Article

The Sociological Review MONOGRAPH SERIES

Food as medicine: Making 'better bananas' in Uganda

The Sociological Review Monographs
2021, Vol. 69(3) 560–579

DOI: 10.1177/00380261211009059
journals.sagepub.com/home/sor
SAGE

Sandra Calkins
Free University of Berlin, Germany

Abstract

Cooking bananas (*matooke*) are a main staple in central Uganda and are very important to well-being and health. Recently, *matooke* have also been associated with micronutrient deficiencies among children and women. For a number of years, this fruit has been at the heart of a public health strategy that seeks to create 'better bananas', that is, biofortified or nutritionally enriched bananas. The efforts to biofortify food crops are part of a recent trend in the nutrition world towards improving the quality and not only the quantity of food. This article unpacks recent configurations of philanthropy, plant science and global public health and the ways in which they make conventional food crops thinkable, for instance, as cost-effective medicines. This emergent and economized form of valuing bananas is in tension with how Ugandans appreciate bananas in everyday life. I show that emerging valuations of food matter but still should not be mistaken for changes on the ground. This article thereby searches for a middle ground between critiques of global public health and everyday practice in Uganda as well as between praxeological and structuralist/culturalist approaches to food. Instead of dismissing this banana as part of a mere paternalistic project, I show that it also is 'good' conceptually in that it makes bananas and health thinkable in new ways.

Keywords

biofortification, cost-effectiveness, micronutrient deficiencies, Uganda, valuation

Introduction

What makes a good banana? The difficulties involved in giving a satisfying answer have animated discussions between myself, an anthropologist of science, and a molecular biologist since a joint walk through the fenced field trials of transgenic bananas in 2015. The field trials, bananas planted in small earth mounds in several consecutive rows, lie within the area occupied by the National Agricultural Research Laboratories at Kawanda, one of the governmental agricultural research institutes that searches for solutions to problems Ugandan farmers are dealing with (see Figure 1). Kawanda itself is a small and

Corresponding author:
Sandra Calkins, Institute for Social and Cultural Anthropology, Free University of Berlin, Thielallee 52, 14195 Berlin, Germany.
Email: s.calkins@fu-berlin.de

Figure 1. Trial field of biofortified bananas at Kawanda, July 2015.
Photo: S. Calkins.

inconspicuous village that emerged around the institute, 12 km north of the Ugandan capital Kampala.

As we were searching for shade under larger banana leaves Dr Stephen Buah told me what was good about these experimental plants. The bananas being trialled contain higher levels of beta-carotene and were created to tackle a serious health concern in Uganda, namely, vitamin A deficiency. Micronutrient deficiencies have become a more recent health concern in Uganda, a country that has long been food insecure in spite of decades-long policies and programmes targeting malnutrition (Tappan, 2017).[1] While earlier scholarship on famines argued that hunger and famine result from the political economy and not from food scarcity and thus need political solutions (Sen, 1981), development discourse and practice have still often focused on food scarcity or insufficiency, which seems easier to address managerially through specific foods, rather than calling for political reforms. A side effect of rendering wider social problems into technical-managerial and scientific ones has been a depoliticization of hunger (see Edkins, 2000; Escobar, 1995; Ferguson, 1994) and its compartmentalization, i.e. into specific micronutrient deficiencies.

'Good bananas' (*matooke*), for molecular biologists in this project, are known after testing fruit samples from the field and measuring their beta-carotene levels. In our conversation, Dr Buah highlighted this project's public health objectives. By asserting it was not about big business but humanitarian in its orientation, he braced himself against a blanket critique of biotech that he suspected social scientists might be prone to – namely that it targets corporate profit and does not attend to small farmers' needs. The way in

which Ugandan molecular biologists promote a science-based understanding of good *matooke* occurs in a regional setting where bananas are the most beloved staple,[2] ubiquitously being moved on bicycles, trucks, or motorcycle taxis. Nearly all Ugandans regularly eat *matooke*, boil or steam them at home, grow them in their own backyards or family plantations, buy or sell the fruit, its leaves or young suckers for planting. All of them have a robust sense of what makes good *matooke*. At food stalls around the research institute I learned more about the sensory qualities of *matooke*: good *matooke* implies a smooth, yellowish and plentiful heap on the plate and a starchy smoothness on the tongue. There are of course countless other practices in farming and marketing with which different partially ancient ideas about 'good *matooke*' emerge.

Thinking about what makes the banana 'good' is a useful entry point to discussions about food and its potential to promote or inhibit social change. Food today is often assumed to be an easy vehicle for pursuing social change by governments, the development sector, the food industry or scientific projects. It is used, for instance, to make populations healthier and economically more productive. This representation of the world where social change can simply be engineered from above or the outside through 'better foods' receives inadvertent support from social science theorization that highlights the contingent making and performativity of values. Recent scholarship has, for instance, addressed the sensory and aesthetic dimensions of valuation practices for such commodities as wine, tomatoes and tea and argued that 'good quality' is always a practical achievement (e.g. Besky, 2020; Heuts & Mol, 2013; Teil & Hennion, 2004; Tsigkas, 2019), or created through an inventory of different registers or orders of worth that are brought to bear on a situation (Boltanski & Thévenot, 2006). There is considerable overlap between such top-down visions of social change and praxeological approaches in the social sciences that highlight how meanings and qualities emerge from and are remade in a multitude of practices.

This proximity between the ways in which those designing food as medicine and social science invested in praxeology imagine valuation to result from practical performances certainly invites some caution. There is of course much to be gained from studying emerging valuations on the policy level and how these are translated through specific scientific or humanitarian projects like the improved banana. But there is a risk of mistaking an ideological model – here the performativity of framing foods as medicines – for social change on the ground. My examination of the engineered 'better bananas' and the agendas of social change they are articulated with suggests precisely that, namely, that one shouldn't overestimate the effects that new forms of valuation have on people's everyday lives. To approach the valuation of food performatively and as something that is easily manipulable tends to background long-standing affective attachments and culturally acquired tastes for particular foods. Earlier – though now unpopular – culturalist-structuralist approaches to food were better able to capture such affective attachments that in the case of the Ugandan banana are hard to deny. Given the long historical and cultural investment in banana cultivation in Uganda, this main food crop remains a rich reservoir of meanings, tastes and distinctions that partially rubs up against emerging valuations and the agendas for social change that are articulated with them. Based on long-term fieldwork in Uganda, this article shows that the valuation of food as medicine, while an intriguing object of study in its own right and while it certainly has effects, does

not reflect how most Ugandans connect to *matooke*. What is good about *matooke* in Uganda seems so self-evident that the idea of having to produce a better banana is surely not intuitive and tends to breed resentment.

It is a typical social science gesture to critique biomedical and epidemiological sciences for their reductionisms, to highlight that things are more complex, that holistic analysis is needed, that, for instance, certain foods are intimately embedded in larger historical and cultural contexts that exceed rather narrow biomedical and epidemiological framings. But rather than simply reiterating disciplinary boundaries between the natural and social sciences and their diverging schemes of valuation, this article takes a slightly different route: it first introduces the case of lab-improved 'better bananas for Africans' (Gates, 2012), a melioristic initiative that seeks to improve human health through the foods that humans consume. It then examines the nutritional situation in Uganda and why this high-tech banana could emerge as a cure for micronutrient deficiency in the first place. The next section highlights that what emerges as 'good' here is guided by a rather recent emphasis on cost-effectiveness in the international field of nutrition. It points at concerns that fall from view when economic rationalities and logics of measurement come to define priorities in health care delivery and value certain types of food and humanitarian interventions. This is followed by an analysis of initiatives focused on vitamin A, which shows that the GM banana nonetheless could play an important role in the Ugandan nutritional landscape. Instead of simply pitting historically-grown, cultural attitudes to *matooke* against the GM banana, the final section shows that the GM banana is also good conceptually in that it opens up new questions about interspecies entanglement and ecological futures that could be more successfully aligned with historically-grown cultural appreciations of *matooke*.

Biofortification in Uganda

Uganda was selected as a pilot country for biofortification research in 2001/2002 by the organization Harvest Plus for conventionally bred orange-fleshed sweet potatoes that contain higher beta-carotene levels than the typical white sweet potatoes cultivated across Uganda (Potts & Nagujja, 2007). Biofortification is short for biological fortification and refers to strategies to prevent micronutrient deficiencies by either breeding or molecularly altering food crops so that they accumulate higher levels of micronutrients (Brooks, 2010; Kimura, 2013). Meanwhile research on conventionally bred high-iron beans has progressed in Uganda and experiments are being done with genetically modified cassava, sorghum, potatoes, soybeans, maize and bananas. The banana biofortification project at the National Agricultural Research Laboratories (NARL), an institution under the Ugandan Ministry of Agriculture, Industries and Fisheries, is financed by a grant from the Bill and Melinda Gates Foundation (BMGF), the Government of Uganda and Queensland University of Technology (QUT), and Dr Buah leads the research on the Ugandan side. Advertised as part of the Grand Challenges in Global Health in 2004, BMGF challenged researchers to compete for funding to develop micronutrient enriched staple crops. James Dale, a banana plant virologist at QUT, won one of the highly competitive grants in 2005 and is the principal investigator of this project that seeks to develop cooking bananas enriched with micronutrients.

After receiving the grant, the lengthy research on these biofortified bananas was done in Australia. Researchers there isolated a banana gene that increases the expression of beta-carotene in the plant from a South East Asian banana, the Asupina, that naturally contains high amounts of beta-carotene, and inserted it into sweet Cavendish bananas. Cavendish bananas are the commercially mass produced and homogeneous variety we find on supermarket shelves in most parts of the world. They served as a model for the transformation of *matooke* after they were tested in a series of laboratory and field trials in Australia. The Australian project partners then made the technology available to Ugandan project partners at NARL, who transformed the *matooke* genome in their own laboratories at Kawanda. Meanwhile the beta-carotene banana experiment has selected high beta-carotene lines from among the initial field trials and is testing them in multilocational field trials across Uganda.

The project's goal is to find 'the golden plant'. The golden plant, or possibly the golden plants suited for different environments, will be multiplied through tissue culture techniques, creating genetic copies (Smith, 2007). Then, if things go to plan, they will be distributed to Ugandan farmers once the regulatory framework ('the biotech bill') is finally passed by the government. Analogous to the golden rice, speaking of the golden banana plant also refers to the orange colour that the fruits will have due to the increased levels of beta-carotene. Molecular biologists in the biofortification project target high beta-carotene levels that are assessed through laboratory methods, but the plants selected from the trial fields additionally had to have a high bunch weight and meet a number of other criteria. Yet, whether farmers will accept the biofortified banana is unclear. While some are already pressuring NARL to receive planting materials, others are opposed to any transgenic banana, swayed by the arguments of a small but visible anti-GM lobbying network in Kampala.

Better bananas for Africa

What here makes a good banana plant even better? Banana biofortification draws on understandings that *matooke*-based diets are deficient in at least pro-vitamin A, E and iron (Chandler, 1995). According to Bill Gates (2012), whose organization has funded a number of biofortification projects since that first call to address Grand Challenges in Global Health, the banana biofortification project's initial goal was to build 'better bananas for Africans' through new molecular techniques, adding these micronutrients to plant genomes. Such efforts are part of a broader trend in the nutrition world that shifts its concerns from severe and visible forms of hunger, like protein-energy malnutrition, towards preventing micronutrient deficiencies which are estimated to affect 2 billion people worldwide and whose detection relies on laboratory testing (Biesalski, 2013; Global Hunger Index, 2014). This moves the focus from the quantity to the quality of food. Better bananas mean nutrient-denser bananas. An increasing number of research and development projects internationally target human health through agricultural innovations, such as food crops or new fertilizers, turning their products into the equivalent of medicines. Biofortification as an agricultural public health intervention is justified by positing a deficiency that this intervention wants to ameliorate, such as a vitamin A deficient population or a crop that lacks essential nutrients.

Figure 2. A girl's height measures are taken during a nutritional survey in Eastern Uganda, May 2015.
Photo: S. Calkins.

According to demographic health surveys that have been carried out in Uganda since the 1990s (see Figure 2 for a related nutritional survey), nearly 25% of women between 15 and 49 and children under five years of age are anaemic and nearly 40% are vitamin A deficient – at least these were the figures the banana biofortification project started from in the early 2000s (Uganda Bureau of Statistics [UBOS] & ICF, 2012a, 2012b). The main problem in this formulation is that due to poverty most people eat mainly a few starchy staples in Uganda (banana, sweet potato, cassava, maize, millet). And it cannot be denied that when eating at typical Ugandan restaurants, several of these starches take up the lion's share of any meal.

This framing of hunger and malnutrition as caused by poor-quality diets, foods 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 and that works to narrow down malnutrition to a problem of deficient food (Kimura 2013, p. 51, 106; Scrinis, 2008). In such an economized rendering, a project's impacts are not only imagined in terms of improved health but also in terms of improved human capital that could lead to economic gains (Stein & Qaim, 2007). This implies translating the complicated and multicausal problem of hunger into something more specific: a micronutrient deficiency that in principle is manageable by technical means.

In a similar context, Alice Street (2015) observed the rise of 'nutraceuticals'. These are functional foods – whether synthetic or plant-derived – products that are marketed as promoting health and well-being to customers. Typical examples are industrially fortified foods that have been part of national public health programmes for decades, i.e. adding iodine to salt, iron or folic acid to milled grains, or vitamin A to cooking oil. In many developing countries, where the budgets of public institutions were often culled during 1980s structural adjustment programmes, public–private partnerships have in

recent years become central to distributing such nutraceuticals. Relying on market mechanisms for distribution, products are imagined to travel from urban centres to the peripheries. However, such products cannot be accessed by a large part of the Ugandan population. Biofortification's coverage is thus envisioned to work inversely – from the farms to the cities. While these products could also be considered nutraceuticals, they do not participate in the same economic circuits. Biofortified crops do not address customers through markets, rather subsistence farmers here figure as part of the vitamin deficient population in need of a health intervention from above. Seen from this angle, it is hard to dispute that biofortified crops are 'good' because they have mainly a humanitarian mission: targeted primarily to poverty-ridden groups in need, they are envisioned as healthy and accessible foods set apart from companies' desires to make money.

This is not to say that the banana biofortification project purports its bananas to be the silver bullet. Rather, this research project targets a nutritional problem among the rural poor that in its understanding large-scale public health initiatives, such as the supplementation of vitamin A tablets or the fortification of cooking oil, have left unresolved. There have been several additional initiatives in the past decade or two, partially donor-funded, partially spearheaded by the Ugandan Ministry of Health and the Ministry of Education to promote and educate about dietary diversity in Uganda, such as eating more fruits and vegetables, especially the highly nutritious leafy greens; and learning about healthy nutrition is part of Ugandan school curricula. Nonetheless, such initiatives often run up against a problem: the consumption of fruits and vegetables is associated with poverty. I remember being the object of much jest after I brought cucumbers and carrots as a snack to the Kawanda research institute. Even in a setting where highly educated, middle-class Ugandans are working, this did not pass as an appropriate snack for anyone but a goat.

The idea to insert micronutrients into food crops that farmers grow, similar to food fortification, also reckons with such culturally acquired attitudes towards vegetables and fruit. I attended several international conferences on nutrition,[3] where a set of questions in relation to biofortification was debated: Does biofortification assume people know about what they are eating? And if it can be inserted and works for people's good without them knowing would that make it ethically troublesome? At a roundtable at the Congress on Hidden Hunger in Stuttgart in 2015, advocates of biofortification saw this precisely as an advantage of biofortified crops: that people's diets could be improved cheaply and lastingly without having to enrol people in such an ambitious and prone-to-fail project as behavioural change. While there might be reservations about the biopolitics of such a paternalistic approach, it is already well-established and little contested with the largely invisible industrial fortification of food items in Uganda and elsewhere (Horton, 2006). The next section considers recent reconfigurations in the field of global health that affect how humanitarian or developmental interventions are assessed.

Humanitarian biotech and logics of cost-effectiveness

Biofortification has gained attention in development as a pro-poor and cost-effective strategy against micronutrient deficiencies in the international nutrition scene (Copenhagen Consensus Centre [CCC], 2008).[4] The Ugandan biofortified bananas, according to James Dale, are produced under a humanitarian biotech licence. The stipulation is that no money

is to be made of this technology, at least in any setting where subsistence farmers grow biofortified bananas. To make this a successful intervention with subsistence farmers, issuing humanitarian licences implies a crucial step as it means limiting its commercial dissemination. Nonetheless, this intervention participates in another type of competitive economy, one between foundations, NGOs and public–private partnerships in global health that could be subsumed under the motto: the more good done per dollar invested, the better (CCC, 2008; Erikson, 2012, p. 372). In this rendering 'good' no longer refers to the morally necessary or urgent as in classical humanitarian ideals or to making economic profit in private–public partnerships but rather to that which offers maximizing the benefit per US dollar spent. To get to grips with such changes, Monika Krause (2014) suggested that scholars need to move beyond an examination of the values of NGO and humanitarian projects and turn to an examination of the practical logics of humanitarianism. She highlights that specific measurable and realistic outcomes, timelines and budgets are central to the definition of 'a good project' (p. 25).

In recent years – encouraged by the rise of global health sciences since the 1990s with the characteristic pairing of therapeutic intervention and scientific research from North to South – critical scholarship highlighted the growing importance of the comparability of evidence and impact measurement across geographical and cultural settings; this has resulted in an increasing production of project-related metrics and indicators (for instance, Adams, 2016a, 2016b; Crane, 2013; Lakoff, 2010; Merry, 2011). Susan Erikson (2012, pp. 368, 369) examined the overall bureaucratization of health care delivery and links this to the profusion of business models that similarly served to make decisions about interventions in global health more rational, commensurable and efficient. Furthermore, players in the field of health like the Gates Foundation have doubted official metrics and have built their own infrastructures of data collection (Erikson, 2012; Mahajan, 2018). Overall, attention seems to gradually have shifted from the ways in which health care is provided and suffering is alleviated to questions of proof of service delivery and the adequate use of funds (Erikson, 2012; Mahajan, 2018; McGoey, 2015). The focus on getting the data right and proving one's impact in many cases has encouraged a focus on short-term outcomes and thinking in project cycles (Krause, 2014; Meinert & Whyte, 2014). The Gates Foundation that funds the banana project in particular is known for pioneering the use of business models in global health and for its exacting evaluations of projects as either good or bad investments; it is also known to be quick to close down projects that fail to meet the targeted measures of progress (Erikson, 2012; Mahajan, 2018; McGoey, 2015).

Such broader shifts in the aid and humanitarian landscape imply that economic measures have become critical to deciding where and how to spend money on nutrition. By this rationale that prioritizes those cases likely to register the greatest improvement, David would not be a good case to support. I met David in July 2017 when he was institutionalized in Mwanamugimu, the paediatric ward for malnourished children in Kampala's Mulago national referral hospital. Staff were unsure for how long he had been there. Weeks it had been, much longer than the usual three weeks of care required until children can be released into the care of their families again. David is a spindly thin young boy of six years, in a blue oversized and washed out T-shirt with the caption 'know your status' across his chest; a T-shirt doubtlessly donated by one of the countless HIV/AIDS organizations

operating in the region. Hailing from a small village in Luweero, a region just north of Kampala, David was accompanied by his old grandfather, who is his caretaker and who for lack of other means sleeps on a thin cotton sheet on the hospital floor under his bed (see Figure 3). David breathed heavily and aimlessly peered out of the barred window, away from the group of medical doctors and nurses congregating around his hospital bed during the ward round. A nurse explained to me that he was an unusually big boy to be admitted with severe acute malnutrition (mostly severe acute malnutrition affects children that have just been weaned). David couldn't walk anymore. He didn't play or talk, he did not respond to questions when medical students examined him. At age six, David already had a dooming diagnosis: 'FAILURE TO THRIVE' was written in large red letters across his medical examination sheet that was pinned to the foot of his bed.

Someone like David – far beyond the first 1000 days of his life, that prime window for nutritional intervention – no longer offers ideal rates of returns for nutritional interventions. According to the metrics and probabilities so often applied in the justification of interventions, even if he survives, his ability to achieve good marks in school are diminished, and according to some estimates he could have lost as much as 13 IQ points, and his probabilities of making a good salary have shrunk, his future salary is assumed to already be 10% less than that of his age mates (Food and Nutrition Technical Assistance [FANTA], 2017a; Namugumya et al., 2014).

David suffered from an acute severe malnutrition but 'his failure to thrive', as nutritional parlance would have it, resulted from chronic malnutrition, as it does for the 30% of Ugandan children that are considered stunted today. Their human capital is seen as diminished by lower productivity and lost DALYs (disability-adjusted life years). DALYs are a measure that was developed to express a year of healthy life lost to an impairment. It is used to make lost health economically measurable. In nutrition programming, it is used to calculate losses that child malnutrition incurs to an individual, to the health system and losses to GDP. While the DALY is hard to calculate, it allows estimating and comparing the cost-effectiveness of different nutrition interventions (Sassi, 2006).[5] Estimates in 2017 put the number stunting cost the Ugandan economy at US$8 billion, nearly 6% of the Ugandan GDP (FANTA, 2017b). While these calculations point at enormous losses related to severe forms of undernutrition, investing in alleviating chronic malnutrition, where damage is assumed to have already occurred, does not offer the same type of payoff in DALYs as do micronutrient interventions.

In 2008 the Copenhagen Consensus Centre, a thinktank promoting cost-benefit analysis in development, rated micronutrient interventions and specifically biofortification among the best investments for donors, allegedly allowing the greatest good to be done per US dollar invested. That food in Uganda and other places becomes valuable as medicine is part of this recent configuration in philanthropy and global public health that derives its justification from its cost-effectiveness, measured in quantifiable economic terms (Qaim et al., 2007; Stein & Qaim, 2007). The application of economic models to assess the value of nutrition interventions channels attention to the best investments with the highest and quickest impact – not the most morally urgent.

Of course there should be a careful approach to how health budgets are being spent but it also seems important to question the importance cost-effectiveness has acquired for aid and humanitarian initiatives. David's case highlights an individual life – a boy

Figure 3. Empty bed in a Ugandan nutrition ward in Mbarara, July 2018.
Photo: S. Calkins.

whose development was assessed as a failure. Economists advising philanthropists and others on the best investments of course do not consider the plight of individuals but their focus is on aggregates. Nonetheless, David's case demonstrates what slips out of view when performance-based numbers in global health and issues of cost-effectiveness are prioritized. In her book *The Economization of Life*, Michelle Murphy (2017) draws attention to the racist and eugenicist histories that are being perpetuated with economized approaches to population and calculative models that determine what service certain groups bring for the national economy, whereby lives are ranked according to their economic productivity. A consequence, Murphy shows, is that some people who are deemed to have 'unproductive lives' are degraded as 'better not born lives'. Though part of this wider field of economized nutrition and aid, beta-carotene biofortified bananas can still do good in the nutritional landscape of Uganda; the next section explains how.

Vitamin A deficiency and measurements in humans

Vitamin A has long been a favourite micronutrient for intervention. Vitamin A deficiency is the focus of several initiatives coordinated by the Ugandan Ministry of Health and the National Bureau of Standards, i.e. oil fortification, biofortification of sweet potatoes and bananas, and the distribution of vitamin A supplements to pregnant and lactating women and children under five years of age. Not as a result of these interventions but as a long-standing problem of reliably measuring heat- and light-sensitive vitamin A levels in blood samples in large population surveys, the figures for vitamin A deficiency have dropped dramatically recently. The latest Ugandan Demographic Health Survey (UDHS) from 2016 put the figure at only around 9% – down from the 30–40% the biofortification project started from years ago (UBOS & ICF, 2012b, 2018a). Such a drop is considered inexplicable and an addendum warns that data should be used with 'extreme caution' (UBOS & ICF, 2018b).[6]

Uncertainty around the Ugandan vitamin A data persists. However, the latest data's suggestion that vitamin A deficiency may only be a minor problem in Uganda does not make these beta-carotene biofortified bananas obsolete – to the contrary. They gain relevance as a preventive measure against vitamin A deficiency. This has to do with biochemistry. Beta-carotene is a substance the body converts into vitamin A according to its needs, whereas too much vitamin A can be toxic – if, for instance, fortified oil, vitamin A supplements and micronutrient powders are consumed by a non-deficient person. This means from a food safety standard – and if one follows these new data and assumes that vitamin A deficiency is a small problem – these bananas allow doing good and preventing vitamin A deficiency without the risks of toxicity that other vitamin A interventions entail. With these new data, however, vitamin A also suddenly seems to be a low priority micronutrient for interventions. Stunting, however, the result of chronic hunger, has consistently affected around at 30% of children under five years in these population surveys. Yet, it receives less attention, not least because interventions are complicated, hard to account for and less cost-effective.

While economic metrics define the understanding that biofortification is a worthwhile investments for donors, the entire *matooke* research is stitched together by internal metrics and modalities of evidence production that prioritize human health. This implies that biomedical efficacy tests and their models of accountability are used to measure the Uganda banana project's success. In her examination of rice biofortification, Brooks (2010) argues that a shift from bioavailability, the proportion of the nutrients that bodies could extract from plants, to bioefficacy, the measurable impact on human nutritional status, was consequential in giving clinicians more weight over the research outcomes than plant biologists. She relates this shift to the need for measurable impacts of efficacy within global health, the prerequisite to receive funding and provide accountability to donors. For Dr Buah and his Ugandan colleagues in plant science, this means that whilst their work and insights crucially feed into the larger apparatus of evidence making about biofortification, they also are somewhat detached from some of the principles by which outcomes will be evaluated. According to James Dale and Jean-Yves Paul, a postdoc on his team at QUT, normally the field is where their technologies against disease resistance succeed or more often fail. The biofortification project is new for these experienced researchers also in that it establishes the human body and its vitamin A levels as endpoint and this involves some discomfort in letting clinical nutritionists and their methods have the final say over nearly two decades of plant transformation and breeding work.

Human nutritional studies, so-called feeding trials, still provide the most critical evidence for the success of any biofortification project and its merits as a public health strategy, also for the Ugandan golden banana. This type of evidence is produced in randomized controlled trials (RCTs), clinical studies that test the pharmaceutical effects of certain substances on human bodies. Evidence emerging from RCTs is widely still seen as the most credible in a hierarchy of evidences about biofortification and other global health interventions, translating imperfect, fuzzy materials into medical certainties (Brooks, 2010; cf. Timmermans & Berg, 2002; Will, 2007). The experimental design of the RCT is based on a placeless biomedical ontology and has a simple task of measuring whether the beta-carotene biofortified bananas do what they were designed to do, namely,

raise vitamin A levels in human bodies. However, so far evidence for this has been hard to come by. A study meant to be carried out by a nutritionist at a US university had to be postponed several times due to anti-GM protests and a reluctance of the Gates Foundation to garner bad publicity.

When I asked him about reasons for working on vitamin A instead of other micronutrients, James Dale explained that the project idea had initially been to create a super banana with several added micronutrients, a sort of daily nutrient-rich food for Ugandans and other plantain consuming regions of East Africa. However, work on other micronutrients, notably iron, was more complicated and time-consuming, so not least for these pragmatic reasons vitamin A emerged as priority. The public health framework and the focus on vitamin A let a specific version of what makes a good banana come to the fore, where the good is rendered measurable – in the banana's fruits, as bioefficacy in human blood and in the overall cost-effectiveness of the interventions. The next section puts this in conversation with how many Ugandans think of this crop.

Food as a way of life

There is a vast social science literature that documents the ways in which food is not only vital for survival but also stands as a cultural artefact endowed with a reservoir of social meanings and distinctions, which manifest themselves as tastes, expressing personal, class-based, gendered, cultural and national identities as well as forms of relatedness (see e.g. Allison, 1991; Appadurai, 1981; Carsten, 1995). While recent literature has turned to how values of food emerge or are actively reconfigured to serve political agendas (Caldwell, 2002; Tsigkas, 2019), there is a more culturalist or structuralist argument at the core of earlier approaches that though old-fashioned is hard to dismiss entirely. The case of *matooke* and its ubiquity in Uganda (see Figure 4) illustrates this well.

These cooking bananas are not only the main staple food in central Uganda, they also signify fertility, abundance, life and connection. In Luganda, a language spoken in central Uganda, *matooke* not only means cooked bananas and the banana plant but it also generally means food. Initially I was confused when I attended weddings or banquets with rich and varied buffets in south-central Uganda and heard people complaining that there was no food or asking where the food is when the *matooke* tray had been emptied. I gradually learned that eating bananas in this part of the world is central to feeling satisfied and to wider understanding of well-being and health. The Nakitembe cultivar, one of two varieties whose genome the biofortification project transformed, is a plant that traditionally was considered to attract blessing and luck to households planting them. When I visited traditional healers, I could confirm that Nakitembe was still used in ritual practices to absorb the evil threatening a person. It has often been observed how Kiganda culture in central Uganda revolves around the banana. Dozens of rituals involve eating of banana, using their leaves and stems, and they can forge connections between the spirits and the living.[7]

Banana plants not only help to grow bodies, persons and communities, they also make a place habitable and comfortable. They make a home and connect families across generations. Many people I spoke to told me about the importance of getting banana suckers from parents, friends and other family members, when they started a new family and a

Figure 4. *Matooke* at a market in Mbarara, Western Uganda, August 2017.
Photo: S. Calkins.

new banana plantation. The self-evidence of rich connections between banana cultivation and prosperity was underscored by the Ugandan president Yoweri Museveni in the fall of 2015. Before the elections that would reinstate him in his sixth term as president, he explained his inability to step down in the following way: '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?'[8]

All of this suggests a long-standing appreciation of the banana as a good, fertile and capacious plant. It was this popularity of the banana in Uganda that made the plant seem an ideal crop to drive a public health agenda. However, thinking of the *matooke* as deficient in some vital substances (here: micronutrients) and as in need of improvement is not a starting point that is widely shared in everyday life in Uganda. In her astute history of nutrition interventions in Uganda, Jennifer Tappan (2017, p. 81) documents resentment that people felt in the 1950s and 1960s when they were being educated that *matooke* is not a proper weaning food for children because *matooke* was so unquestionably what quenched hunger and what all children ate – the well- and malnourished alike. While Bill Gates (2012) expressed the intention to even improve upon this highly prized crop by creating 'better bananas for Africans', Dr Buah believes a better way of putting this is to think about 'bananas for the 21st century'. With this he means, affordable, nutrient-denser bananas that are one part of providing healthy food for an ever growing population that will not always have access to other foods.

This tenacity of historically grown valuations of bananas in Uganda suggests some limitations to praxeological assumptions about the performativity of the values of food. Such theoretical approaches seem to defend the efforts of development economists and other public health actors to produce 'better crops' without paying attention to the particular ways in which their forms of valuation are situated and do not mirror how people value foods on the ground. Still, it can hardly be a productive endpoint to merely criticize

the biomedical, epidemiological and economical framings of the biofortification project by pointing at the larger cultural and historical contexts in which food is embedded and to thereby reinstate sharp boundary schemes of valuation in the social and the natural sciences. For many decades now food has indeed become an item that can be readily engineered, and that applies even to food crops and not only industrial food processing. While many people fear GMOs, one shouldn't overlook that humans have always tried to distil new qualities in their food crops. The bananas eaten today are hybrids, products of long human endeavours of breeding them to contain no seed and they are nearly sterile. This means they rely on human labour for their reproduction and are hard to transform without the tools of biotechnology. While public sentiment in Uganda might be tilting towards a greater openness towards GMOs in recent years, one can also encounter a robust sense that the banana already is good enough, that people don't need a humanitarian super banana, that efforts to improve this crop will not be able to convince people that this 'Kawanda banana' can be any better than the plants people received from grandparents, aunts or siblings. It is therefore unlikely that new forms of valuing *matooke* and the promise of better health and national economic gains will swiftly change understandings concerning what makes *matooke* good in Uganda. Yet, many conversations in and beyond Uganda have led me to believe that at the interstice of plant science, public health and everyday farming this banana has a place – and that beyond the particular nutritional contribution the projects aims to make.

This banana project and biofortification as such is interesting in that it conceives of and targets human health through another living organism, in this case plants. Addressing human health by means of the plants that humans cultivate and eat is a much more encompassing and ecologically complex interdisciplinary effort than many other nutrition interventions that work with simple biomedical and epidemiological ontologies. This approach allows a shift in focus in nutrition away from only compartmentalized substances, human bodies and human populations to much wider ecological connections. Such shifts to increase complexity by focusing on interspecies entanglements may prompt necessary moves to more holistic analysis in nutritional research and intervention where a broader range of factors, including contemporary ecological, political and socio-economic vulnerabilities responsible for severe malnutrition, could figure and in the long run complicate narrow cost-benefit analyses.

Maybe a good banana for a social scientist is precisely one like this that allows asking new questions? I am thus suggesting another way to value and appraise this banana – a valuation that like 'food as medicine' is not visible on the ground, but that holds promise for imaging more inclusive ways forward. This allows distilling alternative and as of now untapped ways of thinking about health from the practices of Uganda scientists, their thinking, commensurating and translating between human and plant. After all, this project directly imbricates human and plant health, where only healthy plants can deliver health to humans.

So what if alternative visions for nutritional interventions started – not from deficient plants or people – but right from there, from fields, plantations and people's engagements with capacious plants? The nutrition and health of many people in Uganda cannot easily be separated out from the goings-on in banana plantations and related research institutes. The ethnographic and historical record on south-central Uganda documents a

recognition of human entanglement with banana plants in particular. Elsewhere I argued that this produced an understanding of 'health as growth' (Calkins, 2019), where healthy humans like plants have to continuously grow and expand their projects in the world. Plants are interesting to think with because they express themselves through growth and they are oriented toward their environments. Many plants, just like the banana, however at the same time depend upon human intervention and care for their reproduction and growth, just as many human livelihoods in Uganda and elsewhere hinge upon calories and incomes derived from bananas. Thinking about health in relation to plants and humans implies attending to such interdependencies between environments and human societies and figuring out which initiatives and conditions can promote mutual thriving (Langwick, 2018; Nading, 2012). While this article draws out what drops from view in many nutritional initiatives when 'good' is narrowly defined, some philanthropic and humanitarian organizations have suggested going even further in reconfiguring health than human–plant relationships, namely, reimaging health within a holistic planetary imaginary (e.g. OneHealth or planetary health) (Farman & Rottenburg, 2019). In the beginning of this article I noted how the compartmentalization of hunger into very specific deficiencies has been paired with a depoliticization of hunger and its disassociation from questions of political economy. A move to de-compartmentalize hunger and situate it in broader relationships again thus may be an important corrective that could foster its re-politicization.

Conclusions

In Uganda a variety of answers are at hand to respond to the question of what a good banana is. But mostly the assumption is that the banana already is a good and capable fruit, nothing that needs to be improved upon nutritionally (Karugaba, 1999). The idea to make the banana better and thus improve upon the Ugandan population is articulated with a top-down foreign intervention that draws Ugandan bananas into globalizing philanthropic networks. Promoting social change in the population by developing food as a medicine is part of a novel paternalistic configuration in philanthropy and global public health that derives its justification from its cost-effectiveness. Biofortification as an investment idea for donors is tied to economized assessments of where the most good can be done per dollar invested and where it will pay off most for a national economy. The economization of nutrition interventions has shifted the focus from chronic hunger and starvation, complex problems that are rooted in political economy, that draw together questions of hygiene, infrastructure and socioeconomic factors, to the micro-manageable problem of micronutrient deficiencies that can be addressed by scientific methods. This idea of doing good through targeted interventions, such as 'better bananas', absolves of the responsibility of alleviating suffering and working towards a more comprehensive health care provision. Undeniably the field of nutrition, just like other dimensions of global health, has become more reliant on scientific metrics and is today often dominated by health economists that define the measures by which specific interventions are planned, carried out and accounted for (Adams, 2016b). Biofortification is implicated into scientific evidentiary practices that translate biological into economic growth and thereby by default posit a large part of Ugandan population as deficient, less

productive and lastly as an impediment to the country's economic growth. This calculative way of appraising lives adds economic incentives to moral ones in taking action against some forms of malnutrition, yet as David's case illustrated it also devalues some lives and channels funds away from them.

Biofortification is advanced in a field of discourse and practice that advances top-down and sweeping solutions to problems it identifies with rather narrow senses of 'the good', framed by cost-benefit analysis and realized by scientific methods. I showed that thinking from the everyday lives of many Ugandans troubles ideas of quick fixes (Lupton, 1994). There bananas are irreducible to their ability to improve bodies medically but rather connote affective registers, including senses of comfort, home, family and aspirations for fertility and growth in multiple avenues of life. Everyday forms of valuation that have accreted over a long period of time still strongly shape attitudes to food today. This draws attention to the parochialism of this new configuration of food as medicine and its detachment from lived realities in Uganda. Superfoods can be engineered but that does not mean that they will be assessed in the same way by the people they were designed for. The tenacity of historically grown cultural appreciations of food is also an argument for not dismissing culturalist-structuralist approaches to food and eating too quickly in favour of more fashionable praxis-theoretical approaches that highlight the making, shaping and performativity of 'good food'. The latter approaches perhaps also too conspicuously overlap with how those designing food as medicine imagine creating new products and marketing them to consumers.

By showing that emerging valuations of food matter but still should not be mistaken for changes on the ground, this article was searching for some middle ground between critiques of global public health and lived experience in Uganda as well as between praxeological and structuralist/culturalist approaches to food. This exploration of the middle ground while sceptical of larger development-economical framings of 'better bananas' was still slow to dismiss the idea of these fruits genuinely conveying some good for Ugandans. Apart from nutritional benefits that I outlined above, a more holistic idea of 'good *matooke*' is being incubated in plant scientists' practices, as they draw fields, plants, metrics, farmers' concerns with high yield into an understanding of the golden banana. This added concern for the health of both plants and people overlaps with Ugandan understandings where plants and people were imagined as growing together. This also offers a counterpoint to the nutrition interventions that start from assumptions of deficiency and not the highly capacious relationships with banana plants that people in Uganda are familiar with and which this initiative could build upon. Projects that highlight interspecies thriving and challenge us to think about humans and other beings in the same framework hold the kernels of further important contemporary moral and political questions, such as what makes a plant or a project good and whose health needs to be accounted for.

Acknowledgements

I am indebted to Stephen Buah with whom I had many conversations about this article and to the many researchers at Kawanda with whom I interacted. Special thanks are due to James Dale and Wilberforce Tushmeireirwe for allowing me to study their project and labs ethnographically. I'm further grateful to the editors of this special issue for their thoughtful commentary, to Stephen

Brown and his team at *The Sociological Review*, to Stephanie Schütze and Caroline Noack for organizing the workshop 'Food Lokal/Global' where I presented a first version of this article, and to Tyler Zoanni and Sophie Nakeuira for conversations about good *matooke*.

Funding

The Max Planck Society financed the research on which this article is based.

Notes

1. It has one of the youngest and quickest growing populations in Africa, high rates of youth unemployment, problems with diseases such as malaria or HIV/AIDS, and inadequate health and sanitary infrastructures, aggravating hunger (FANTA II, 2010, pp. iii, iv; Potts & Nagujja, 2007, pp. 8, 14).
2. Some banana varieties are used to make beer or wine, some are eaten fresh as fruit, others are fried, roasted, boiled but the economically most important are *matooke* that are steamed and mashed in banana leaves and served with sauces.
3. Biofortification was endorsed at a number of international conferences on nutrition that I attended, such as the International Conference of Nutrition (ICN 2) in Rome (November 2014), the Congress on Hidden Hunger 2 in Stuttgart (March 2015), the Arusha Summit on Food Fortification (September 2015), and at a technical consultation of the World Health Organization in New York (April 2016) that assembled experts to debate the integration of biofortification into public health programmes.
4. A further indication of this is that the 2016 World Food Prize went to plant breeders working on the biofortification of sweet potatoes (World Food Prize, 2016).
5. See Sassi (2006) also for the difference between the earlier metric QALYs (quality-adjusted life years) in currency since the 1970s and the 1990s framework of DALYs.
6. The UDHS from 2000/2001 measured the retinol contained in dried blood spots but this proved to be expensive because samples had to be sent abroad. The past three UDHS used the same methods: measuring the retinol-binding protein in a dried blood spot (UBOS & ICF, 2018b). However, agencies such as the CDC, USAID and others have long warned that this measurement methodology cannot be trusted and might lead to an overestimation of vitamin A deficiency (DHS Program, 2018).
7. For a summary of an extensive ethnographic and historical literature on this topic, see Calkins (2019).
8. http://mgafrica.com/article/2016-01-10-uganda-president-urges-voters-to-re-elect-the-old-man (accessed 17 February 2016).

References

Adams, V. (2016a). *Metrics: What counts in global health*. Duke University Press.

Adams, V. (2016b). What is critical global health. *Medicine Anthropology Theory*, *3*(2), 186–197.

Allison, A. (1991). Japanese mothers and obentōs: The lunch-box as ideological state apparatus. *Anthropological Quarterly*, *64*(4), 195–208.

Appadurai, A. (1981). Gastro-politics in Hindu South Asia. *American Ethnologist*, *8*(3), 494–511.

Besky, S. (2020). *Tasting qualities: The past and future of tea*. University of California Press.

Biesalski, H. K. (2013). *Hidden hunger* (P. O'Mealy, Trans). Springer.

Boltanski, L., & Thévenot, L. (2006). *On justification: Economies of worth* (C. Porter, Trans.). Princeton University Press.

Brooks, S. (2010). *Rice biofortification: Lessons for global science and development*. Earthscan.

Caldwell, M. L. (2002). The taste of nationalism: Food politics in postsocialist Moscow. *Ethnos*, *67*, 295–319.

Calkins, S. (2019). Health as growth: Bananas, humanitarian biotech and human-plant histories in Uganda. *Medicine Anthropology Theory*, *6*(3), 29–53.

Carsten, J. (1995). The substance of kinship and the heat of the hearth: Feeding, personhood, and relatedness among Malays in Pulau Langkawi. *American Ethnologist*, *22*, 223-241.

Chandler, S. (1995). The nutritional value of bananas. In S. Gowen (Ed.), *Bananas and plantains* (pp. 468–480). Springer.

Copenhagen Consensus Centre. (2008). Results. www.copenhagenconsensus.com/sites/default/files/cc08_results_final_0.pdf (accessed 11 November 2015).

Crane, J. (2013). *Scrambling for Africa: AIDS, expertise, and the rise of American global health science*. Cornell University Press.

DHS Program. (2018). *Meeting report. Use of dried blood spot specimens to measure retinol binding protein*. https://dhsprogram.com/topics/Nutrition/upload/vitamin-A-meeting-report-March-1-2018.pdf (last accessed 26 March 2021).

Edkins, J. (2000). *Whose hunger? Concepts of famine, practices of aid*. University of Minnesota Press.

Erikson, S. (2012). Global health business: The production and performativity of statistics in Sierra Leone and Germany. *Medical Anthropology*, *31*(4), 367–384.

Escobar, A. (1995). The dispersion of power: Tales of food and hunger. In *Encountering development: The making and unmaking of the third world* (pp. 102–153). Princeton University Press.

Farman, A., & Rottenburg, R. (2019). Measures of future health, from the nonhuman to the planetary. *Medicine Anthropology Theory*, *6*(3), 1–28.

Ferguson, J. (1994). *The anti-politics machine: 'Development', depoliticization and bureaucratic power in Lesotho*. University of Minnesota Press.

Food and Nutrition Technical Assistance II. (2010). *The analysis of the nutrition situation in Uganda*. USAID.

Food and Nutrition Technical Assistance. (2017a, December). Education and nutrition fact sheet. www.fantaproject.org/sites/default/files/resources/Uganda-Education-Nutrition-FactSheet-Dec2017.pdf (last accessed 26 March 2021).

Food and Nutrition Technical Assistance. (2017b, December). Economic development and nutrition fact sheet. www.fantaproject.org/sites/default/files/resources/Uganda-Econ-Dev-Nutrition-FactSheet-Dec2017.pdf (last accessed 26 March 2021).

Gates, B. (2012, January 30). Building better bananas. www.gatesnotes.com/Development/Building-Better-Bananas (last accessed 26 March 2021).

Global Hunger Index. (2014). *Addressing the challenge of hidden hunger*. www.globalhungerindex.org/issues-in-focus/2014.html (last accessed 26 March 2021).

Heuts, F., & Mol, A. (2013). What is a good tomato? A case of valuing in practice. *Valuation Studies*, *1*(2), 125–146.

Horton, S. (2006). The economics of food fortification. *The Journal of Nutrition*, *136*(4), 1068–1071.

Karugaba, A. (1999). *Banana production in Uganda: An essential food and cash crop* (Technical Handbook No. 18). Regional Land Management Unit

Kimura, A. (2013). *Hidden hunger: Gender and the politics of smarter foods*. Cornell University Press.

Krause, M. (2014). *The good project: Humanitarian relief NGOs and the fragmentation of reason*. University of Chicago Press.

Lakoff, A. (2010). Two regimes of global health. *Humanity: An International Journal of Human Rights, Humanitarianism, and Development*, *1*(1), 59–79.

Langwick, S. (2018). A politics of habitability: Plants, healing, and sovereignty in a toxic world. *Cultural Anthropology*, *33*(3), 415–443.

Lupton, D. (1994). Food, memory and meaning: The symbolic and social nature of food events. *The Sociological Review*, *42*(4), 664–685.

Mahajan, M. (2018). Philanthropy and the nation-state in global health: The Gates Foundation in India. *Global Public Health*, *13*(10), 1357–1368.

McGoey, L. (2015). *No such thing as a free gift: The Gates Foundation and the price of philanthropy*. Verso Books.

Meinert, L., & Whyte, S. R. (2014). Epidemic projectification: AIDS responses in Uganda as event and process. *The Cambridge Journal of Anthropology*, *32*(1), 77–94.

Merry, S. E. (2011). Measuring the world: Indicators, human rights, and global governance. *Current Anthropology*, *52*(3), 83–93.

Murphy, M. (2017). *The economization of life*. Duke University Press.

Nading, A. (2012). Dengue mosquitoes are single mothers: Biopolitics meet ecological aesthetics in Nicaraguan community health work. *Cultural Anthropology*, *27*(4), 572–596.

Namugumya, B., Sethuraman, K., Sommerfelt, A. E., Oot, L., Kovach, T., & Musiimenta, B. (2014). *Reducing malnutrition in Uganda: Estimates to support nutrition advocacy – Uganda PROFILES 2013*. FHI 360/FANTA and Office of the Prime Minister, Uganda.

Potts, M. J., & Nagujja, S. (2007). *A review of agriculture and health policies in Uganda with implications for the dissemination of biofortified crops* (HarvestPlus Working Paper 1).

Qaim, M., Stein, A., & Meenakshi, J. V. (2007). Economics of biofortification. *Agricultural Economics*, *37*, 119–131.

Sassi, F. (2006). Calculating QALYs, comparing QALY and DALY calculations. *Health Policy and Planning*, *21*(5), 402–408.

Scrinis, G. (2008). On the ideology of nutritionism. *Gastronomica*, *8*(1), 39–48.

Sen, A. (1981). *Poverty and famines: An essay on entitlement and deprivation*. Oxford University Press.

Smith, J. (2007). Culturing development: Bananas, petri dishes and ‘mad science’. *Journal of Eastern African Studies*, *1*(2), 212–233.

Stein, A., & Qaim, M. (2007). The human and economic cost of hidden hunger. *Food and Nutrition Bulletin*, *28*(2), 125–134.

Street, A. (2015). Food as pharma: Marketing nutraceuticals to India’s rural poor. *Critical Public Health*, *25*(3), 361–372.

Tappan, J. (2017). *The riddle of malnutrition: The long arc of biomedical and public health intervention in Uganda*. Ohio University Press.

Teil, G., & Hennion, A. (2004). Discovering quality or performing taste? A sociology of the amateur. In M. Harvey, A. McMeekin, & A. Warde (Eds.), *Qualities of food*. Manchester University Press.

Timmermans, S., & Berg, M. (2003). *The gold standard: The challenge of evidence-based medicine and standardization in health care*. Temple University Press.

Tsigkas, A. (2019). Tasting Ceylon tea: Aesthetic judgment beyond ‘good taste’. *Food, Culture & Society*, *22*(2), 152–167.

Uganda Bureau of Statistics and ICF International. (2012a). *Uganda demographic and health survey 2011*.

Ugandan Bureau of Statistics and ICF International. (2012b). *2011 Uganda DHS - Addendum to chapter 11*.

Uganda Bureau of Statistics and ICF International. (2018a). *Uganda demographic and health survey 2016*.

Uganda Bureau of Statistics and ICF International. (2018b). *Vitamin A dissemination handout. Addendum to the UDHS 2016*. https://dhsprogram.com/pubs/pdf/FR333/Vitamin_A_dissemination_handout_9March2018.pdf (last accessed 26 March 2021).

Will, C. M. (2007). The alchemy of clinical trials. *BioSocieties*, *2*(1), 85–99.

World Food Prize. (2016). Andrade, Mwanga, Low and Bouis. www.worldfoodprize.org/index.cfm/87428/40771/2016_world_food_prize_presented_to_four_international_researchers (last accessed 26 March 2021).

Author biography

Sandra Calkins is Assistant Professor for Social and Cultural Anthropology at the Free University of Berlin. She has done field research in Sudan, Uganda and Australia on uncertainty, nutrition, land rights, postcolonial science, and human–plant relations. Her current book project, inspired by STS, more-than-human anthropologies and medical anthropology, examines a Ugandan–Australian scientific collaboration to improve banana plants.