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ARTICLES

Health as growth

Bananas, humanitarian biotech, and human-plant histories in Uganda

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Abstract

What notions of health and proper nutrition are articulated in the use and promotion of agricultural biotechnology in the global South? What future trajectories for health do they envision? Experiments with genetically modified bananas in Uganda use the fruit as a vehicle to achieve public health goals. This work in plant science understands itself as humanitarian, drawing on specific notions of health and its opposite: the deficient health of humans and plants. Instead of thinking about improved health through bananas, which implies an instrumental relationship to plants, I connect this high-tech effort to a way of thinking with the banana plant in central Uganda that highlights the entanglement of human and plant growth. Expanding our thinking about health with plants and the gardens where they grow relocates the production of health to sites that still seldom figure in medical anthropology and helps reconceptualize what one takes growth to be and what relations can sustain cross-species thriving.

Keywords

plant studies, growth, agricultural biotechnology, biofortification, Uganda

A sunny morning in early August 2017. Power is once again out at the biotech lab in Kawanda, disabling the AC. The heat, stuffiness, and smell of chemicals drive researchers out of the lab. I accompany Dr. Stephen Buah to the field trial, just behind the laboratories. Dr. Buah, a senior biologist on a collaborative banana biofortification project, consults a list

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to verify which banana plants have already been harvested. The fruit has been genetically modified and enriched nutritionally with beta-carotene, as part of a public health intervention against vitamin A deficiency in Uganda, and Dr. Buah has been running lab analyses to identify which plants were expressing the highest levels of beta-carotene. He had been attending workshops upcountry; a month has passed since his last visit to the field trial. We pass through the gate and record our names in the guestbook. Sarah, one of the gardeners, emerges from the tool shed in her gumboots. The three of us wander through the plantation, which consists of several consecutively planted rows of banana plants. We see tall weeds amidst the banana plants and discover banana plants with several tall suckers. Some have five or six tall suckers with thin stems, an indication that the flower and thus the banana bunch will be small. On seeing this, Dr. Buah shouts at Sarah: 'What a wild trial! It's growing bushy! Look what you people have done! We could be throwing away the best bunches!'

This scene unfolded at the National Agricultural Research Laboratories, a research institute at Kawanda, just a few kilometers north of Kampala. The Ugandan public health banana project is part of a flagship project at the Center for Tropical Crops and Biocommodities at Queensland University of Technology in Brisbane, Australia, one of two main research centers for banana biotechnology in the world. This project uses molecular biology tools to insert foreign DNA into a Ugandan banana genome and increase its expression of beta-carotene.[1] Stephen Buah was furious about the gardeners' negligence, which could result in too-small bunches and thus thwart this transnational project and years of collaborative work. Dr. Buah, originally from northern Uganda, is not a Luganda speaker; otherwise he might have used the common saying '*Ekitooke kiva nsalira*', which means 'the banana plant will give a big bunch only if it is de-suckered properly'. Banana farmers across Uganda know that all but the healthiest-looking sucker have to be removed by hoe to produce a sizeable bunch of bananas, one that can feed a family for days and fetch a good price on the market. This scene and many others led me to begin thinking about how plant health (as expressed in a bunch's weight) is central to projects of human health in this biotech intervention.

The banana has recently become an 'endangered species', even though it remains the most widely eaten fruit on the planet (Peed 2011; Habekuss 2015; Karp 2019). After centuries of

1 Other teams and scientists working at the Center for Tropical Crops and Biocommodities under James Dale, an internationally recognized expert on banana biotechnology, are doing cutting-edge research on the banana genome. For example, they are editing the genome of banana plants at precise locations, using clustered regularly interspaced short palindromic repeats (CRISPR), to investigate the function of specific genes. These researchers paint a future where it will be possible to produce desired traits in a plant simply by editing its genome and switching genes on and off.

breeding, the plant has become sterile and can no longer be bred for new traits like disease resistance. Biotech is often seen as the only hope for the banana, the only way of including new genetic traits quick enough to respond to migrating and evolving plant pandemics. Such issues are debated with particular urgency in places like Uganda, where the banana is both a staple crop and a main source of nourishment. Beginning in 2015, I carried out more than a year of intermittent ethnographic field research in Uganda, much of it with the banana program at the National Agricultural Research Organization (NARO), which has pioneered biotechnology in the country since the early 2000s. Today it hosts several foreign-directed projects that focus on local pests and diseases afflicting bananas. These projects are part of a wider international effort to employ biotech for humanitarian purposes to tackle harvest failures caused by pests and diseases, make crops drought resistant, and contribute to public health by enriching plants with micronutrients that are judged to be missing in rural diets.

In this broader context of bioengineering healthier human futures through genomic interventions in plants, the banana biofortification project is an example of a top-down and narrowly targeted public health intervention. It imagines improvement in human health *through* plants but demotes them to a vehicle, a carrier of medicine. This ignores the rich Ugandan histories of thinking *with* banana plants. Turning to banana plants and to Ugandan gardens offers lessons on the mundane ways that people in Uganda think about health and envision working toward a healthy society. Relocating health to sites of everyday gardening practices in Uganda and work in plant science may seem like a strange move, but it allows thinking through and diversifying our resources beyond the clinical and epidemiological gazes (Baer et al. 2018; see Yates-Doerr and Carney 2016).[2] China Scherz (2018, 550), for instance, argues that trying to get out of 'the clinic' is valuable because a narrow anthropological focus on biomedicine in Africa, while trying to avoid the traps of exoticizing African healing practices, tends to affirm the priority of Western medical practices, further backgrounding rich African archives of health. On another front, Stacey Langwick's (2018, 434) work on herbal remedies in Tanzania redirects attention from clinical concerns to

2 Biomedical models of health, typically focused on curing individual bodies, appear narrow vis-à-vis healing in African contexts that typically involves religious, political, and medical dimensions (Whyte 1989; Feierman and Janzen 1992; Schoenbrun 2006). Of course, life-saving biomedical advances have been made in the field of nutrition and in lowering child mortality. Nonetheless, in recent years biomedical understandings of health have been critiqued as moralizing, prescriptive, ideological, and bound up with hidden economic and political interests (Metzl and Kirkland 2010). Even agencies in global health such as the World Health Organization (WHO), the World Bank, and the Rockefeller Foundation have recently begun to operate with ecological approaches to health that conceive of the human as part of an earth-wide integrated system, subsumed under the rubric of 'One Health' or 'planetary health'.

gardens and the manifold human-plant collaborations that are involved in making increasingly precarious places habitable and in allowing the cultivation of vitalities that may enable healing. Langwick's focus on plants and gardening articulates concerns for human health along with concerns for the environment. It thereby joins a broader turn toward relational thinking in medical anthropology and global health, one that takes ecology into account at a time when it is becoming increasingly difficult to ignore the planet's environmental precarity and its toll on human (and nonhuman) beings (Haraway 2016; Murphy 2017; Clarke and Haraway 2018).

Modernist thinking imagines growth to unfold along an upward trajectory, the only path of social and cultural change it deems desirable. Biofortification, as a typical example of 'modernist growth thinking' that seeks to improve on bodies and plants, inadvertently reiterates familiar notions of African deficiency (Vaughan 1991, 202, 203). Ideas of normalizing unhealthy and deficient populations and goals of economic profitability have long been intertwined, most prominently in colonial governance, which linked the steady improvement of bodies, populations, and national economies (Foucault 2007; Li 2007; Murphy 2016). According to the anthropologist Bernhard Streck (1997, 156), the orientation toward better, bigger, richer, and healthier futures, upward, forward, are main markers of 'developmental societies' (*Entwicklungsgesellschaften*), which sit in contrast to 'growth societies' (*Wachstumsgesellschaften*), which imagine growth as a seasonal and rhythmic cycle of flourishing and decay, a dialectic of life and death that contrasts a belief in steady betterment. The Ugandan case, however, blurs such neat distinctions and undermines any romance about alternatives to growth to be found in places far from the Euro-American capitalist heartland.

In Uganda, health, bananas, and their political economies have historically been entangled in a way that has produced an imagination of 'health as growth'. Health as growth captures a wider set of approaches to capacity, vitality, and development; these approaches are partially commensurate with a biomedical imagination of how future health can be attained, namely, through forward movement. But health as growth exceeds this focus on forward movement because it imagines growth on several scales simultaneously. In central Uganda, where I spent most of my time during fieldwork, the banana is not commonly seen as deficient and vulnerable but is almost overcharged with a sense of capaciousness and fecundity. It is sessile, rooted in a place from where it can expand continuously, growing bodies, persons, homesteads, and societies. It thus provides a way to rethink growth neither as cyclical and up and down nor as continual unilinear improvement but as an ongoing, long-standing, and open-ended experiment with relatedness, vitality, and cross-species thriving.

Banana rhizomes

Sliced over cereal or chomped as a quick and healthy snack on the run, bananas are commonplace, even boring. Botanically, though, they are full of surprises: the banana plant is often called a tree because of how it looks, but it doesn't have a real stem supported by underground roots. It has instead a 'pseudostem' that springs up from an underground rhizome and is cut down when the bunch is harvested. The banana is a complicated crop: the fruit is considered a giant berry that grows on a plant classified as an herb (Promusa 2014). James Dale, the principal investigator of the biofortification project I studied, complained that these plants are remarkably stubborn and difficult to breed and reproduce; he calls them a 'plant breeder's nightmare'.

If bananas are so stubborn, why is biotech today often presented as the banana's only chance for survival? The bananas that are being eaten around the globe today do not reproduce, and they would likely die out without human assistance in their reproduction (Pua 2007, 21; Koeppel 2008; Soluri 2009; Peed 2011; Ordonez et al. 2015; Dale, James, et al. 2017; Dale, Paul, et al. 2017, 334–35). They are hybrids and were bred over hundreds of years to contain no seed. But no seed means near-sterility; it forestalls the emergence of genetically different generations of banana plants through cross-pollination. (In contrast to commercial varieties, wild bananas, native to Southeast Asia, are full of hard, inedible seed [Pillay and Tripathi 2007, 281]).

The banana can thus be seen as doubly impaired: unable to reproduce sexually, it is also unable to grow with and adapt to diseases and pests in its environment. Ugandan small farmers propagate the plant by digging out and chopping off young shoots, called suckers, that emerge from the underground rootstock, and replanting them elsewhere in the field, thereby creating a copy of the 'mother'. A much quicker way for propagation in commercial banana farming is using tissue-culture techniques to create innumerable copies of a plant (Smith 2007). This, however, means that commercial farms are made up of clones of a single plant to ensure the production of uniform bananas for easy commodification. Those of us buying bananas in Europe and the United States are largely eating a single banana: the Cavendish. Even in small-farming settings like Uganda, where many varieties of bananas are grown, a field will still contain many copies of the same plant, genetically identical suckers that are replanted. This tendency toward genetic homogeneity makes bananas quite vulnerable to pests and diseases, a problem with monoculture everywhere.

The banana, however, is not only a fragile fruit and a vulnerable crop but also a potentially colonizing rhizome, an underground rootstock (Karugaba 1999, 8–9). Often cast as the tree's antipode, the rhizome has become a well-known metaphor for nonhierarchical and creative

thinking that runs against the grain of foundational or 'arborescent' thought (Deleuze and Guattari 1987). Trees are hierarchical and genealogical; they grow to the top; they are wholes organized around a center; they have roots that supply them with underground nutrients, water, and stability; and they reproduce. Rhizomes, in contrast, grow underground and horizontally; they are creeping and quickly expanding rootstocks; they can grow unpredictably in all directions; they have no fixed order. Rhizomes have no clear ends or beginnings; any end or severed piece can grow again and multiply.

A great number of suckers can appear from a rhizome, so much so that in Uganda the banana, despite its sterility and asexual propagation, has become the epitome of fertility. Charles Hattersley (1908, 99), a missionary, and later headmaster of Mengo school and agri-entrepreneur, reflected on this rhizomatic quality: 'Nothing in the vegetable world can be imbued with more vitality than the banana root. It seems impossible for it to die, and a garden of bananas required as a site for any other purpose is most difficult to clear, young shoots peeping up everywhere, even when all the roots have apparently been dug up'.

Human-banana relations in Uganda crisscross the difference Streck (1997, 156) drew between 'developmental societies' and 'growth societies'. The idea of the 'growth society' hinges on a setting where there is an annual harvest of the main staple crop (see Malinowski 1966, 62; Jensen 1948, 39–40). The banana rhizome doesn't go through a seasonal cycle of death and rebirth; it produces fruit year-round, generates suckers that can be used for the expansion of the plantation, and potentially remains productive over generations. This plant's biology thus offers a distinct way to think about growth, namely, as perpetually increasing and adding to what was before. In this sense, its growth overlaps with the telos of modernist thinking about steady and potentially limitless growth.

Deficiency and humanitarian biotech in Uganda

Since it won funding under the 2005 Bill and Melinda Gates Foundation's Grand Challenges in Global Health initiative, the banana biofortification project has set itself the public health goal of improving the micronutrient status of what is framed as a nutritionally deficient population in Uganda, by way of the transgenic banana (*matooke*), now scheduled for release in 2021.

Vitamin A has emerged as a key micronutrient since the 1980s. This can be linked to a series of studies by scholars around Alfred Sommer that established the efficacy and cost-effectiveness of administering vitamin A supplements in lowering child mortality in developing countries (Sommer, Katz, and Tarwotjo 1984; Sommer and West 1996, 19, 150–158; Biesalski 2013, 29; cf. Kimura 2016, 29). While vitamin A emerged as a crucial

micronutrient internationally, there is a longer debate on the accuracy of vitamin A data in Uganda. Uganda was the first country on the African continent where studies on vitamin A were carried out, in a context where a wider racist discourse on human difference and nutrition was beginning to concentrate on the role of protein in diets (Uganda Protectorate Nutrition Committee [UPNC] 1945, n.p.; see also Committee on Nutrition in the Colonial Empire 1936, 14). It was initially in the context of a general interest in protein and energy in malnutrition (Nott 2016; Tappan 2017) that Wrigley (1959, 8–9) found nutrition to be deficient in Uganda's banana-growing regions. However, an earlier colonial report identified the lack of 'African standards' for health as a key problem, which turned statements about malnutrition in Uganda into 'purely a matter of opinion' (UPNC 1945, n.p.). Still, the same report had concluded: 'we are dealing with a people who, in normal times, are comparatively well set up and outwardly healthy'.[3] Back then, administrators did not take vitamin A deficiency to be a general problem in areas where bananas and sweet potatoes were the main crops (UPNC 1945, n.p.).

The situation has much changed since the 1930s. Since the 1990s, vitamin A deficiency has been considered a severe problem across Uganda, affecting between 30 and 40 percent of children up to the age of five and women between fourteen and forty-nine, at least according to the official data long presented in past Ugandan demographic health surveys (Uganda Bureau of Statistics [UBOS] and ICF International [ICF] 2012a, 139; 2012b, 4–5). Doubts about the accuracy of these data have been discussed for a long time among those implementing and funding nutrition programs in Uganda, such the World Health Organization, the Food and Agriculture Organization of the United Nations, the US Center for Disease Control and Prevention, and the Ugandan Ministry of Health. I witnessed some heated disputes during conferences in Kampala, in eastern Uganda, and at a nutrition summit in Arusha, Tanzania. Many of the organizations running nutrition programs

3 The report expresses surprise at signs of vitamin A deficiency that were first observed in prisoners (UPNC 1945, n.p.). However, given that the banana does indeed contain beta-carotene that only in newer estimations no longer seems sufficient (Chandler 1995, 473), vitamin A deficiency in Uganda was mainly seen as a dry-season problem in grain-eating communities, not in regions where the banana is the main staple. For example, almost 50 percent of Iteso schoolchildren upon examination showed clinical symptoms of vitamin A deficiency in their eyes and skin (Loewenthal 1935, 350). The study also suggested a strong connection between vitamin A deficiency and the fertility of the land, an insight that led to a subsequent integrated nutritional and agricultural survey in Teso, eastern Uganda, that examined household wealth, overcrowding, and loss of soil fertility with regards to human health (Courcy-Ireland, Hosking, and Loewenthal 1937, 14). These early studies pointed to seasonal bottlenecks in the vitamin A supply in grain-eating communities of eastern and by extension northern Uganda but mentioned the bounty of vitamin A–rich foods consumed in the wet season, such as local varieties of spinach, mangos, pawpaw, and pumpkins.

nonetheless used the disputed data to justify their own micronutrient interventions in Uganda. The demographic health survey from 2016, which was not released until 2018 because of its controversial findings, confirmed these suspicions: it indicated that only about 9 percent of children were affected by vitamin A deficiency (UBOS and ICF 2018, 204–205).

For the biofortification project – a research project on plants that is not intricately versed in the specificities of micronutrient data collection – the prevention and amelioration of high rates of vitamin A deficiency is still the starting point (Buah 2015, 38). In this framing, the health of Ugandan children and women is compromised and in need of improvement. Gates's micronutrient-enriched bananas figure both as food and pharmaceutical for deficient Ugandan bodies that cannot draw enough vitamin A from their conventional foods and environments. Improvement here hinges on a single micronutrient, and a single trait in the plant figures as a 'silver bullet' that can vanquish a specific nutritional problem in the population.

Biofortification overall has gained traction in global health and development. Initiatives have shifted from tackling extreme hunger and starvation to addressing hidden forms of hunger that require biochemical examinations to be detected. The consequences of hidden hunger are taken to affect more than two billion people globally, limiting potentials for adequate physical and mental development and causing enormous losses of economic capital (Biesalski 2013, 47–49; Von Grebmer et al. 2014, 7). This biotech project, like many other epidemiological initiatives, promotes an understanding of health that can be compartmentalized into distinct problems, located in aggregated bodies (women aged fifteen to nineteen and children younger than five), and improved by targeted interventions at the population level. Gains are not only imagined in terms of health but also in terms of the population as economic capital. Such a framing of hunger and malnutrition as caused by poor-quality food or specific micronutrient deficiencies was recently coined as 'nutritionism', denoting a rationalized and economized view of nutrition that is amenable to economic analysis and technical solutions (Scrinis 2008; Kimura 2013, 51, 106). It means translating the complicated and multicausal problem of hunger into something smaller and more specialized: a deficiency that is manageable and fixable through a simple genomic intervention in a staple food plant.

The biofortification project defines 'deficiency' as something currently causing economic losses and lost years of 'healthy life', but it does not clearly indicate what 'healthy life' means. Health here is more of an absence, a biological hope for the future, a future in which children and women will be well nourished instead of deficient and in which children can reach their full economic potentials. In addition to assuming that Ugandan bodies are deficient, the biofortification frame posits the banana plant itself as deficient. Unable to satisfy human micronutrient needs, it requires molecular improvement to create 'better

bananas' (Gates 2012).[4] This recalls the earlier colonial interventions and their so-called civilizational mission to move deficient societies toward physical, moral, and economic improvement. 'The will to improve' (Li 2007, 7, 14) lives on in contemporary forms of meliorism, where improvement unfolds as a patronizing biopolitical project that polices a boundary, in this case, between deficient Africans and experts able to detect and treat the deficiency. Contemporary efforts to intervene with crops intersect with prior colonial logics. The British saw agriculture as crucial to economic growth in Uganda and therefore invested heavily in agricultural research and education (Tothill 1940). Following this melioristic logic, agriculture should have promoted economic growth, and growth should have trickled down and translated into improved standards of living and health in the Ugandan population. It instead resulted in social differentiation, and a new class of wealthy farmers emerged in Buganda (Richards, Sturrock, and Fortt 1973). Because much of the colonial government's expansive network of agricultural research stations across Uganda was dedicated to testing and improving crop varieties in different regions for export, this work focused mainly on cotton, coffee, and rubber; there was little interest in the banana. It is rather only recently that the banana, of all crops, is seen as no longer good enough and in need of nutritional improvement.

Human-banana histories in Uganda

The most common staple in central Uganda is the cooking banana (*matooke*). The crop provides bunches year-round and thus steadily supplies small farmers with food and income. For many Ugandans, eating *matooke* is central to well-being and feeling satisfied. In Luganda, a language spoken in central Uganda, '*matooke*' not only means the banana plant or the steamed and mashed food prepared from it; it also connotes food more generally. Still, *matooke* cannot be reduced to its utility in providing food and income. It signifies fertility, life, and connection, particularly in the ancient polity of Buganda. Bananas there have been long entangled with ideas of health and are central to prevailing idioms of growth in Uganda.

Matooke has been intensively cultivated in Uganda at least since sometime between the fourteenth and seventeenth centuries (Schoenbrun 1993, 52). Precolonial historians have established the banana's gradual rise to significance based on linguistic evidence and analyses

4 Howard Bouis and other promoters of biofortification typically argue at roundtables and workshops held for the nutritional community, several of which I attended between 2014 and 2017, that there is indeed a larger deficiency problem: intensive agricultural systems have reduced plants' nutrient contents, and they are much less nutritious than they were fifty years ago (Davies, Epp, and Riordan 2004).

of oral traditions (Stephens 2013, 44). The ascent of the kingdom and its sophistication is often treated as a historical special case: based on banana farming, Buganda is said to have supported higher population densities, more permanent settlement, and greater centralization than much of the rest of sub-Saharan Africa (Fallers 1969, 17; Schoenbrun 1998, 79–83; Reid 2002, 22ff.; Stephens 2013, 66–69). The ethnographic and historical record on Buganda at the brink of colonization is full of rituals involving banana gardens, fruits, leaves, or other parts of the plant. Many of these were connected to increasing fertility. Since my first visit to Uganda, I have been collecting stories, memories, and accounts of ritual practices involving banana plants and their parts from research participants in Buganda and other banana-growing regions; this has been an easy task because Ugandans love discussing *matooke*. One difficulty, however, was that many practices that today fall under the purview of traditional healing have been stigmatized, shunned, and partially forgotten. People I interacted with daily in Kampala and other urban parts of Uganda only admitted to knowing a fraction of these practices and to learning about them at school or from relatives in the villages; few conceded to practicing some of these rituals (see also Geissler and Prince 2010, 103). Christianization and the Baganda elite's initial embrace of the colonial administration and their self-portrayal as modern rational subjects have led to a recent far-reaching reworking of Kiganda ideas and practices (Fallers 1964, 3, 7; Twaddle 1974b; cf. Kodesh 2007, 530). Traditional healers and shrines in and around Kampala remain frequented by people seeking cures (Scherz 2018). However, in view of the dominance of Christianity in public life, many of the practices occurring in such spaces are hidden, and it is hard to establish their continuity since the onset of colonization (Mair 1934, 223; Feierman 1999).

Public health as a discrete sphere of social life and governmental management emerged in Uganda, as in many other African settings, under colonialism and its institutions, ideas, and technologies. In precolonial Uganda, health was causally knitted into larger contexts of prosperity rather than rooted in an individual's biology (Whyte 1997). Healing practices helped create the social and ecological conditions for collective prosperity and cut across what were constituted as different domains by colonial administration, such as politics, economy, ecology, and religion (Schoenbrun 2006, 1417; Kodesh 2010, 20). Anthropological and historical scholarship has demonstrated that early colonial and missionary classifications that placed healing within the realm of religion misunderstood its centrality to governing the conditions of collective well-being within many societies. Healing and agriculture cut to the heart of collective life (Whyte 1989; Feierman and Janzen 1992, 5, 12; Livingston 2005, 16–22; Kodesh 2007, 534; Geissler and Prince 2010, 10). In Uganda, healing served, among other purposes, to maintain the fertility of banana gardens. Historians who criticized the narrowness of Western conceptions of healing and its designation as religion have read the banana's history in Buganda mainly through the lens of political economy: how intensive banana cultivation enabled early permanent settlement and the emergence of centralized and

bureaucratic political organization and how, being cultivated by women and requiring comparatively little labor, it freed men to engage in the male business of politics and waging war, raiding neighboring tribes for slaves and women (Wrigley 1959, 7–8; 1964, 18–19; Fallers 1964, 6, 112; Schoenbrun 1993, 53; Reid 2002, 24, 25). But just as healing is more than religion, the banana exceeds such political-economic framings.

Banana plants were and still are nodes of sociality that connect families across generations. They have a unique role as arbiters of connectivity beyond death. Banana plantations (*ensuku*) for Baganda were both burial and birthing sites: the places where new life emerged and where connections with ancestor spirits were maintained (Roscoe 1911, 54). Today, most people still get buried in their family's gardens. When graves have been dug but the corpse is missing, a banana's pseudostem can stand in for the person's body. (Ugandan friends explained that the grave, once dug, demands a body. To prevent bad luck and it reaching out to someone else in the absence of the corpse, the pseudostem is buried to satisfy the grave's calling.) Furthermore, John Roscoe (1911, 57) reported that in the early twentieth century, Baganda believed that every person was born with a spiritual twin, the afterbirth or 'second child' (*omwana ow'okubiri*). The placenta was placed on the banana's rhizome right after birth, whereby the banana plant that absorbed it maintained the spiritual connection to this ghost twin, who was alive till the fruit ripened. Fittingly, the banana is the only plant whose fruiting is called 'breathing' (*okussa*) in Luganda, possibly indexing this vital connection between ghost and living twin. With the biomedicalization of childbirth and the difficulty of retrieving placentas from hospitals, this practice has disappeared, particularly in urban areas.

Importantly, fertility could be transferred between humans and banana plants. Formerly, a husband could send his barren wife back to her family for fear her barrenness might rub off on the plantation (Roscoe 1911, 80).[5] Conversely, bananas were so potently fecund that there were known to be ghost pregnancies: a woman could conceive without having sex if, while digging in the plantation, a banana flower fell on her back (Roscoe 1911, 11). Banana flowers were also tied to barren women's backs as a fertility treatment until rather recently. (Susan Reynolds Whyte and Michael Whyte told me they had observed this practice in the late 1970s.) When women harvested a bunch of bananas, they rubbed the flower (at the bunch's tip) onto the spot where they had cut off the stem to 'ensure the continuous growth

5 I mainly rely on Roscoe's account, though Apollo Kagwa ([1934] 1969) has a slightly earlier parallel account that was originally written in Luganda. Kaggwa's account, however, has less detail on ritual practice and on *matooke*. Lucy Mair (1934) and Ray (1993, 22–53) have pointed out a distortion in Roscoe's and especially Frazer's depictions of Baganda, in that the *kabaka*, a secular and political leader, was mistakenly taken to be a divine king, who was in charge of the land's fertility.

of the plantain tree' (Kagwa [1934] 1969, 108). Humans who proved to be extraordinarily fertile – that is, parents of twins – were probably also used to increase the productivity of the banana groves.[6] The fertility and growth of banana plantations thus was an important indication of a healthy community, where productive ties between ancestor and later territorial spirits and present generations of humans were maintained.

Thinking with the banana highlights the inextricability of bodily health from wider moral, political, economic, and ecological situations of well-being and vitality. In many Ugandan languages, there is no separate word for health. In Luganda health is called '*obulamu*', which also means life more generally, connoting a more encompassing understanding of well-being than the absence of disease.[7] The prominence of the biomedical model of course habituated focusing on biological processes of an individual body, whereas the epidemiological model focuses on managing a deficient population. In both models it seems strange to think of a banana garden as an entry point to health. Yet attending to banana plants allows conceiving health as growth on different scales, and it changes what we take to be at stake when debating measures of health.

As long as a banana plant is healthy, it grows and produces fruit and suckers that can be replanted to expand the plantation. The focus on growth implies that, to be healthy, both human and plant need more than the maintenance of fertility or perpetual reproduction; they need to expand or add to the previous status quo. In this biosocial imbrication of health, fertility, and growth, where in the promulgation of overall well-being the social, the individual, the banana, and the garden's health are symbiotic rather than isolatable processes, new conceptual possibilities emerge. It allows rethinking the normativity of health as expressed, for example, by Gadamer (1993, 98–99, 115), who argued that it is always sickness that captures the attention, while health is unobserved and taken for granted as the normal state of affairs. When health is seen as growth, it is not invisible; it is not merely taken for granted till illness strikes. Rather, thinking of health as growth directs attention to the individual and communal efforts needed to achieve and sustain growth and vitality over a long period of time. Prospering, fatness, doing well materially and accumulating wealth, having a nice *matooke* garden, having children, owning a big house and big cars: all are

6 Such ceremonies, which involve obscene jokes and sexual promiscuity, are famous for having used the parents' reproductive capacity to bestow their blessing of fertility on their gardens as well as their friends' and relatives' gardens (Roscoe 1911, 70–72; Kagwa [1934] 1969, 105ff.; Nyanzi et al. 2009, 527–528) – though this point is also contested (Mair 1934, 51).

7 Thanks to Tyler Zoanni to drawing my attention to this.

indicators of good health today, weaving bodily health and fertility, moral and material wealth together (Sharman 1972, 76–77).

In central Uganda, where growth is a dominant ethos, everyday life is interspersed with expressions that indicate wishes for increased growth, accumulation, and well-being; for instance, '*weebale*', the most common equivalent of 'thank you', literally means 'may it increase you' (Zoanni 2019, 73). Failures to grow were long at the heart of public healing efforts that strove to ensure growth and fertility at the individual, family, community, and territory level (Berger 1995; Whyte and Whyte 1998; Schoenbrun 2006, 1426, 1431; Kodesh 2010).[8] To this day, infertility is seen not only as a personal affliction but a threat to the social order (Stephens 2013, 82; Boyd 2013).

While an individual can be praised for his efforts in achieving success and prosperity, a failure to grow or prosper can also be attributed to individual actions. This point was brought home to me at Mwanamugimu, the Mulago hospital's nutrition unit, one of my field sites in Kampala. This government-run special care unit for children admitted with severe acute malnutrition is infamous for having the highest mortality rate of any pediatric hospital in Uganda. Speaking to parents, doctors, and nurses between the feeding intervals, ward rounds, and attempts to stabilize and rehydrate children who had become unconscious, I learned that people often do not think of the opposite of prosperity – a failure to grow or thrive in infants and children – as stemming from a medical condition like malnutrition, wasting, stunting, or some underlying disease like tuberculosis or HIV. Parents I talked to linked such failures to grow to their own moral failures, for instance, to *obusobe* – a ritual mistake – or not having fully performed the childbirth *kukuza* rite (see also Orley 1970, 17; Nyanzi et al. 2009, 526).[9] Along with failures to perform the rituals required at birth, other possibilities include picking up one's baby without washing after extramarital sex and being the victim of witchcraft (Orley 1970, 16, 20). More than one hundred years ago Roscoe (1911, 101–102) indicated that mothers were blamed for children's birth defects, skin diseases, and failures to grow, and could be punished by their husband's family for their gross misconduct. Similarly, early nutritional interventions attributed blame to mothers (Tappan 2017, 14, 44–46). Today, nutritional initiatives that define populations as victims of

8 There also was 'excessive anxiety' about male impotence (Orley 1970, 13). Those against genetic modification in Uganda are using this ur-angst of infertility, suggesting that humanitarian biotech is a window to capitalist promotion of biotechnology and that genetically modified organisms are a targeted Western conspiracy against Ugandan fertility, causing impotence (Ssali 2014).

9 An important rite at childbirth was *kukuza*, which means 'to cause to grow'; this rite not only caused the child but also the whole clan to grow healthily (Mair 1934, 43; Stephens 2013, 95).

their own deficient biology often condemn mothers as inadequate and negligent and thus the causes of child malnutrition (Kimura 2013, 4, 33). When growth is the normal and healthy trajectory, this also means that sudden or unpredictable growth appears less worrisome than elsewhere (cf. Comaroff and Comaroff 2002). Rather, it is mainly the failure to grow, to add on to the existing state of affairs, that needs explanation and treatment.

What is more, a connection to *matooke* helped define the particular forms in which growth and societal development were imagined in the recent past in Buganda. Formerly, for a young man, the way to maturity, prosperity, and success started with a banana garden (Wrigley 1959, 7). Having land for a wife's banana garden was a condition for any young man seeking to marry and to build a family and a home; this required forging political ties with a chief managing the access to clan land (Roscoe 1911, 426; Wrigley 1959, 10–11; 1969, 23; Hanson 2003, 29–30). While growth and health are not necessarily connected to having a banana garden today, people still place much emphasis on 'building oneself' (*okwezimba*).[10] It is important to strive to grow, to start a family, have children, and build a house. Ideally, one might grow to be a big person or patron that is able and often obligated to support others to build themselves; it is also assumed that a rich person will 'pull the others up' (Whyte and Whyte 1989, 237; Hanson 2003; Scherz 2014; see also Wrigley 1969, 20–22). Similarly, among Luo in Kenya, growth is a dominant societal idiom, and people imagine that their own ability to progress hinges on their senior kin's progress: growth is imagined like descending rainwater, unable to invert or suddenly change direction (Geissler and Prince 2010, 121–23). In this rendering of growth, however, the trajectory is more normatively fixed than in Uganda, where growth is imagined to occur unpredictably at times, just like the banana's suckers, which can suddenly and unexpectedly flourish.

10 Writing about debility and personhood among southern Bantu in Botswana, Julie Livingston (2005, 15) draws attention to a related idea, namely, the importance of continually striving 'to build' (*boaga*) as a marker of adulthood and success. Building in that context likewise referred to founding families, homes, accumulating things, and developing gardens or farms, a process that forges connections between past investments and future outcomes. Average birth rates in Uganda still are high, at about five children per woman, but they have dropped from seven children since the 1980s, and, increasingly, having fewer children is becoming a marker of class and social status (UBOS and ICF 2016, 13). Africanist scholarship has made the point that accumulation in African settings is less about material wealth and more about 'wealth in people' and possibly 'wealth in knowledge' (Guyer and Belinga 1995). In Buganda, where growth indexes health, continuous accumulation or growth itself was an end, not attaining wealth alone, though at least since the dawn of colonization accumulating 'wealth very largely in European terms, was a widely and clearly recognized objective' (Wrigley 1959, 16–17). See also Whyte and Whyte (1998, 229–30) on the importance of growing and progressing in Bunyole, in eastern Uganda.

The merging of human and plant health in plant research

Biomedical and epidemiological understandings of health are broadly consonant with the idiom of growth insofar as they privilege improvement. The biofortification project focuses on a particularly narrow intervention, one measurable in elevated beta-carotene levels in Ugandan bodies. Yet thinking with the experimental plants that are being observed and grown at Kawanda underlines the narrowness of medical framings of health. These banana plants decompartmentalize and expand the locations of health beyond only human bodies. The opening vignette highlights the concerns for plants that should not have to divide their energies between too many competing suckers. Producing 'better bananas' in Uganda, though oriented toward improving human health alone, still practically implies foregrounding plant health and the gardening techniques through which bananas are known to prosper.

Ugandan *matooke* recently have been troubled by both globally spreading and East African plant diseases. Since 2001, they have been hit by a highly contagious bacterial disease called banana Xanthomonas wilt, or banana bacterial wilt. The bacteria travel through the soil via insects, infected tools, and planting materials. It is considered the most destructive pandemic in eastern Africa and has ruined plantations across the region (Tripathia et al. 2013, 82–83; Dale, Paul, et al. 2017, 335). In view of this serious threat to banana production, the National Agricultural Research Organization and Queensland University of Technology jointly commenced a second set of experiments, which are still at an early stage, introducing two traits to banana genomes: resistance to banana bacterial wilt to boost plant health and advanced beta-carotene expression to boost human health, a literal merging together of measures for banana and human health.

And indeed I was able to observe that in the daily work of biologists at Kawanda, much attention goes into monitoring the growth of experimental banana plants. After all, any positive effect this project could ever have for Ugandans can only be realized by identifying healthy plants in the field. Biologists expose the plants to all sorts of beetles, nematodes, bugs, viruses, fungi, and bacteria, in order to draw conclusions about their response to such environmental pressures, and to figure out which plants are able to thrive. The overarching logic orienting the biofortification project is the goal of remedying a particular deficiency in the Ugandan population and, by extension, of the banana plant through a genetic intervention. However, to identify plants that can promote this objective, scientists handle experimental plants intimately and pay attention to their interactions with the environment, soil, rainfall, and other beings like fungi, worms, and bugs.

Plants as points of health intervention inadvertently invite thinking with and alongside plants – what makes them grow well – and not in purely instrumental terms. These sessile beings are oriented toward what lies outside of them: nutrients in the soil, air, water, sunshine, and their relations with other beings. Thinking with these genetically modified banana plants, both their environmental connections and their anticipated pharmaceutical effects, underlines the fictitiousness of the compartmentalized biomedical model of health and its focus on isolated interventions in human bodies. It emphasizes the ways that human health and well-being are always nested in ecological relationships from which they can't be severed. This understanding echoes recent calls from within development organizations and health institutions for more networked and ecologically sensitive thinking about health (Whitmee et al. 2015). In Uganda it is particularly the daily intimacy with banana plants, which makes clear their exuberance and capacity to grow relations in all directions, that bursts narrow clinical and epidemiological framings of the banana as pharmaceutical for allegedly deficient Ugandan bodies. It is striking that this biotech intervention focuses on improving a plant already so rich and centrally tied to ideas of personhood, cross-generational connection, and communal development.

To sum up, banana plantations might be an unusual place from which to think about health, but at least in central Uganda recent efforts to improve bodies through biofortified plants partially align with and partially depart from how health was historically pursued as growth. The banana is an interesting plant to think with here. The creeping and unruly rhizome grows underground, in all directions, without fixed order, without a clear teleology, connecting with spirits, enabling personhood, molding bodies by providing daily food, warding off or refracting evil, sickness, and even death, bestowing blessing and luck. In addition to these capacities, this plant is able to draw a range of unusual sites into the production of health, such as gardens, plantations, laboratories, trial fields, and kitchens. Such sites deserve more anthropological scrutiny; doing so can expand discussions of health in medical anthropology and global health beyond their narrow focus on and in the clinic (Baer et al. 2010; Yates-Doerr and Carney 2016; Scherz 2018). This move to extend the field plowed by medical anthropology and global health is especially warranted in view of the planetary environmental moment and the recognition that the conditions of all life have been and are being altered, and that there are no simple ways to extricate ourselves from (often toxic) entanglement (Haraway 2016; Murphy 2016; Shotwell 2016).

Conclusion

'This old man who has saved the country, how do you want him to go? How can I go out of a banana plantation I have planted that has started bearing fruits?' This is what Yoweri Museveni, president of Uganda since 1986, said in the fall of 2015, before his contested

election to his sixth term as president (Tisdall 2016). By referring to Uganda as a banana plantation and to his personal efforts in making it grow, Museveni was not only invoking the idiom of growth; he was also claiming recognition for his efforts to grow personally and for his being – in his view – the country's source of growth.

The Ugandan case underlines entwined histories of human and plant, of limitation and possibility in what can grow. Given the scenario of accelerated population growth in Uganda and new threats to food crops from global pandemics and climate change, Ugandan biologists believe in the inevitability of improving living forms in the laboratory. Biotech, to them, is central to saving the banana, a crucial food-security crop in East Africa. Biotechnology claims legitimacy through its humanitarian mission. Humanitarian biotechnology involves efforts to respond to deficiencies in plants, humans, or environments in the context of developing countries and is purposely positioned as not for profit. As is typical for melioristic projects, its definitions of who needs to be improved and who is able to provide that improvement are patronizing. However, in their day-to-day efforts to biofortify plants, Ugandan biologists expose the limitations of targeted interventions that tend to isolate bodies rather than see them as extended and constituted through delicate relationships with their environments.

At the same time, the modernist will to improve on population health that frames the entire biofortification project is broadly consonant with Ugandan ideas that think of health as being evinced chiefly by continuous growth. Yet, in spite of a common orientation to the future and growth, there are differences: the former is vested mostly in a unilinear, treelike version of growth, whereas understandings of growth as they emerged in the past few centuries in Uganda emphasized the necessity of being fertile and perpetually growing in multiple directions, like the banana. Growing in health or life (*obulamu*) in this vision does not imply a cycle of ever-returning flourishing and decay. Nor does it start from a conception of deficiency that demands a targeted, external intervention. Instead, it implies caring for continuous collective and individual flourishing; thriving materially, morally, and spiritually; and becoming 'banana-like' – and, once severed from the rootstock, ideally becoming a new node or patron for others' growth and prosperity.

Though growth is a normative framework that internationally dominates policy decisions and governmental action, we can't conclude that the ethos of growth is always an import

connected to capitalist expansion.[11] Growth is also an idiom for personal and societal development across eastern Africa. In Uganda, accumulation and expansion are surely within the range of what a healthy person and a healthy community aspires to. This focus on forward movement again points to the distinctiveness of how health as growth is imagined in central Uganda, building on the mutual cross-species thriving of humans and banana plants. Undeniably, salient ideas of growth in contemporary Uganda have mixed origins and genealogies, including liberal individualism, historically contingent Kiganda notions, and biomedicine. However, attaining an improved biology is rarely a goal in isolation in everyday life in Uganda. Understanding health as growth is therefore a holistic way of approaching life, both the shared struggles for prosperity and the unpredictable paths and dimensions of development. It emphasizes that at any moment not-yet-activated potentials for development and sources of one's own growth lie in relationships between people and their environments. Nonetheless, Ugandan imaginations of growth that emerged in close proximity with bananas do not provide necessarily benign or nobler conceptions of what health might be. Just as the banana rhizome can be a colonizer whose growth must be pruned and channeled in the right direction, so the striving to grow perpetually as a society was connected to patronage and dominance, violence, plundering, and warfare. Still, while for many around the globe overcoming the harmful ideology of limitless economic growth has become a main concern, and although initiatives to 'de-grow' are spreading in leftist and environmentalist circles, dismissing the need to grow can hardly be a response in settings like

11 Semakula Kiwanuka (1971, 154) describes Kiganda society in the second half of the nineteenth century as marked by individualism and 'fierce on at all social levels. … Competition generated a spirit of acquisitiveness and forward-lookingness unparalleled in the interlacustrine region'. Christopher Wrigley (1959, 18; 1964, 20), one of the commentators who depicts Baganda as inherently ambitious, entrepreneurial, progress oriented, and opportunistic, writes that during this period there existed between Europeans and Ganda elites a shared sense of new spiritual and material opportunities. Others had commented on a great social mobility based on achievement in Buganda, a reliance on hard work and on winning a superior's patronage as central features of Kiganda sociality (Fallers 1964, 10; Richards 1973, 54; Hanson 2003, 47–52). This mentality is said to have allowed a new class of ambitious farmers since the 1950s to seize the opportunity to make profits in coffee and cotton cultivation (Wrigley 1959; Mafefe 1973, 226). However, portraying Baganda as sophisticated modernizers with the inherent 'urge to excel' has also been criticized as falling for the Kiganda triumphant narrative of modernization and centralization (Twaddle 1974a, 304). Baganda elites made themselves appear as very similar to the colonizers, gaining politically from their colonial classification as an ethnic group less in need of improvement compared to other groups, allowing them to profit from new administrative, educational, agricultural, and religious opportunities and obtaining special rights of land tenure (Twaddle 1974a; Fortt 1973, 66–69). Twaddle (1974a, 304) argues that the Baganda elite's urge to excel was not some inherent cultural orientation but rather a consequence, not cause, of encounters with modernizing colonial forces.

Uganda, where growth has long been, and remains, tied so centrally to the possibility of personhood, health, intergenerational connection, and future prosperity.

But what would healthy growth look like? And how does one think health from a garden? Plants are oriented toward the outside, toward their environment to grow. The banana is more than a delivery mechanism of micronutrients. It is food, comfort, connection. Thinking about health in relation to how Ugandans grow with banana plants, whether in home gardens or in research institutes, draws attention to the delicate interdependencies among humans, plants, and environments. These interdependencies need constant work and attention to enable mutual thriving. Thinking health with the banana brings into view the conditions under which human and plant can thrive together, a type of relational thinking that will increasingly become important as medical anthropology and global health deal with precarious living in an ecologically fraught world. Sites like gardens, which lie beyond the usual clinical gaze, are useful heuristic tools at this planetary moment. In such sites we may discover ways to imagine other trajectories of well-being and ways in which health is already actively being done otherwise, ways not defined by measures of economic growth and their blazing trail of destruction, ways that draw on rich lived histories in Africa, which foreground the daily forging of relationships that exceed an individual body and that for their vitality depend upon weaving broader environmental relations. Thinking with plants – alongside them – whether in plant research or everyday farming practices, folds the health of humans, plants, and environments into one another inextricably.

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