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Inside the Ensete Garden, Beyond the Plantation: Perennial Polycultures for *Radically* Sustainable Food Systems

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Abstract.
Against a backdrop of increasingly simplified ecologies—in the form of plantation and monocultural thinking—this article elaborates a call to radical change in sustainable food systems as being fostered by multispecies communities and rooted in a less anthropocentric vision of farming practices and the natural environment. Multiplicity in practice (and as a philosophical guiding principle in the quest for sustainable food systems) is analyzed through the lens of edible perennials and the functional role they play in specific integrated farming systems. The analysis starts from the case study of a perennial root tuber crop in Southwestern Ethiopia, and further expands into the related ramifications of home gardening, polycultural farming, multistoried landscapes, and integrated agriculture. This multilayered story then branches out from the Ethiopian home garden to touch upon the broader category of improved agroforestry practices, which are based on solid and ecologically sound perennial components. It is argued that multifunctional mosaics hold untapped potential to address the call for sustainable food systems in times of profound socio-natural crisis. A bold paradigm shift sustains this vision—from plantations back to forest-like intricacies.

Life in the garden is like life at large:
the creature who remains alone, and does not commingle,
is doomed to pass away unrecorded.

—Hadiyya woman farmer, March 2014

Broken Nature and the Quest for Sustainable Food Systems

'Broken Nature' was the evocative title of an exhibition held at the XXII Triennale di Milano in 2019 that collected creative forms of both science and art from around the world to represent the global environmental crisis.[1] The exhibition was based on the concept of restorative design and on the new ways the relationship between people and the environment, as well as between the self and other human beings, could be re-imagined. The questions looming over the exhibition have become even more pressing in a syndemic world when the environmental crisis has been dramatically revealed by feral diseases—diseases that indeed, it is argued, have mushroomed in late capitalist and industrial infrastructures and are likely the product of a

[1] https://www.triennale.org/en/events/broken-nature/ (Accessed April 15, 2021).

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dysfunctional relationship with the broader environment at large.[2] A sharp divide between nature and culture—between humans (at the core) and "the rest" (at the periphery)—lies at the foundation of capitalism as a world-ecology, and specifically of extractive ecologies and big agriculture. As a consequence, the current socioeconomic system is based on a particularly violent relationship toward the webs of life. In such landscapes, "conviviality" across kin and species, and as a marker of farming and biodiversity, has been erased or dramatically reduced; and with it, abundant sites of overlapping systems of cultivation—of multiple ontologies held in a web of interdependence.[3]

This scenario of broken natures and tangled global inequalities raises several questions: How to thrive and reclaim collective prosperity by bringing nonhuman allies (plants, animals, soil, and more) into the nexus of environment, food, and agriculture? How to shape cultivation of food and broader economies around sustainable goals? How can farming and livelihoods be remade with what remains? What are the components of the sustainability buzzword that more urgently beg attention in a world which finds itself in the process of ruination? What are the dimensions of the sustainability conundrum that hold promise for socioecological transformation—especially in relation to debunking monocultural thinking, and to fostering reparation, restoration, and healing in multispecies worlds?

Efforts to promote a move toward a more holistic approach from production to consumption continue apace; along (and in tune) with a growing multidisciplinary scholarship that calls for a more-than-human (or less anthropocentric) vision of the food system (Corbin Sies 2014); one in which a plurality of agri/ and food/cultures—from indigenous food forests and agroecology, to rewilding the industrial plantation—are contemplated. One attempt at tracing (and repairing) the dramatic reinforcement and globalization of the nature-culture dualism is captured by the ecosystem health approach for which "strategies that focus on single issues—be they economic, public health, or ecological—in isolation of others are bound to fail" (Rapport and Maffi 2011, 1045). Eco-cultural health can be defined as "a dynamic interaction of nature and culture that allows for the co-evolution of both without compromising either critical ecosystem processes or the vitality of cultures" (Rapport and Maffi 2011, 1044). The loss in the vitality of ecosystems at the global scale has been widely documented; less discussed is the parallel and interconnected loss of cultures and languages, and with them, of vast repositories of environmental and dietary knowledge which have been instrumental in underpinning sustainable food systems within diverse landscapes. If the vitality of social configurations is inextricably linked to the health of the entire ecosystem, "it follows from this that forces affecting one domain are likely to have ripple effects in the other" (Veteto and Skarbø 2009, 75). The concept of eco-cultural health evokes in a timely manner, and warns against, a converging extinction crisis, which is also captured in the concept of biocultural diversity.

Homogenizing forces pushing forth the monocultural mindset have proven to threaten the existence of both biological and cultural diversity. Moreover, dependence on improved varieties (which mostly come in the form of monoculture) may increase food security, but decrease dietary diversity. The loss of food crops is even more alarming considering the concomitant and persistent neglect of indigenous plant species on the part of policymakers and researchers—which counts indeed as a form of blindness in addition to loss and erosion. This

[2] See for example T. van Dooren on "Pangolins and Pandemics: The Real Source of the Crisis is Human, not Animal" (https://newmatilda.com/2020/03/22/pangolins-and-pandemics-the-real-source-of-this-crisis-is-human-not-animal/, Accessed April 15, 2021).

[3] The Second Convivialist Manifesto was signed by 300 academics from 33 countries, applying insights on solidarity, conviviality and gift cultures toward a paradigm of global wealth redistribution and transforming human relations with nature. The Manifesto is rooted in and mirrors post-humanist critiques that question binary categories and dichotomies such as nature versus culture, and human versus non-human (Convivialist International 2020).

practice of 'selective forgetting' is due to the fact that "multinationals mainly concentrate on crops of primary interest which will result in the largest financial benefit derived from cultivating these crops, therefore neglecting the innovation needed to develop 'orphan crops' that are simple and cost effective for poorer countries"; which is also consistent with the argument "that certain crops are developed to increase shareholder value for private companies as opposed to solving the problems of hunger and deprivation in developing countries" (Adenle et al. 2012, 260).

In an attempt to reappropriate and reconfigure decay towards the future, my scope in this article is to propose reflections on the constitutive relationship between agroindustrial modernity (through the prism of plantation ecology) and the quest for sustainable food systems; and how this nexus might be recast by bringing to the table of sustainability the theme of the socioecological value of home garden agroforestry systems, with a special focus on the vital contribution of (perennial) key-stone species within them.

Plantation Ecology: Control and Simplification

Scholars and activists from a variety of disciplines have increasingly attempted to capture the nodes and conundra of the modern monoculture-based capitalism by rethinking it through the prism of the Plantationocene—as social system, imperative, and ideal (cf. Wolford 2021). Such perspective revolves around a call to radical thinking, based on an overt critique of the "productionist trap" and of "the dominance of neoliberal ideas in the global food security field" (Fouilleux, Bricas and Alpha 2017, 5). The Plantationocene concept is also apt to be applied to food systems, and how corporations are attempting to capture vegetal life, as well as diverse food systems, and make them uniform through technologies of production, storage, and distribution as well as through control over global governance of food systems themselves.

Haraway (2015) traces the image of *plantation* and the concept of *plantationocene* back to the historical roots of a plantation economy (or plantocracy) that refuses to die and has in fact obstinately resurfaced over centuries in the forms of enclosure, extraction, and techniques of capture—which continue indeed to underpin modern agroindustry. The plantation mindset operates through strategies of global conquest, endless commodification, and relentless rationalization (see Friedmann 2017, 246-49). As a philosophical and practical approach to natural resources, Plantationocene unfolds as "the devastating transformation of diverse kinds of human-tended farms, pastures, and forests into extractive and enclosed plantations, relying on slave labor and other forms of exploited, alienated, and usually spatially transported labor" (Haraway 2015, 162). Nowadays landscapes mainly host annual cereal grains (wheat, maize and rice) in the form of monoculture, which in fact occupy more than three quarters of arable land (Glover, Cox and Reganold 2007).

The very concept of plantation brings with it the necessity of identifying and eliminating forms of life that thrive at the edges and escape the logic of production. A mono-cultivated field rests on the notion that unwanted species should be clearly demarcated and excluded. The weed lies in the eye of the beholder, so to speak; and discourses of weediness and badness become potent metaphors to capture what must be conceived as waste—or matter out place that overgrows and spoils the dominant crop. The plantation is a place of chemo-sociality, marked by the use of agrochemicals to separate the good from the bad; a place where people and plants, as well as the good plant and the rest (weediness), are artificially bounded. In the words of A. Tsing, "plantations kill off beings that are not recognized as assets. They also sponsor new ecologies of *proliferation*, the unmanageable spread of plantation-augmented life in the form of disease and pollution" (2017, 52). As put by Alain, the eradication of cultivated crops from their vital ecologies, which informs the monocultural perspective, has indeed contributed to configure "the necropolitics agenda of the genetic engineering enterprise for eliminating unfitted and unwanted agencies" (2017, 242).

The great acceleration toward mono-thinking, and the alienation of humans from other- and more-than-human beings, has led to ecological disasters that are no longer merely expected to emerge, but currently infiltrate our daily lives in the form of deadly encounters of animals, plants, humans, and viruses. Not coincidentally, they linger in border zones of capitalist decay.[4] However, despite the proliferation of instances of failure and extinction, there are also emerging "possibilities of life in capitalist ruins" (see Tsing 2015)—especially those that grow at the edges of the system. This could take the form, for example, of shifting the focus from development to conservation; of paying attention to the importance of alien and invasive species; or of mapping and reviving the value of long-neglected minor crops. For, so to speak, "there is hope, even in the weediness" (Lounela, Berglund and Kallinen 2019, 24).

By fully embracing the present syndemic time-space as a moment of grace "for learning to stay with the trouble of living and dying in response-ability on a damaged earth" (Haraway 2016, 2), in what follows I will dwell on forms of permanent mixed cropping in the tropics as a way to think radically about sustainable pasts, presents, and futures. But before discussing home garden agroforestry practices with a special focus on the Ethiopian scenario, some reflections are due to ecological forgetting and neglected food cultures.

Life Otherwise: Neglected Crops, Missing Data

There is unspoken violence in ecological forgetting. In the last century the history of agriculture has been one of impoverishment of the genetic base of food. In this light, the 'dietary species richness'—a count of the number of species consumed by each individual—has been recently recommended as the most appropriate measure of food biodiversity in diets (Lachat et al. 2018; see also Eme et al. 2019). Such an approach rests on the assumption that forgotten or underutilized crops have indeed a major part to play in the transition towards a more sustainable and climate-friendly food system; and that 'eating biodiversity' might be accounted for as an indirect yet effective means to achieve better nutritional quality. However, when it comes to mapping biodiversity, the literature reveals that a great deal of information is available only on cereals—not on livestock, and even less on roots and tubers. In *long durée* history, 'grain' has been equated with 'food' despite the "growing understanding of the ecological limits of grain monocultures" compared to the underestimated model of the mixed farming and diets, and of mosaic landscapes (Friedmann 2017, 248).

The majority of data about food composition databases and total diet studies contain a small minority of the vast array of foods eaten by humans, especially when considering different species and subspecies. This general ignorance about biodiverse resources in sustainability studies is aggravated by a geopolitical imbalance, whereas 92% of the studies are based on data from high income countries in Europe, Northern America and Australia (Jones et al. 2016; see also Eme et al. 2019). Moreover, the privilege given to nutritional assessments of food, according to which the correct amount of specific nutrients and calories must be achieved, does not explicitly admit that such measures "are based upon Western, colonial, and mainstream standards of nutritious food and healthy bodies" (Hammelman and Hayes-Conroy 2015, 39). This culturally blind vision does not take into consideration the non-nutrient based values of food and eating. On the contrary, sustainable diets should "be understood beyond specific food types or nutrients to also include unpalatable and unfamiliar foods, cultural relationships, political economic impacts and power structures, relationships to the land, food origins, and production practices, among other characteristics" (Hammelman and Hayes-Conroy 2015, 43). In neglecting certain crops, pockets of production as well as entire (and wise) food cultures

[4] For a reading of COVID-19 in the framework of disaster capitalism and the outlining of a 'pandemic industrial complex' see for example: http://somatosphere.net/2020/disaster-capitalism-covid19.html/ (Accessed April 15, 2021).

scholars are also at high risk of losing sight of diverse forms and communities of knowledge as opposed to only official 'scientific' knowledge (Hammelman and Hayes-Conroy 2015, 42-43; cf. also Altieri 2004; Jerneck and Olsson 2013).

In this scenario of missing data and unbalanced gastropolitical relations, sub-Saharan Africa stands out as being severely underrepresented. Paradoxically, that is the place where staple foods (including a large proportion of root and tuber vegetables) are mostly neglected, and yet where most diets are already plant-based. Such untapped green heritage is typically referred to as neglected and underutilized crop species (NUCS) and is comprised of species that are commercialized only at small local markets or within a geographically limited area; and are excluded from scientific research, breeding programs, and the main distribution chains (cf. Chivenge et al. 2015; Hall and Rudebjer 2016; Shelef, Weisberg and Provenza 2017, 2). As global concerns rise over a pronounced shift toward diets higher in animal-based foods in combination with projected high rates of population growth (Clark, Hill and Tilman 2018), what goes missing in estimations and reflections is precisely a repository of solid data on virtuous examples in Low and Middle Income Countries (LMICs) of plant-based diets that have been successfully practiced over time.

Although in international guidelines staple foods are frequently deemed to have low nutrient density, it is worth recalling that in non-Western contexts they are typically combined with fringe foods; this may require a more accurate investigation of locally-based practices, and a more humble appreciation of local bodies of knowledge in achieving healthy, sustainable, and resilient diets.[5] On the contrary, the literature highlights "practitioners' reliance on global or regional databases (rather than actual field sites) for much if not all of their data" (Freidberg 2016, 73). Scale is key in achieving dietary diversity through sustainable diets (and the other way round); for this reason, national-level estimates need to be grounded at local scales in order to design appropriate policy responses. According to Poppy et al. (2014, 8), the crux of the problem with agricultural statistics is that they are not equipped to account for food items that are not traded commercially, for more traditional crops, or for wild and non-conventional foods within agroecosystems, fields, and homestead plots. In addition, global and national-level datasets are not designed to capture overlapping differences by age, gender, class, caste, ethnicity, indigeneity, physical ability, and geographic location. In this way, for example, the fact that rural communities, and especially the poorest among them, have diets that may be significantly different from the national food consumption standards goes totally unrecorded. A healthy and at the same time sustainable diet may certainly be too expensive for the poorest, especially in sub-Saharan Africa and South Asia; but are there local options available that food experts are still not aware of (Hirvonen et al. 2020)?[6]

Methodology and Outline

My approach to multicrop and multispecies networks as counter-narratives to dominant agrarian paradigms is that of an environmental humanist who has been trained in social anthropology; and is deeply rooted in my ethnographic research into small-scale farming,

[5] Fringe foods (in the form of sauces, soups, spreads or fillings, and sometimes of animal protein and fat) may account for a smaller proportion of caloric intake than the core starches and yet they are by no means a peripheral part of the diet. By combining cooked roots and tubers as a staple with protein and fats from fish, shellfish, small and large fauna, certain populations have been able to optimally adapt to their environment, indicating great ecological intelligence. Nutrition is more complex than the simple sum of nutrients—foods interact with one another; that is, the presence of a certain food affects the availability of nutrients in another food; therefore, the optimum quantity of a nutrient depends on the quantities of the other nutrients (Gephart et al. 2016, 123).

[6] The right mixture of animal and plant protein sources remains very regional-dependent (FAO & WHO 2019, 21). Unfortunately, most territorial diets discussed in the official data (e.g., the Atlantic, Japanese, Mediterranean, Traditional Nordic and New Nordic diets) or dietary trends (such as vegetarian, pescetarian, and vegan) are set in the Global North (Clark Chai et al. 2019).

farming for beauty and subsistence, and sustainability from the point of view of farmers at the edges of the agroindustrial system.

Evidence contained in this article is based on ethnographic fieldwork in the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Since 2004 I have been conducting research in the Hadiyya zone, paying annual visits of several months each year up until March 2015. The work required daily presence in the field for long periods, in order to build trust with the community; as well as interviews with representatives of community elders, municipal administrators, development agents, and district agricultural officials. However, what I have learned from this ethnography is primarily due to months of cohabitation and has arisen from sharing everyday activities with farmers. The collection of data in the field was based on participatory tools such as participant and floating observation, formal cognitive interviewing and informal conversations; food diaries; transect walks; village resource maps; seasonal labor calendars; working with women on their daily household chores and agricultural activities, including work in their home gardens; supplemented by conversations with husbands and male kin in an attempt to balance women-only samples. I have considered emotions and bodily language as an integral part of the research experience—in the wake of scholarship that intentionally pursues sensory and experiential approaches to the anthropological artisanal work.

Ensete [*Ensete ventricosum* (Welw.) Cheesman] is the perennial root tuber crop to which the bulk of my ethnographic work has been devoted. Although research was conducted from the privileged angle of observation of the Hadiyya ways of relating to ensete, it must be noted that their relationship with the plant is not unique. The ensete cultures in Southwestern Ethiopia constitute a constellation made of various regional types, with each people and place in turn characterized by a certain degree of distinctiveness in their approach to the cultivation, care, and transformation of the plant into food products. The purpose and setting of ensete may slightly vary—in terms of age, height and density, or mixture of other plants and species living in the same environment, and with flexible patterns in the ways in which people develop farming knowledge and invest in biodiversity. However, the similarities found within the ensete belt weave and diffuse local differences into a palpable family resemblance.

What follows is a composite picture inspired by long term participant observation, in-depth interviews, and ongoing media and secondary sources review. Together, these streams of information weave the concept and practice of smallholder mixed farming systems—and within them, of the perennial component—into the discussion, and show how they could function as a sustainable counter to homogenous plantations, straight lines, and human exceptionalism. By first introducing the perennial root tuber crop of my ethnography, I will show how the underlying logic of the system which the perennial plant sustains, based on complementarity and synergy, challenges the logic of plantocracy. In this way, the narrative plot will progressively expand from the single (of mono-culture) to the many (of multi-storied landscapes).

Living in Multitudes: The Ensete Home Garden in Southwestern Ethiopia

My first encounter with perennial polyculture and its intricate layers of meaning took the form of an affective and bodily encounter with a perennial root tuber crop in Southwestern Ethiopia. I have conducted my long-term ethnography in a landscape that local people—who care for the perennial plant through the processes and acts of gardening, through daily connection, investment and entanglement (or 'meshwork')—consider in many ways as sentient, and at times even enchanted. For them, the perennial plant has soul, flesh, and traits of humanity. I have learned from local farmers to dwell not only with that specific plant, but with the complex landscape of which the plant is the beating heart. As a social scientist, ensete has progressively taken the contours of a living instance of plant personhood (see Peveri 2020; cf. Lounela, Berglund and Kallinen 2019; van der Veen 2014). For the sake of this article I will specifically

introduce this case study from rural Ethiopia, based on indigenous environmental particularism, to provide an example of sustainable agriculture while showing how an integration of diversified natural resources and repertoires of knowledge might indeed open up new lines of inquiry for rethinking sustainable food systems (see Altieri 2004).

Ensete is a long-lived, banana-like perennial plant which is cultivated by smallholders throughout the Southern Highlands of Ethiopia (Rahmato 1995). Ethiopia is in the only place where the plant has been domesticated and then cultivated starting from around 10,000 years ago (Brandt et al. 1997). In general terms, it can be considered one of those minor crops that are not traded around the world, receive little or no attention from research networks, and nonetheless play an important role in regional food security (Adenle et al. 2012; Chivenge et al. 2015; Guinand and Dechassa 2001; Tsegaye and Struik 2002). Ensete has always been an orphan crop and has received far less attention from policymakers when compared to cereals and cash crops. Why is that so?

Let us first look at the plant in and of itself, before discussing its entanglements and synergies with the surrounding environment. Ensete provides food but also the opportunity to flexibly diversify production of different ensete by-products (e.g., fibers, fodder, medicines, building and wrapping material). The parts of the plant that are used for human consumption are the enlarged pseudostem and underground corm that swell over time with carbohydrates. Farmers transplant ensete individuals several times during their lifecycle; full maturity is reached after four to twelve years—widely depending on variety, management, and climate. An elaborate process is required to extract the starchy pulp from the pseudostem and corm; several women from the community are recruited by a household and come together to perform this highly cooperative and engaging task (cf. MacEntee et al. 2013). After extraction, an involved fermentation process is initiated (cf. Fujimoto 2011). The heavy, bulky tubers of ensete provide a long-lasting underground store of calories that is resistant to drought, pests, and disease outbreaks—which may, on the contrary, have severe effects in monocultural stands. The ability to store processed ensete pulp with little storage loss for long periods of time, lasting months or even years, has provided households with a mechanism to modulate consumption during food shortages. However, the role of ensete in agronomic, nutritional, and ecological terms cannot be grasped unless we place this perennial lynchpin where it holistically belongs: the home garden. In the places of my fieldwork all ensete inhabits small but highly populated plots around the homestead and is managed as a family-farm enterprise.[7]

[7] Agroforestry has been a widespread practice in all regions of Ethiopia except the semiarid lowlands. The type of agroforestry depends on geography, altitude, and proximity to market. It can be practiced on the whole agricultural landscape or only on farmer homesteads. In the latter case, it habitually goes under the name of home garden agroforestry.

Figure 1. Ensete harvesting. Photograph by the author.

This is indeed the crucial point of this short biography of a perennial plant: the single instance cannot be read in isolation from multicrop and multispecies networks, as it needs multiplicity at both the plot and the pot level to play a critical role in achieving sustainability and resilience. Ensete is not a stand-alone plant; it belongs to a complex system whose components (that is, a mixture of perennials, annual crops, and also animals) all contribute to overcome some of its inherent weaknesses—including low vitamins and protein content, bacterial wilt, continual harvesting, and the need for manure to maintain vigorous growth (cf. Jacobsen et al. 2018). Like cassava, sago, plantain and some other staples, ensete flour is little more than starch, with minimal fat, protein, and vitamins. Each kilogram contains a mere 37 grams of protein. Ensete-based diets thus need supplementation (Board on Science and Technology et al. 1996, 179). For this reason, ensete-cultivating groups have traditionally developed a high level of farming integration, and engaged in wide-ranging, and very subtle, combinations of livelihood activities to cope with structural bottlenecks including cereals, legumes, other root crops, fruit trees, livestock, stimulants, timber, off-farm work, and trade. The plant is intensively intercropped in order to give nutritionally diverse food crops throughout the year; wild foods are gathered; and herbs, vegetables, and condiment crops complement grains. In juggling multiple crops, constantly changing plots and soil conditions, battling against new pathogens, and adjusting gardens to incorporate new plant species, gardening becomes a creative act that requires constant improvisation and innovation. Edible and marketable resources grown in home gardens are used to fill seasonal gaps, as well as unexpected disruptions in food and cash supply, by producing crops with different harvesting seasons, which ultimately enhance the stability of the whole system. Moreover, rural households are engaged in an integrated crop-livestock system. One of the keys to the success of ensete-based systems is in fact the maintaining of livestock and hence access to manure as a source of soil fertility and thus of vitality of the ensete garden. Animals and perennial plants

particularly serve as a saving account in case of household emergency. Within this intricate web of species, in a forest-like micro-environment, ensete acts as a 'nurse crop' that hosts and shelters family members—be they human, animal, or vegetal beings (Board on Science and Technology et al. 1996, 179).

Figure 2. Ethiopian home garden. Photograph by the author.

In Southwestern Ethiopia the home garden cultivation of ensete represents a long-established example of an ecological system that thrives on diversity, integration of companion species, and complex traditional knowledge. Today 18 to 20 million people—20 percent of the total population of Ethiopia—depend on ensete either as a staple food or as a fall back crop in the event of seasonal or extreme food shortages (Negash and Niehof 2004). This giant vegetable produces such huge amounts of food that a single plant supplies a family of five or six for a month. Those who can number at least a few exemplars of ensete in their home gardens have never starved, even during the tragic droughts of the 1970s and 1980s. The millions of sufferers were mostly people in the Northern Highlands who relied on far less complex cereal-based systems for their existence (Brandt et al. 1997). For centuries ensete has provided food self-sufficiency to some of the most densely populated rural areas of Ethiopia. Beside its food role, it also plays a pivotal environmental role by protecting the soil from erosion and runoff; serving as shade and improving the microclimate for undergrowth; and benefitting soil fertility with litter from its leaves. Unlike annual plants, a small portion of the biomass is taken out of the system during harvest, while the largest portion is returned directly as litter or indirectly through manure.

Yet, national and global development policies have been characterized by an age-old and still lingering lack of research and public investment in composite forms of smallholder farming (Borrell et al. 2019). This fact appears paradoxical in terms of breaking up cycles of hunger and fostering already existing sustainable forms of agriculture. A 1997 publication produced by the American Association for the Advancement of Science (Brandt et al.) sought to raise awareness of the potential and future prospects of ensete. That year, the Ethiopian government formally declared ensete a 'national crop' worthy of significant research and

funding. But since then, only a few disparate initiatives have been undertaken to throw a positive light on this plant and the resilient farming mosaics it sustains. In its National Nutrition Programme 2008–2015[8], the government of Ethiopia conformed to international directions in fostering the 'scaling up' and intensification of nutritional trends that are expressed according to the body mass index (BMI) and other 'performance indicators.' Accordingly, agriculture research centers were encouraged to "identify seeds of improved nutritional value from other countries and adapt them to the agro-ecological conditions of Ethiopia" in line with the internationally endorsed perspective of quick-fix technological solutions. In this official document there was no mention of tuber or root crops, let alone of ensete. Moreover, and not coincidentally, in Ethiopia traditional polycultural systems—of which edible perennials are a major component—are rapidly replaced by hybrid maize and other forms of monoculture (like tea, pepper, and eucalyptus).[9]

Multifunctional Mosaics (and their Perennial Pillars)

In revealing what the life form of ensete tells us about radically sustainable food systems we should keep in mind the Chinese box structure: with the perennial plant nested inside a space called home garden, and the home garden nested in turn inside the more articulate system of multispecies integrated agriculture. Only by following this path from simple elements to complex ecosystems can the potential for perennial polycultures be grasped as an enduring component of sustainable landscapes.

Home gardens can be defined as land-use practices involving the deliberate management of multipurpose trees and shrubs in intimate association with annual and perennial agricultural crops and, invariably, livestock. The whole crop-tree-animal unit is managed by family labor within the compounds of individual houses. To frame the nature of tropical home gardens at large it may be useful to imagine them along a gradient of intensification. The end point is represented by commercial (typically monocropping) production systems that are high input and open, with low species diversity, and aimed at maximum profitability; at the opposite end rainforests are found that are low input and closed systems, with high species diversity. Tropical home gardens, as instances of agroforestry and intercropping systems, are characterized by intermediate complexity and species diversity in the rainforest-monocropping continuum. Beside fulfilling the needs of local populations, they help achieve stability in land utilization on a long-term basis (see Galhena, Freed and Maredia 2013; Isgren, Andersson and Carton 2020; Jerneck and Olsson 2013).

[8] See Government of the Federal Democratic Republic of Ethiopia, *National Nutrition Programme 2013–2015*, https://extranet.who.int/nutrition/gina/sites/default/filesstore/ETH%202013%20National%20Nutrition%20Programme.pdf (Accessed April 15, 2021).

[9] Maize is in fact only one of the epiphanies of the 'ideal plant type' (the one best variety) which lies at the core of monocultivation. The agrophysiology of maize is such that, as with most other versions of monoculture, it depletes soil nutrients and requires incremental additions of fertilizer inputs with each successive planting cycle in order to secure and sustain high yields.

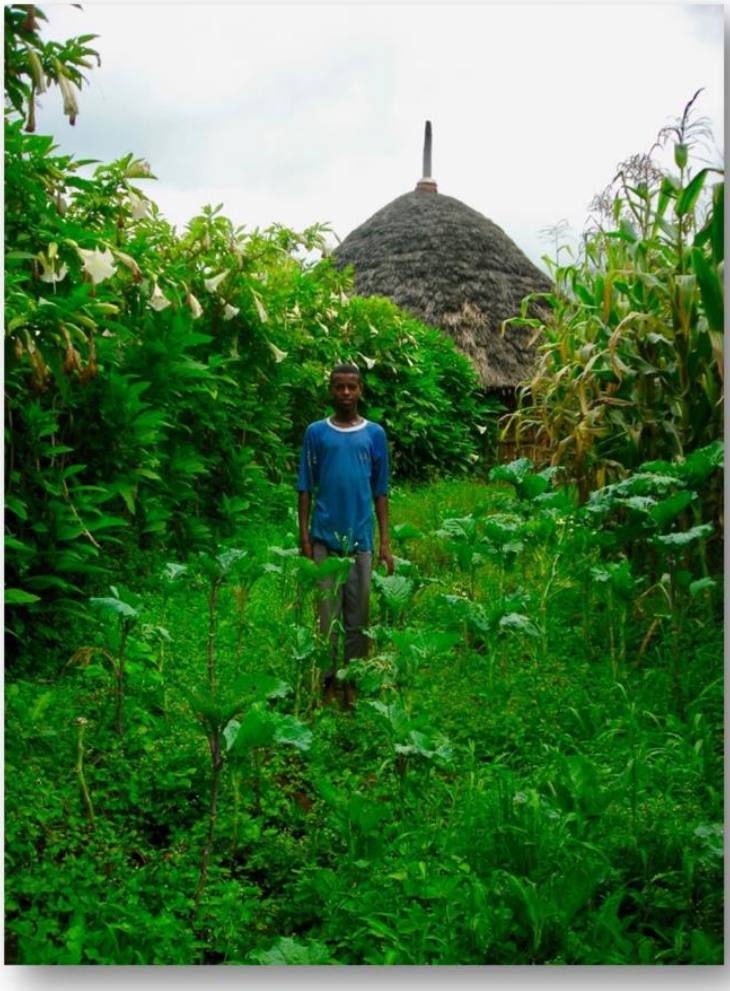

Figure 3. Ethiopian home garden. Photograph by the author.

Despite the paucity of dedicated literature to date, home garden agroforestry systems of Southern Ethiopia are a stable and time-tested traditional way of ensuring both food security and environmental resilience—that is, both production and protection (cf. Abebe 2005). Most of these agroforestry systems have evolved from forests, and mimic natural mixed forest vegetation systems in reproducing the original multispecies intricacy found in the 'wild' (Kumar and Nair 2004, 137). According to Nair (2017, 3), "such similarities with natural ecosystems are strong indicators of ecological sustainability." In terms of structure they are characterized by vegetation layers (stories or strata) imitating the tropical forest structure. This spatial arrangement reflects their functional adaptation to a multitude of factors including utilization of plant-symbiotic relationships through mixed cropping of compatible species. Such a complex structure seems to lack order and pattern to the untrained eye; or better, it seemingly does not often follow any specific geometry (Kumar and Nair 2004, 139-41). Contrary to the monocropping arrangement, healthy home gardens appear as overgrown, intricate, diverse and chaotic—often including ornamentals and weeds; they accommodate local varieties, which would be considered as unruly entities in single-species agricultural enterprises. Single-species stands are artificially created landscapes that are not found in nature.

In Southern Ethiopia, home gardens are typically not a supplementary production system in which only fruit and vegetables are grown to integrate staple crops grown in open and large fields. Instead, they are a principal livelihood system in which all forms of crops—

including staple, cash, and supplementary crops—grow together. Despite the stereotypical view of home gardens as being good only for subsistence and survival, most of them include high-value species (such as khat, *Catha edulis* or cocoa, *Theobroma cacao*, along with fruit and spices) which are purposefully maintained for meeting market demands and generating income (cf. Jemal, Callo-Concha and Van Noordwijk 2018). Found in smallholder farms of less than a hectare area, they are managed mostly by family labor with minimal to no use of chemicals and machinery. Their composition varies from area to area; however, their basic structure is always comprised of a combination of perennials as the stable components of the mixture and as pillars of food security. In Southern Ethiopia home gardens commonly take the form of perennial-crop based systems, with ensete and coffee (both native species with a life cycle of 8-12 and 24-30 years respectively) acting as the backbone of this ingenious cultivation (see Abebe 2005; Kippie Kanshie 2002; Mellisse et al. 2018; Peveri 2020).[10]

It is perennials that, in the mixture, keep these complex systems healthy and durable. In many ways, the perennial component cannot stand alone and yet, in the mix, acts as the secret ingredient of these mosaics of tiny patches. Smallholders thoughtfully avoid relying solely on annual crops for immediate consumption, and instead keep perennials (e.g., ensete, coffee, fruit trees) to foster integrity and stability of the whole system. Perennials in fact occupy, feed, and benefit land for longer periods. Whenever they have been kept in the mixture they are praised for providing beauty and diversity of species, for helping prevent a build-up of pests, and for benefitting wildlife (Altieri 2004, 37-8). On the contrary, annual monocrops love being disturbed by humans through constant tillage by the plow, which breaks and erodes, and through injections of chemical fertilizers and pesticides. In the long term, this would create that negative environmental impact (caused by soil erosion, leakage of nutrients, and soil carbon loss) which is now documented worldwide. Human pressures on soil resources are reaching critical limits. Rates of soil erosion are declared moderate to severe on 80 percent of the world's agricultural lands, amounting to approximately 10 million hectares of cropland being abandoned annually (Crews and Rumsey 2017; Glover, Cox and Reganold 2007; Isgren, Andersson and Carton 2020; Pimentel and Burgess, 2013). While better management of annuals would contribute to partially mitigate the phenomenon, a fundamental question remains around the potential of perennial polycultures to reverse the trend and tackle the root cause of the problem (cf. Batello et al. 2014).

Roots and rooting are indeed good metaphors to consider when looking for radical options. While annuals have relatively shallow roots—most of which occur in the top 0.3 meter of soil—perennials possess root systems that extend several meters into the ground for water, which make them effective in conserving moisture, retaining nutrients, and sequestering carbon in the soil. They do not require breaking up by the plow or infusions of external inputs (Crews, Carton and Olsson 2018; Glover, Cox and Reganold 2007). Rootiness is a sub-category of perenniality (and stability). Perennials are conservative by nature and contribute to the maintenance of "the plant-rhizosphere-soil continuum" (Shelef, Weisberg and Provenza 2017, 8).

[10] Coffee (*Coffea Arabica* L.) farming in Ethiopia takes place under a wide variety of production systems and various growing conditions, with many different cultivation practices. Coffee farming alone provides a livelihood income for around 15 million Ethiopians (16% of the population), based on four million smallholder farms. Here I refer to the traditional and still predominant way of cultivating coffee in the country; that is, coffee grown under shade (in tightly multistoried gardens)—which is superior in aroma and taste, and gains farmers much higher price—as opposed to 'sun coffee', which is cultivated in plantations with heavy input of chemicals (cf. Nair 2017, 3). According to a recent report, "the use of chemical inputs, such as pesticides, fungicides and artificial fertilisers is rarely practiced, and although certification is not common, Ethiopian coffee can often be considered as organic by default and may indeed exceed the standards set for organic certification" (Moat et al. 2017, 6).

Perennials are powerful, but not freestanding actors. They thrive in mixtures that are frequently found in home gardens; in turn, home gardens cannot be read in isolation from more complex farming systems, sometimes including extended farm fields around houses and, in general, a variable degree of "occupational multiplicity" (Jerneck and Olsson 2013, 116). It is because of this inherent socioecological complexity, along with the fact that "agroforestry is a complicated and knowledge intensive technology ill-suited to pre-fabricated farm-based packages" (Jerneck and Olsson 2013, 116), that home gardens have remained a scientific mystery (Kumar and Nair 2004, 137; Nair 2001: 240; see also Borrell et al. 2019). In a nutshell, if these multispecies networks have not received research and policy attention, "this is primarily because they do not fit into the single-species model of agricultural development paradigms" (Nair 2017, 4).

Expansion of Monocrops, or 'Agriculture without Ecology'

In Ethiopia, the multilayered story about perennial crops and trees (and high species diversity) as being key to ecologically sustainable food systems is not one that has attracted the attention and efforts of policymakers, international donors, and other key institutional stakeholders. In recent years, on the contrary, improved varieties of maize have gained the confidence of high-profile institutions, becoming the bridgehead of 'Green Revolution-style' intensification. Historian J.C. McCann describes the momentum towards agricultural modernization in Ethiopia as follows: "Maize as an industrially produced cash crop appeals to the global system because it is controllable by the state and corporate agriculture and amenable to economies of scale in cultivation, processing, and in research investment. It thus suits global economic forces that seek increased food production, the circulation of commoditized agricultural inputs (fertilizer, herbicides, and pesticides, genetic modification), and a product that will be comparable across geography and cultures. But it also appeals strongly to forces of political control and centralization" (2005, 203)[11]. In Ethiopia fortified varieties of maize have been increasingly tested and disseminated by 'philanthrocapitalist' actors, with substantial support from the Bill and Melinda Gates Foundation (Brooks 2014; Doss et al. 2003; Smale, Byerlee, and Jayne 2013). A major commercial crop such as maize—especially Quality Protein Maize (QPM)—has been endorsed by the government and the private sector over and above crops that have the potential of addressing the nutritional needs of the poor.[12]

Maize's success throughout sub-Saharan Africa has been fueled by a mixture of national policies and the flow of resources from governments, donors, and seed companies. In a comprehensive review based on case studies of pigeon pea and sorghum in Southern and East Africa, Snapp et al. (2018, 8) discuss how agronomists have placed annual grain crop production at the centre of development efforts and find that "high-ranking agricultural officers commonly equate sole crops of hybrid, fertilized maize with developed agriculture and mixed cropping systems and ratoons as legacies of the past". Although productivity is often the main focus of agronomists in the development sector, it is unclear how this single indicator, taken alone, can provide enough information about multifunctional systems for which an assessment would rather be necessary of tradeoffs between productivity, resilience, sustainability and equitability (Chavarría, Baudron and Sunderland 2018, 46). In Ethiopia, subsidized fertilizers

[11] See also Alain (2017) for a new materialist perspective on the extractivist-centric nature of industrial maize—and other technocultures of control and domination—in which high yields, productivity, resistance, uniformity and seed malleability have progressively become what matters at the expense of diversity.

[12] Research on biofortified varieties of maize began at the Mexico-based CIMMYT in the 1960s, providing the foundation for the Quality Protein Maize (QPM) program that has continued from the 1970s to the present day. "Accounts of the trajectory of QPM research reveal repeated cycles of optimism inspired by each new 'breakthrough,' only to be tempered by field results that were insufficiently conclusive to justify either full endorsement or closure [...]. Today, QPM is grown extensively in East Africa, although the extent to which this is due to its nutritional qualities is uncertain" (Brooks and Johnson-Beebout 2012, 88).

and a 'Green Revolution' intensification discourse have promoted broader adoption of annual grain crops, such as maize, and often led to the uprooting of mixed plantings with perennial food crops such as ensete (cf. Keeley and Scoones 2000).

The selective neglect for perennial polycultures is certainly related to policy frameworks and development projects that guarantee input and output markets for maize (Scoones 2015). However, there is much more at stake in this generalized bias toward systems other than monocropping of commodities—namely, material interests; but also an annual-centric worldview; and finally, a hegemonic perception of what constitutes 'modern' agriculture (Snapp et al. 2018). Wrong perceptions of agroforestry productivity, erosion of indigenous knowledge, and expansion of monocrops driven by market forces are challenging the survival of systems that have developed over centuries as an eclectic agricultural art that balances plant physiology, soil chemistry, and dietary diversity.

The ignorance around multistoried systems is not about key stakeholders having an aversion to a single plant but is rather grounded in corporate interests and trends that, directly or indirectly, favor and help reproduce monocultural systems and thinking, intensive farming, and grain yield as the key metric in 'successful' agricultural development. A timely report by Biovision Foundation for Ecological Development and IPES-Food (Biovision Foundation 2020) makes a strong point about what is holding back investment in agroecological research in sub-Saharan Africa. The answer becomes clear if we follow the money. Money in fact flows from (philanthropic) donors and investors in agri-development (with the Bill and Melinda Gates Foundation representing the lion's share of it) to short time-framed projects designed to gather quick, tangible returns and thus favoring 'scientized' and technical solutions based on the (new) Green Revolution model—a business-like model that aims at increasing productivity and the upscaling of farms. The reported figures are stunning, with "as many as 85% of projects funded by the BMGF and more than 70% of projects carried out by Kenyan research institutes [...] limited to supporting industrial agriculture and/or increasing its efficiency via targeted approaches such as improved pesticide practices, livestock vaccines or reductions in post-harvest losses. Meanwhile, only 3% of BMGF projects were agroecological, i.e they included elements of agro-ecosystem redesign" (Biovision Foundation 2020, 4).

It is also worth noting that "large shares of AgR4D funding continue to be channeled through the Consortium of International Agricultural Research Centres (CGIAR), despite much of its work remaining limited to crop breeding and input efficiency" (ibid., 5) —with an almost complete neglect of holistic performance measurements for agroecology, and no room for collaboration between farmer groups, civil society organizations, and researchers. Only a handful of research institutes located in sub-Saharan Africa receive funding; interestingly, though, "the projects led by African institutions were often those with the most systemic focus" (loc. cit.). How, to whom, and to what types of projects funding is allocated reveals much about how the prevailing industrial logic is perpetuated, and about the concentration of power that locks out opportunities for sparking agroecological transitions. Such transitions to forms of 'agriculture with ecology' could be particularly relevant for much of sub-Saharan Africa, where large-scale industrialized agriculture is not yet the norm (ibid., 18).

This bold agroecological vision calls for a paradigm shift, not just for marginal or incremental improvements; and sharply questions the explanatory power of positivist research and econometric modelling when tackling the marvel, and untapped potential, of polycultural mixtures. A collaborative and transdisciplinary effort is needed that represents a radical departure from the current dominant agricultural system—one which revolves around (annual) monocultures and which urgently requires redirection toward both ecological services and food production (cf. Wezel et al. 2020). The pursuit of limitless growth in a limited world is fundamentally anti-ecological and deeply unequal. In a sense this perspective considers

'sustainability' as a dinosaur word for there is little or nothing to be sustained in the current scenario, and much indeed to be regenerated through 'reparation ecologies'.

Conclusions: From Plantations Back to Forest-Like Intricacies

What this article offers is a counter to the plantation narrative and practice. An ethnographic passage through the ensete garden reveals an alternative ecology where co-evolved plant, animal and human lives are intimately woven, although amid fragmenting habitats. In this vibrant and hybrid ecology, species (including humans) resist alongside, and often in tension, with extractive frontiers and the operations of capital. This case study holds wider significance for articulating a critique of dominant agrarian paradigms and helps illuminate a plurality of existing agri/cultures in which nonhuman materialities are manifested beyond logics of extractive value; and wherein, on the contrary, multispecies socioecological reproduction is fostered. From tiny plots through farms and landscapes to table there is no miracle plant, be it annual or perennial, that can, alone, solve the riddle of how to establish sustainable food systems. However, much potential lies in designing and sustaining food systems that are rooted in solid and ecologically sound perennial components. In this approach, perennial crops "are not the goal, *per se*, but a central component of a more functional ecosystem" (Baker 2017, 326).

Based on the assumption that humans have become reliant on a food-producing ecosystem that is no longer sustainable, the alternative approach I have discussed here acknowledges that the link between agrobiodiversity and food security forms an integral part of the sustainability discourse, long before a discussion can be held of what sustainable diets are or should be. Stepping back to the underground of a sustainable food system, I have argued that no sustainable diets can be designed unless a form of agricultural economy is designed in the first place that is ecologically moral toward the living environment—both in its methods of production and in its long-term vision. Sustainable diets should be planned for and grown in the field (or in the garden). They should be grounded in a mindset that praises measures of protection, plans for endurance, an inclination to capture and mimic the benefits of cross-species relationships, and ultimately in interspecies imagination. For, "meaningful sustainability requires multispecies resurgence, that is, the remaking of livable landscapes through the actions of many organisms" (Tsing 2017, 51).

Polycultural mixtures emerge as the promise of unexpected reinvigorations of kinship with a multitude of nonhumans. Such alliances are likely to proliferate outside or on the edges of lost or degraded biodiversity, ecosystems and landscapes. From the standpoint of an Ethiopian plant, thinking and co-creating with backbone perennials to generate multifunctional mosaics could be one of the most plausible options we still have available to us; and even an act of realism in a time of syndemic when epistemologies of finitude and extinction appear equally plausible, and brutally necessary. The proposed agriculture moves away from the extractive carbon economy (and from a human-centric wordview) in nurturing a system of perennial polycultures, and in doing so, in mimicking nature's complex biodiverse systems, efficacy and complexity—which, in some provocative way, means mimicking natural ecosystems before agriculture (Crews, Carton and Olsson 2018; Plews-Ogan, Mariola and Ananta 2017). In this vision the annual-centric logic of most 'development in agriculture' is overcome; and future farming is remodeled as a return to roots, to radical options, and love for mixtures.

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