures, the knowledge of farmers, categorization, and valorization of phenotypically expressed varietal differences, and the incorporation of sexually reproduced plants. All of these factors together encourage intra-varietal diversity and occasionally lead to the creation of new varieties (Rival and Mckey, 2008). The multiple forms of social organization of the various Indigenous peoples and peasants, their networks of reciprocity and kinship, as well as relations with the market, contributed, in this narrative, to the evolutionary construction of this diversity. In this natural and cultural division of the scientific field of studies on manioc, it was then up to the natural and agronomic sciences to understand the bioecological aspects of this species and its diversification. On the other hand, anthropology and human ecology has been concerned with culture, with the thought and representations of humans that give meaning and significance to this species.

When integrating the cultural with the biological dimensions of existence, manioc is conceived as a biological object that is culturally constructed. In this argument, it is human action, not biology, which gives manioc meaning or significance. This model that explains the phylogeny of domesticated species, based mainly on genetics and the morpho-physiological characteristics of an individual, would be based on what Tim Ingold called the genealogical model (Ingold, 2007). According to Ingold, we assume that organisms and people are endowed with the essential attributes or specifications (characters or identities) inherited to carry out a particular, independent way of life and promote their growth and development in an environment. In this model, the lines that connect ancestors and descendants are intergenerational transmission lines of genetic (genotypes in the case of nonhuman organisms) and cognitive information (in the case of humans). The lines provoke a strong division between what would be innate and what would be acquired; or what would be given and what would be learned or constructed, or, in other words, between nature and culture.

### **Becoming manioc-*with*-others**

Evolutionary biology offers different ways to tell stories about the relationship between humans and plants, either through reflections from the field known as Eco-Evo-Devo or through theories of symbiosis. We prefer to have this biological perspective dialogue with the practices and perspectives of Indigenous peoples. Indigenous narratives of manioc's origin are well known in Brazil in multiple versions told by peoples who have cultivated it.

The Baré, for example, inhabitants of the northwest Amazon, tell us another story of manioc evolution, based on a different ontology. For them, manioc appeared in the world through the body of a teenage girl named Mani, who after her death in mythical times was buried by her mother. The manioc trunk, which was then called *maniva*,<sup>4</sup> sprouted from her body. Burgeoning *maniva* is cared for like a daughter by the female farmers who established relations of reciprocity with the feminine spirit of the field, *the mãe da roça* (mother-of-the-field). We can see this relationship in the following passage,

“Manivas were born from the earth, from people. Maniva came from an indigenous woman who one day fell sick and died. Later other people buried her body. Six months later they went to her grave and found a maniva plant there. That’s why we call it maniva because she, the indigenous woman, was called Mani. Mani died and from her body spread many seeds. In ancient times there wasn’t any manioc, only white maize. After her death manioc appeared....” (account of a Baré farmer) (Cardoso, 2010).

The emergence of manioc as part of a human body is described among the Tukano: manioc is born of an ancestral body called Basebo or Baaribo (Pārōkumu and Kehíri, 1995) who offers its parts for cultivation by female farmers. At that time several cultivated plants and agricultural spaces were created. The anthropologist Phillipe Descola describes the Nunkui myth of the plant’s origin as cultivated among the Achuar. Nunkui is a spirit, creator, and the mother of cultivated plants and with whom the horticulturists relate daily (Descola, 2004). Among the Krahô, plants are persons who have thoughts, feelings, language, and sociality, “Every plant has its way, they talk to each other, but we do not understand. They organize themselves. Plants are persons, they have voice” (Lima, 2017).

Lima reports that for this Indigenous group these plants, including manioc, are not simply born but sprout “for someone,” their human and nonhuman owners. This involves exchange, creation, care and predation and the establishment of a negotiation. In this way, Lima reports that if Krahô farmers take good care of their plants they will be seen as good mothers and their gardens will be beautiful and diverse. If they do not, the plants may become ill and abandon them to live in another person’s garden. This created an ethic of care in the sociality between women and their plants. This relationship of caring for manioc as a daughter is also widely described in the literature and substantiated by Indigenous narratives of bio-anthropo-morphic origin, in which manioc emerges from the body of an ancestor and becomes a person after being cared for and cultivated. Manioc is part of the family; it is a relative, a daughter; it has a mother in Indigenous peoples’ socialities (Empeiraire, 2000; Empeiraire et al. 2001, 2008; Descola, 2004; Cardoso, 2010).

Manioc comes from a world made up of ancestral anthropomorphic beings that, through successive series of human body-form transformations, pass into the manioc-form and subsequently relate to present-day humans. The contrast with the narrative of domestication is evident. In this Panamazonian narrative of anti-domestication (Carneiro da Cunha, 2019) and the indomesticable (Santos and Soares, 2021), manioc is not a biological object - a biological species - controlled and modified by humans in agricultural systems, but is a person, immersed in more-than-human socialities in a web of intimacy: care, diplomacy, exchange, communication, danger, and disease. All the varieties of manioc bodies are explained in these stories of origin and through the interactive processes that they have with humans and other beings that give them form, color, and names. The production of all the differences among bodies is valued as indigenous agroecology that gives priority to collection and care and not homogenization and controlled selection.

4 *Manivas* is a Tupi word for the name given by Amerindian farmers to the stem of the manioc that is cut into pieces for planting by asexual reproduction.

In this context, we propose that when identifying manioc it is important to consider its innumerable diversity of varieties, multiple social lives, and the multiple stories of sympoietic differentiation that occur throughout a lifetime together with the lifecycles of other beings (and other things) that are connected to the cycles of manioc.

Considering how this differentiation process is expressed, there are several modes of manioc social life that inhabit the fields of different peasants and Indigenous peoples in the tropics. Notably, in the Amazon, for example, anthropologists and ethnobotanists have recorded more than a hundred different varieties identified by Indigenous peoples (Chernela, 1986; Emperaire and Peroni, 2007; Boster, 1983; Elias et al. 2000; Heckler and Zent, 2008; Oliveira et al. 2021). Each manioc-body is grouped not only according to its physical similarities, such as stem shape, root color and format, and the amount and color of its leaves, but also by considering its life, niche, time of maturity, development on certain types of land, associations with other species and geographical origins. If this distinction points to an apparent ontological distance among “varieties,” we can think of this distinction, not in terms of essentials and rigid boundaries, but as a performative process along a social life coordinated with other lives in a relational environment. To do this, we must identify a type of *becoming*, a life in constant co-formation, co-development, and which is entangled in multi-specific meshworks with other lives and things.

**Figure 1.** Entangled manioc and female bodies on the Rio Negro, Brazil, by (Thiago Mota Cardoso)





Manioc bodies *become with* people, mycorrhizae, soil, ants, pollinators, fungi, larvae, wind, solar rays, and water. With their humans (fig.1), they move and circulate in micro-places, regions and across trans-oceanic borders. This is similar to the perspective of many Indigenous and peasant collectives, which understand that manioc social life is entangled and interdependent with other “others,” but it also serves as a reminder of the difficulty generated by efforts to conceptualize species (Tsing, 2012, 2018).

Farmers and agronomists know that to thrive, manioc depends on more-than-human relationships and coordination. Coordination here is defined as material entanglements (Gan, 2017; Gan and Tsing, 2018), that is, as that which transforms and creates modes of existence through encounters with “the other,” in common worlds. Coordination allows us to observe actions and emergences without the need for intentional communication or mutual clarity among participants. Take, for example, their relationship with fungi, the mycorrhizae that colonize manioc roots. The symbiosis established between different endomycorrhizal fungi and manioc roots is an example of interaction in which both reciprocally benefit each other. Studies have concluded that since manioc does not have a root system sufficiently branched to absorb phosphorus from the soil – when cultivated in agricultural systems it benefits from the hyphae that these mycorrhizas develop in their roots. The hyphae play the role of absorbing “fur,” and in return, the mycorrhizae receive energy from the plant in the form of carbohydrates (Habte and Byappanahalli, 1994).

Let’s see another interspecies example. In the Amazon, there are insects that “take care” of manioc seeds and support their sexual life and thus contribute to the resurgence of manioc in the landscape. Manioc produces pollen, which is captured by insects, which in turn contribute to interbreeding and the formation of seeds, which explode and fall to the ground. The seeds are carried by arthropods to their burrows in the ground. A seed in the earth becomes dormant while the manioc cycle takes place on the landscape. In this resurgent process the dormant manioc seed sprouts after vegetation is burned and a new field is created for cultivation. After years of dormancy these seeds blossom after the resumption of agricultural activity with the use of fire. In the Rio Negro region, manioc that is born from seeds and not by the direct care of a farmer is initially referred to as being *without-a-mother* (Cardoso, 2010) and then adopted and replanted: an act of care, an act of love.

Considering other beings that live with manioc, but in a not so positive relationship, approximately two hundred species of arthropods have been recorded to interact with manioc (Farias and Bellotti, 2006). The *mandrová* (*Ello sphinx* moth) is considered one of the most important manioc companions according to studies about plagues in agronomy texts. Since the *Ello sphinx* can consume a high quantity of foliage, it can reduce root yield and lead to the death of very young plants. Manioc can also coexist with forty species of mites that feed on its leaves, sucking the cellular contents, leaving the leaves yellowish and altering root development. The lace bug also feeds on the leaves of manioc, mainly on some sweeter varieties, leaving them yellowish. Cochineals, when sucking the sap, produce a substance with a high sugar content that serves as a medium for fungi growth, such as “sooty mold” that can cover the leaves and the petiole, which affects photosynthesis.

**Figure 2.** Manioc seeds visited by insects, by Thiago Mota Cardoso



Many other beings (fig.2) are reported to interact with manioc: thrips, whiteflies, cassava shoot flies, fruit flies, *Sternocoelus* weevils, locusts, ants, termites, larvae, proteobacteria, fungi that cause rot, viruses, nematodes, and squamous insects. Manioc's interactions with the gall midge, for example, can make the roots thin and fibrous. Throughout its growth and development, new agents appear in manioc's meshwork of interaction, coupling its life cycle with adventitious herbs or animals, wind, solar rays, rocks, water, the moon, and protective spirits, which all at different times create groups of different forms that interact and become with manioc (Arruda Campos, 2016).

### **Manioc Persistence in Landscape Resurgence**

The location of manioc's multispecies coordination is agricultural landscapes. Gardens host confluences of multiple temporalities of beings that occupy the land during resurgence processes, which are socio-ecological responses to a "disturbance" - any quick ecological change, such as farming practices (fig. 3). Resurgence arises from the ability of plants and animals to move around and make their own rearrangements and contributions to restoring Indigenous and peasant landscapes after a slow disturbance (Tsing, 2017). The concept of resurgence highlights manioc's life cycles and its relationship with other living and non-living beings in gardens. The different temporal phases in a garden - as in an Indigenous agroforestry system - involve different stages of ecological succession in which manioc grows and is cared for by humans, while a multiplicity of organisms collaborate or compete to proliferate. In the ecological simplification of a modernist plantation model, the landscape is shaped to prevent resurgence and multiplicity.

Land is one of these human and nonhuman beings with which manioc intra-acts throughout its social life. Manioc is maintained in relational processes that interweave different maniocs with different qualities of earth, while maintaining the multiplicity of lives that are entangled in heterogeneous assemblages in the resurgence of the landscape. Although manioc grows best in loamy, sandy soils of moderate fertility, it can grow in soils too infertile to support other crops and is, therefore, often planted in marginal areas. However, as Gudeman and Rivera (1990) emphasize, soil has an important role as a promoter of life among peasants in Central America, since land is more than the quantitative sum of nutrients. The Pataxó of Northeast Brazil as well as Indigenous peoples from the lower Rio Negro region affirm that the land is alive (Cardoso, 2010; Cardoso, 2018). They highlight that different types of land provide different conditions for each type of manioc and describe how the cultivation of plants influences the soil's development and transformations. Land in these ontoepistemologies is a living material agency that expresses itself as strong or weak, rested or tired, depending on whether agricultors incorporate a multiplicity of beings in an agroecosystem.

**Figure 3.** In the middle of a resurgence by (Thiago Mota Cardoso)



For the vivacity of earth to persist in resurgence dynamics, it is important to look at the temporalities of the assemblage of organisms that work together to create landscapes. In an Indigenous agroforestry system, manioc is cultivated with dozens of other species in crop fields created by clearing the forest and burning vegetation. After two or three years, and with the perception of lower manioc productivity as the land becomes “weak” or “tired”, the deforested area becomes forest again. This happens through a process of resurgence that includes an “invasion” of weeds and pests and management of fruit trees, which Indigenous peoples of the Amazon call “*capoeiras*” (secondary forests). These environmental resurgence dynamics that entangle humans and nonhumans are often mentioned in the literature (Descola, 2004; Posey and Ballée, 1989; Chernela, 1986; Empeaire and Peroni, 2007; Elias, 2000; Rival and MacKey, 2008; Danevan et al., 1984; Eloy, 2005; Martins, 2005; Cardoso et al., 2010). We can understand this dynamic as Indigenous and peasant technospheres, local modes of coordinating the myriad of lives that contribute to the ecological reconstitution of the forest and the vivacity of the soils.

Manioc and the other lives that interact with it within heterogeneous agricultural systems steer us toward the concept of multispecies world-making based on the ecological process of resurgence. For example, Philippe Descola (2004) shows how the Achuar of Ecuador cultivate a wide variety of manioc and other plant species from the forest or secondary vegetation. Animals and weeds, which compose the landscape and compete with the cultivated plants, constantly visit the gardens. The same occurs in the gardens of Indigenous peoples of the Rio Negro region (Cardoso, 2010) and in Southern Bahia (Arruda Campos, 2016) where, in resurgent spatiotemporal processes, plants cross boundaries between gardens and forest. It is in this resurgent process that the modernist dualisms such as the domestic and the wild are broken.

For the Achuar, the house is the focus of social life, and is located at the center of the garden, which in turn is surrounded by a vast area of forest, which is a place of spirits and other human and nonhuman beings. Although a man is expected to prepare a field for each of his wives, cultivation, maintenance, and harvesting are exclusively the work of women. This contrasts with activities in the hunting zone, a space of risk where men dominate and women venture only when accompanied by their husbands. Motherhood, among the Achuar also extends to a woman's relationship with the plants that grow in the spaces she cultivates. She has, so to speak, two sets of offspring, the plants in her garden and the children in her home. Also, despite a peaceful appearance, agricultural fields are as full of threats as the surrounding forest. For the Achuar, manioc has the power to suck the blood of human infants. In this case there is no strong dualism between savage and domestic. In the case of the Wajapi, manioc is a seductive plant (Oliveira, 2019).

According to Ingold (2000), orthodox anthropological concepts would see an opposition between the forest and agricultural spaces, making a sharp distinction between the wild and the domesticated when analyzing the Achuar case. But this, as Descola shows, would be deeply at odds with Achuar understandings. For the construction and maintenance of their cultivated fields, the Achuar do not see themselves to be taming the untouched world of the forest. The conception that there is a border between wild and domesticated plants, understood as a separation between nature and culture, does not make much sense to and is clearly problematic for several peoples, including the Achuar. "Wild" and "domestic" plants are not understood to be involved in separate evolutionary dramas. Plants are involved in continuous interactions with other nonhuman beings in resurgent landscapes in which they are entangled, making porous the border between domestic and wild.

The continuity of this history of resurgence through agrobiodiversity dynamics in manioc fields has created landscapes over large temporal scales. Archeology has demonstrated how this spatiotemporal relationship involving human, manioc, and land consists of coevolutionary pasts, contributing over centuries to the creation of the so-called highly fertile Amazonian black earth (*terra preta de índio*) (Fraser and Clement, 2008). These lands are involved in formative processes through the interactions in the multispecies meshworks shaped over history, composing a cluster of residues from dead bodies, living organisms, beings and their tracks (such as human practices). The story of the Amazonian black earth led them to understand that the possibilities that manioc's way of life offered allowed large human groups to inhabit the Amazon. These millenary groupings were based on intimate interrelations with manioc (Heckenberger, 1998; Clement, 1999).

## Life is movement

Manioc social life involves movement and encounters in flows that transcend places and particularities, blurring the boundaries between local and global, contributing to the possibilities of relationships. Manioc has circulated and circulates on very wide scales, allowing us to refer to a global manioc civilization. Its local and regional circulation and movement is well described among Indigenous groups, either by migration or circulation of *manivas*.

In a local context, among the many Indigenous and peasant groups with which manioc is immersed in intimate relationships with humans, manioc entangled with women producing coordinated cycles throughout their journeys and life trajectories, which are impossible to describe in a single story. At the interstices of the fields, plants circulate through the planting and replanting of their stems (*manivas*), causing them to move through places, secondary vegetation, fields, houses (fig. 4), families, and on a local and continental scale (Cardoso, 2010; Cardoso et al., 2010; Emperaire and Peroni, 2007; Kawa et al., 2013; Pautasso et al., 2013).

Each mode of manioc social life (or each manioc assemblage), and its relational and corporeal varieties, also produces new relations after its 'death'. That is, the moment it is withdrawn from the land, multiple interactions are established with different parts of the manioc body. As we have seen, the stem can return to the earth, regrow, or circulate among people who appreciate the specificity and quality of the variety. The roots enter into socio-technical circuits, they are processed and entangle relationships in places like the *casas de farinhas* (flour houses) and kitchens where manioc flour and its byproducts - such as *tapioca*, *beijus*, *cauins*, cakes, and *paçocas* are made. These food products connect new people and things in larger networks, be it at the level of homes when feeding children, or at the community level with rituals such as gift offerings, or even in regional and international markets, such as manioc production in Africa and Asia that penetrates "ethnic" markets in European countries. The life of manioc is a continuum of movement involving co-habitation and co-development, in intimate relationships with humans and other beings.

On a global scale, *maniva* left the Americas, participating directly in the establishment of slave colonies in the southern hemisphere by the Portuguese empire in the Americas and Africa (Piperno, 2011), undertaking a global circulation<sup>5</sup>. The consequences of this movement for human history were manifold and laid the basis for the European colonization of the Americas. In the plantation areas of the colonial period, manioc was consumed mainly as flour. In the 16th century, Portuguese settlers used Indigenous slave labor on both manioc and sugarcane plantations, but by the end of the century, African slaves began to replace the Indigenous peoples as a source of forced labor. Manioc flour was one of the main items Luso-Brazilians exchanged for African slaves in West and Central Africa. However, it took several years for manioc cultivation to be transferred to the other side of the Atlantic. The most common variety of manioc is poisonous, and the Portuguese and Africans in Brazil used Indigenous techniques to extract the poison from the plant and make flour (Freitas, 2011).

When the Portuguese and Spanish landed in the Americas, Indigenous peoples already cultivated manioc in resurgent and multispecific landscapes. The colonial process replaced these resurgent systems with plantations and the logic of domestication, while simultaneously creating practices and ideologies to expel manioc and its cultivators to the margins of the system in spaces not occupied by colonial plantation. Viewed as a "plant of the poor" or an "Indian plant" by the colonialists, manioc and its people were used to maintain the colonial system of the South Atlantic.

In the political ecology of colonial plantations, in the seventeenth century manioc flour became one of the "cornerstones of the South Atlantic economy," not only as the main food source for the crews of slave ships but also for slaves waiting for embarkation at African ports, and troops involved with the slave trade. Alongside sweet potatoes and maize, manioc flour served as a source of sustenance for captives, soldiers, and slave traffickers on the land, sea and, rivers in colonial times (Alencastro, 2000). The original manioc importations by Africa were probably quite small and obtained by the Portuguese on the Brazilian coast from Indigenous Tupi groups who brought the crop from tall forests early in the 15th century (Jones, 1959). These cultivars were likely adaptable to West African forest regions where slash-and-burn agriculture was widely established. In southern Benin, the introduction of manioc and the history of returnees from South America are closely linked.

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<sup>5</sup> From 1492 onwards, different species of animals, plants, viruses and bacteria were exchanged between the Old and the New World following their human symbiotic companions.

Manioc also arrived on Asian landscapes (see Ellen and Souselisa, 2012; Ellen et al. 2012; Hohnholz, 1980) such as in Indonesia where after the year 1900 manioc consumption increased so rapidly that its byproducts became a major part of staple diets, which remains true today. There is no evidence of pre-Columbian dispersal of any of the American root crops to other parts of the world. Moreover, these crops most likely arrived in archipelagic Southeast Asia well after 1511, the date of the Portuguese conquest of Malacca and the first direct Portuguese contact with the Moluccan spice-trade centers. The French took manioc from the Guiana coast to Reunion and Mauritius, and later to Madagascar. Manioc is first unequivocally mentioned in Dutch sources regarding Indonesia in 1781. It was probably transported from Mauritius to Batavia. An alternative potential route was that followed by Spanish vessels sailing westward in the 16th century from the Pacific coast of Mexico to the Philippines. Stem cuttings, however, did not have the same storage potential as maize seeds or sweet potato tubers, and may not have survived voyages longer than a few weeks. Thus, it is more plausible that there was a series of introductions across the globe that staggered from one place to another, connected by the shortest possible sea voyages, thus establishing pan-tropical global circumnavigation. In contrast to South American and African landscapes, where (with some exceptions such as Nigeria) manioc is predominantly cultivated in small resurgent agricultural systems for local consumption, in Asian countries such as Thailand, the Philippines, and Indonesia large industrial production and processing developed during the 20th century. This sector is highlighted by the starch and “pellet” industries that target international markets and most of the manioc produced is for the industrialization of these two products.

Through movements to new places, and new encounters, in contemporary times manioc enters modernist agronomic projects. Until the beginning of the twentieth century, although a diverse range of local manioc varieties in Africa had been registered, the yield of most of the African cultivars was low. On this continent, manioc found new companions in the ecology of life such as the white fly that transmits the African virus responsible for manioc (or cassava) mosaic disease (CMD). This disease had not been reported in Latin America and was being spread by vegetative propagation, from stakes of infected plants. This situation caused the Nigerian, Ghanaian, and Tanzanian governments, for example, to start manioc-breeding programs to develop cultivars resistant to the disease (Beck, 1982).

Associated with the growing expansion of manioc and its diseases in the agricultural plantations in Africa and Asia, in the 1970s research centers were created for ex-situ conservation, genetic improvement, and the development of varieties adapted to “more productive” monoculture systems. Cultivation practices and the multispecies relationships that circulated from the colonial period until contemporary times have been replaced by manioc domestication on plantations. In Brazil, as well as in Africa and Asia, manioc has recently entered socio-technical environments through so-called plant genetic resources conservation networks (Santoniere, 2015). Considered a genetic resource by biologists and agronomists, manioc entered ex-situ conservation efforts and in the 1970s these efforts stimulated the establishment of a worldwide network of Centers for the Conservation of Genetic Resources located in regions considered to have high genetic variability by the UN Food and Agriculture Organization (FAO). In 1974, the Brazilian Agricultural Research Corporation (*Embrapa*) recognized the strategic importance of genetic resources and created the National Center for Genetic Resources (*CENARGEN*). Since then, collections of germplasm have been organized in various decentralized agronomic laboratories. The main objective has been the genetic improvement and laboratory manufacture of clones with desired characteristics and manioc has been included in these genetic improvement projects because it is considered a key genetic resource and food in Brazil and other parts of the world. Manioc is now controlled in “cold” sophisticated laboratories yet anchored in the “warmth” of interspecies relations in various agricultural landscapes.

Manioc social life thus combines intimate stories of love and resistance of “marginal” peoples with stories of domestication through coercion and domination on colonial plantations and in industrial agriculture.

**Figure 4.** Manioc diversity in the Munduruku village, Brazil, by Thiago Mota Cardoso



### **Assemblage of maniocs as symbiopolitics**

Manioc and its different forms of expression has not disappeared from Amerindian landscapes, despite the massacres caused by colonial “encounters”. Its proliferation is not only associated with global trade, and its Indigenous companions have not become “extinct.” (Clement, 1999) In contemporary times, manioc has been “allied” with riverside communities and Indigenous peoples who have sought to live a more autonomous life, opposing the extractive capitalist systems that have searched for labor to remove the forest’s diverse products. Some of those who lived with manioc became more independent from the market system, but simultaneously connected to it, since the Amazonian extractive system absorbed flour produced by “independent” farmers. The same occurred during the days of the rubber plantations with the extraction of latex from rubber trees.

Rubber tappers knew that living with manioc, planting it, caring for it and obtaining food and other ritualistic components provided freedom from the extractive system that sought to exploit maximum production in the shortest possible time. The relentless political power of these markets made it impossible for other plants and living beings to form relationships. In the Atlantic Forest region in Brazil, since the sixteenth century, and more recently on a smaller scale, manioc cultivation by small peasant farmers took place on the margins of coffee plantations and other export products such as sugarcane (Dean, 1997). While coercion and alienation prevailed on plantations, causing the depletion of animals, plants, land, and people, in small fields of peasants there was care, reciprocity and multispecies landscapes were formed.

In recent decades many territories legally dedicated to environmental preservation unfortunately require the absence of humans and cultivated plants, and thus reject the politics of living together, or symbiopolitics (Helmreich, 2014), that entangles humans and manioc. For example, to resist expulsion from their lands because of the creation of a national park in the 1960s, in which human presence and uses were not permitted inside its boundaries, the Pataxó, inhabitants of Southern Bahia, Brazil, sealed an alliance with manioc and undertook a process to retake their traditional territory. The Pataxó struggle in conjunction with manioc made it possible

for humans, manioc and other assemblages to return to their familiar places and led to the re-establishment of resurgent gardens that challenge the power of park rangers who sought at all costs to eliminate people and manioc from within the national park (Arruda Campos, 2016).

In the Anthropocene, amid efforts to create conditions for human survival despite the destruction of landscapes and climate change, manioc is sometimes referred to as the “drought, war and famine crop of the “third world” and reliance upon this crop is expected to increase in coming years as the global climate changes. Some scientists affirm that manioc has the potential to help many countries achieve food security in a sustainable manner, in the face of significant environmental change. Manioc could then become known not only as a crop that can combat “famine” or “poverty” but also as a player in efforts to adapt to climate change. It is an “Anthropocenic” crop, due to its strong capacity for resistance and resilience to droughts (Ceballos et al., 2011; Burns et al., 2010; Jarvis et al., 2012).

### **Final considerations: a sympoietical proposal**

Manioc is not only good for eating or thinking about, but also for building relationships, living with, and for conducting political action and resistance in the Anthropocene (see Oliveira, 2020). For this reason, our purpose is not to affirm facts about manioc, but to consider the intimacy of its ecologies to help notice its relationships and the processes in which it becomes entangled. Our proposal is also to decentralize the role of humans, as exclusive agents in manioc’s evolutionary transformation. Humans, in this story, do have a relevant role in the assemblage of manioc ecology, they are not only supporting actors in this performative encounter, but also act in stories of care, affection, pleasure, domination, resistance, and movement that occur in complex multispecies entanglements.

What we sought to problematize regarding manioc as a domesticated species in this article is the exceptional focus on the role of humans: the Western narrative of progress. This story, in addition to treating each plant as an individual, treats the diversification that occurs in these organisms through the optics of a natural or agricultural selection force. In this perspective, there is an external agent, an outside force that imposes the direction of change on organisms, without considering the reciprocal and mutual influences among living beings, and between organisms and the rest of their *unwelt*. Moreover, when referring to artificial selection, this narrative about organisms emphasizes the idea of human exceptionalism, giving form and meaning to a passive and objectified nature. Through domestication story, “manioc life” disappears in the presence of a human design. Before its own condition of existence is recognized, manioc becomes a natural resource, a biological object to be controlled. We focus on manioc to argue that the narrative of its domestication by humans, understood as its passage from a wild to a domesticated state through human selective and adaptive processes and progress, with subsequent diversification, invisibilizes a process that could be understood as more interactive and complex. For these reasons and due to the attentiveness of this plant to each ethnographic situation, we argue that the concept of domestication is only one way to conceive of manioc sociality, which has informed human control practices of this plant throughout the recent modernist narrative.

When considering manioc “domestication” we encounter the idea that genes are replicators of information through which essence determines form. We also find the idea of human exceptionalism, which affirms that humans construct nature through production and representations. These concepts create impediments because they conceive of species as given biological entities, excluding the effect of the lives of manioc on the lives of other beings, as well as the multispecific processes of landscape formation. Anna Tsing calls attention to the fact that the emphasis on domestication is unidirectional and ignores the concept that other beings can also change humans. Furthermore, for Tsing, domestication tends to be imagined as a sharp dividing line:



“Either you are in the human fold or you are out in the wild.” (Tsing, 2012) Agricultural science has an inherent history of human “dominance” involving a presumption of plant control by human that impact “nature”, rather than an interdependence of ways of life. Tsing affirms:

Because this dichotomisation stems from an ideological commitment to human mastery, it supports the most outrageous fantasies of domestic control, on the one hand, and wild species self-making, on the other. Through such fantasies, domestics are condemned to life imprisonment and genetic standardisation, while wild species are ‘preserved’ in gene banks while their multispecies landscapes are destroyed (Tsing, 2012: 144).

Following this perspective we could argue that one of the limitations to the domestication approaches to manioc and other plants is that they have led us to imagine the ‘human species’ being, or rather the practice of being a species, as something autonomous, self-produced throughout history and among cultures and not entangled in other relationships with other beings and things. Van Dooren (Van Dooren, 2012: 25) proposes that “within this context, the human *invention* of agriculture might be rethought in a way that also acknowledges the *teaching* of agriculture to humans by plants.” He also affirms that valuing and learning to tell stories of these places of multispecies interaction, where new modes of social life emerge, expressed in new forms and ways of life, may allow us to tell alternative stories about the relationship between humans and their companions in the Anthropocene era.

We can learn a lot from the Indigenous peoples of the Americas for whom species are processes, species are verbs. We are not able to account for all the relationships that accompany the intimate interactions involving manioc and humans. Thus we suggest thinking of manioc as a verb, to see the manioc apparatus as a situated assemblage, contingent on relational environments and multiplicities of histories. Relational approaches offer alternatives to the traditional explanatory genealogical model for manioc that is based mainly on genetic mutations and the morpho-physiological characteristics of individual plants, followed by cultural or artificial selection. These relational approaches position living beings as results of their relationships, that is, as *processes* resulting from encounters among organisms and other beings and things, humans or nonhumans. Relational approaches have been conveyed in different studies on embryology, evolution, animal development and immunology, which present living beings as resulting from multiple relationships within a given environmental context. If we change the history of relationships, that is if we change the recognized components of the relationship, the time or synchrony of the encounters, then the result, the history, changes. Relational perspectives in biology have the potential to dialogue with anthropology and Amerindian thought for future studies of multispecies relationships in plant worlds.

Manioc, considering all of its differences, are organisms that have become with humans and landscapes over time. In this proposal manioc is a composite, a multispecies social life<sup>6</sup>. If our argument has value to a research project, we could think of manioc and its differentiation as historical (evolutionary), ontoepistemological and generative processes of assemblages. It is in this sense that Donna Haraway (2008) inspires us to think of manioc as a “companion species”. Anna Tsing (2012) inspires us to *live with manioc*, showing us that we are composites, fundamentally multispecific in our way of life, by suggesting that by cultivating other lives we become open organisms<sup>7</sup> that constantly evolve with other species. These authors reveal that the idea of human control over nature (domestication) never really materializes, leaving gaps where multispecies life acts.

6 In the work of Thom van Dooren (Van Dooren, *Flight ways*), the notion of way of life is central to how he conceives species. Van Dooren proposes approaching species in such a way that an individual organism is not so much a member of a class or type but participant in an evolutionary process in relation to innumerable other beings and things. Thus, species do not simply “occur” but must be achieved with each generation in a process of co-development. He criticizes the fact that often these “other” beings are reduced to mere names and numbers, because of the emphasis given to an objective impartiality when describing facts in research.

7 Each organism is interconnected to others, making it difficult to establish limits, or following Scott Gilbert et al. “*A Symbiotic View of Life*”, we were never individuals (2012).

We look at the complexity of this story in the hopes of understanding the “domestic” no longer as the “controlled,” or the “unproblematic” in a categorical opposition to the complex and powerful notion of the “savage/wild,” the “uncontrollable”, and thus between culture and nature (Ingold, 2000; Viveiros de Castro, 1998). In other words, we could write ethnographic descriptions that go beyond the great dichotomies between nature and culture, wild and domesticated, subject and object, fully recognizing the contingent and emergent local-global stories surrounding the more-than-human socialities of manioc. This was our risky narrative/proposal, to issue a call to emerge from dualism, this insidious distinction produced during the colonial era.

Manioc must be brought back to life. The various ontologies of Indigenous peoples and peasants present stories of animated lives. We must also establish an ethics of responsibility towards the significant others with whom we live, a story of *becoming-with* in deeper intimate relations.

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