

Draft : PLEASE DO NOT QUOTE WITHOUT PERMISSION

Metabolic drift? Food, fertiliser and the biology of history in Malawi¹

Megan Vaughan
University College London

Abstract

This paper is a work-in-progress. It arises from a larger study of what the medical literature labels “metabolic disorders” in different African locations that has expanded into a consideration of metabolic systems as social as well as biological phenomena. In the paper I trace the recent evolution of a mono-cropping and artificial fertiliser-dependent food production regime in Malawi and think about it metabolically and historically. I call this a ‘Monsanto metabolism’. Since soils and fertiliser are so central to this story, this takes me into what may or may not be an unnecessary diversion into Marx’s metabolic rift theory. Using colonial nutritional and production data from the mid-twentieth century, I paint a picture of a rural biological and social metabolic system already deeply and unevenly affected by capitalism, and maintained, with many inherent instabilities, by the work and knowledge of agricultural producers, but particularly through women’s labour. In the final section of the paper I examine the polarised debate over the sustainability of the new food production regime in Malawi and question whether it is useful to think in terms of “healing the metabolic rift”.

I am particularly interested in hearing how this case compares with that of rural South African food systems. Thanks for reading – and I apologise that it became rather heavy with the gritty detail.

Our human metabolisms are plastic. Metabolism as a category is also plastic. As a scientific concept it has evolved, since the nineteenth century, in a symbiotic relationship with social, economic and political conditions and has been “made to serve diverse analytical objectives”.² And it has been employed at a variety of different scales, from the cellular to the planetary. Most standard scientific definitions of metabolism describe it as a set of life-sustaining processes common to all organisms which allow them to convert food into energy to run essential cellular processes, to create the ‘building blocks’ for maintenance, growth and reproduction, and to eliminate waste. One ‘goal’ of metabolic processes is to maintain a consistent internal environment (or homeostasis), so when the biomedical literature refers to “metabolic disorders” such as type 2 diabetes or cardiovascular disease, it signals a destabilisation, something gone awry. Though conventionally the concept implies an organism responding to its environment, and adjusting internally to changes in that environment, more recent work in the science of metabolism has broken down this organism/environment boundary, or at the very least greatly complicated it. As Hannah Landecker has shown in a series of illuminating papers, human metabolism, in this new scientific rendition, has shifted from the self-enclosed autonomy of its early twentieth century version to a more open, porous and contingent set of processes, in which “the body” and the “environment” are contiguous and mutually constituted. Our bodies are our environments and our biology is our history. Through its engagement with epigenetics, this new science of metabolism also implies new temporalities. Food is central to metabolism. But it’s not just what you put in your mouth today or yesterday that matters. As life course and “developmental origins” theories combine with emerging epigenetic research, it seems that we are not only what we eat, but what generations before us have eaten and absorbed from the “environment”. Furthermore, as human action has increasingly and sometimes irreversibly altered the “environment”, our bodies are also “conditioned by a world of our making”, as the phenomenon of antimicrobial resistance so directly shows, though who the “we” is of “our” making, raises a whole set of other questions.³

I am not a microbiologist or physiologist and I certainly don't know one cell signalling system from another. In this paper, for the most part I am employing the concept of metabolism in a loose way. But I am not using metabolism merely as a useful metaphor. In the larger project of which this is part, I am thinking about the human biological processes of metabolism and about "metabolic disorder" as well as its social and what used to be called "environmental" aspects.⁴ In this I am following in the footsteps of a body of inspiring recent research on the anthropology and history of health and the body, some of it directly related to the global spread of that classic "metabolic disorder", type 2 diabetes.⁵ Among these are Harris Solomon's account of "metabolic living" in India, Anthony Ryan Hatch's work on sugar, diabetes and race, Emily Yates-Doerr's ethnography of obesity in Guatemala and Amy Moran-Thomas's *Traveling with Sugar*, as well as research arising out of the debates on the Anthropocene and work by Emily Mendenhall on 'syndemics' in South Africa and elsewhere.⁶ My own point of departure is that of food systems, agriculture and health in Malawi. Though, as I will go on to describe, Malawian populations have been affected by the global agro-industries and food systems which are deeply implicated in the stories told by my colleagues working in other parts of the world and other parts of the continent, outside of urban areas most Malawians eat what appears to be (and which they themselves describe) as a longstanding rural diet. Sugary drinks are, needless to say, available everywhere, and a local as well as global food industry does its best to promote products that have been implicated in dramatic rises in diabetes and hypertension elsewhere. Younger people in particular are attracted to "new" foods, often citing the monotony of the "traditional" diet of their parents. But there is a limit to this market and to this consumption that is imposed by the cash-impoverishment and low wages of most Malawians. This means that understanding the slow but noticeable rise of "metabolic disorders" in Malawi involves thinking, not only about the impact of new diets and urban "lifestyles" (that misleading term), but also about poverty, the lasting impact of infant and child undernutrition and of repeated exposure to malaria and other infections.⁷ Above all, since most Malawians live from the land, it involves thinking about the gritty matters of soil and fertiliser and seeds.

I think that many people in Malawi would be less than bowled over by the insights of recent scholarship on the "biosocial" that have made such an impression on me. The idea that human bodies are inextricably linked to those of other humans, to past generations, to other species, to soils and trees and climate, as well as to supernatural forces, comes 'naturally' to societies in which knowledge systems have never been completely overdetermined by Cartesian divides or modernist fantasies of control.⁸ At the same time, we need to be careful not to create another set of artificial divides between "western" and "indigenous" thinking. Malawian "traditional" stories are replete with accounts of fear and conflict as well as harmony with non-human entities.⁹ Locusts are a good source of food, but uncontrolled they can also destroy your crop year after year. Nevertheless, when asked about changes in food systems over their lifetimes, many older people in Malawi will quite quickly talk in terms that emphasise what in the scholarly literature would be called "porosity" and "toxicity".¹⁰ This may be true of all people who live close to the soil (or to livestock), as well as those few populations left on earth who pursue "hunter/gatherer" modes of living. It just seems obvious that what you add to the soil will make its way through your crops you grow or your cow or goat into your own body, and it follows that your own bodily secretions and waste will contain these substances too, albeit

“metabolised”. Added to this is the fact that the trope of poisoning is widespread in the region. So people talk readily and without prompting about how they feel their food and their bodies are being poisoned by pesticides, herbicides and fertiliser and (with much dark humour) how chickens are being made to grow artificially fast and how “they” are “making us all grow too fast”.

Blantyre, January 9, 2019. A 51-year old man has died after taking rice which was contaminated by tomato pesticides in Thyolo.
Limbe Police Deputy Publicist, Widson Nhlane, told Malawi News Agency on Monday that the incident occurred on January 4, this year (2019) when the deceased, Finiyasi Edward, left home for gardening.
“According to the deceased’s brother Isaac Chaima, Finiyasi was staying with his family at Tebulo Village in Traditional Authority Bvumbwe in the district.
“On this day, he left home for gardening at the said village with a container of rice for lunch but he didn’t return.
“This prompted the wife to make a follow up on the following morning. When she visited the place, she was surprised to see him lying dead few metres away from the garden,” said Nhlane.
The police officers from Bvumbwe visited the place and took the body to Thyolo Hospital for post-mortem.
“The medical practitioner established that he died due to food poisoning. The food was contaminated with pesticides which he was applying on his tomatoes,” he said.
Meanwhile, police are appealing to farmers to take precautionary safety measures when handling pesticides to avoid such incidences. Edward hailed from Jekete Village in Traditional Authority Mpama in Thyolo.
(Yamikani Yapuwa, **Malawi News Agency Online**, 9 January 2019)




 Black Australorp

Get **10%** DISCOUNT

Special OFFER

K600 each

Buy **50** chicks get **5** free

Buy **100** chicks get **10** free

We are in Lilongwe. Call us on:

+265 999 982 271
 +265 888 982 271
tcl.investments@yahoo.com

Valid from 1 oct until Dec 2017

As well as being an observation on agricultural methods, this also be a reflection on the significant investment Malawi has seen in infant and child health (“catch-up growth” for malnourished babies) and Malawi’s more recent but “growing” problem with overweight/obesity.¹¹ Of course, it’s also a comment on the economic “growth” mentality that has dominated Malawi’s development discourse and practice for the past forty years or

so.¹² Amidst the critical commentary there is also realism and pragmatism. With some exceptions (which I will refer to later) most people argue that without artificial fertilisers, they would go hungry, or rather, hungrier. While they reminisce about the superior taste of food in the past, they don't romanticise that past as one of effortless plenty. "I was hungry then and I am hungry now" said one woman in answer to my questions. She was around 80 years of age, so reflecting on a childhood in the mid twentieth century. The wider causes of her hunger may have changed, but the raw bodily experience felt the same. Many older people talk of the regular "hungry seasons" of their younger years, the occasional famines and the uneven distribution of the 'best' food by age and gender.¹³ If there were an assumption that food before artificial fertiliser was better food – there was no assumption that it was always available. The increasing incidence of "metabolic disorders" in Malawi might point to one kind of biologically disorienting instability. But perhaps the happy homeostasis assumed by metabolic theory had never existed in their lifetimes.



Cassava flour stored in a home, Karonga district, 2018.

What I go on to describe in this paper is a twentieth century rural metabolic system (social and biological) that was constantly made and re-made through labour, particularly the labour of women, adjusting to a changing environment which included the demands of a colonial economy closely linked to the industrial capitalism of southern Africa. By the turn of the twenty-first century this always uncertain "system" appeared to be reaching a point of exhaustion, as "normal" food shortages pitched into famine. The subsequent re-establishment of some kind of equilibrium has been achieved through a subsidised programme that has, some argue, led to the wholesale capture of Malawi's agricultural and food system by an alliance of agro-industrial multinationals and government promoting a package of hybrid seeds and imported artificial fertilisers, accompanied by pesticides and herbicides, the sustainability of which is questionable to say the least. In an admittedly rather oblique reference to Marx, I am referring to this process as a "metabolic drift", in part because the questions of soil fertility and fertiliser that preoccupied Marx in his later writings are so central to agrarian metabolic system and the political economy of Malawi.

Metabolic Rift and fertiliser politics

Marx's later writings were composed with reference to major concerns over soil fertility in Britain (and subsequently the USA) which surfaced in the 1820s and 1830s as a consequence

of what is called the Second Agricultural Revolution.¹⁴ Marx saw that new forms of British capitalist agriculture (which were also 'outsourced' to empire), and the increasing division between rural areas and cities, "robbed" the soil of nutrients instead of recycling them. The food produced by intensive agriculture was shipped to cities where it was consumed, creating human waste that was never returned to the soil but contributed to the growing problem of urban pollution. The crisis of soil fertility led to a massive increase in demand for fertiliser – from the bones of the London poor and the killing fields of Europe, to the guano wars of Chile – culminating in the rise of the artificial fertiliser industry ("superphosphates") in the 1840s. This innovation demonstrated to Marx and others that soil fertility was not simply a function of "nature" and could be altered by technology, but access to sources of fixed nitrogen in particular continued to cast doubt on the sustainability of intensive agriculture, especially in Britain and Germany.¹⁵ By the 1860s, when writing *Capital*, Marx had become convinced of the contradictory and unsustainable nature of capitalist agricultural production. In this he closely followed the German chemist von Liebig, who called modern agriculture a system of "spoliation". Marx employed the term "metabolic rift" to describe the opening up of an apparently unbridgeable chasm in the relation of "man" and "nature" and in the "social metabolism prescribed by the natural laws of life". Capitalism itself was characterised by alienation which had a "metabolic" dimension. The "metabolic rift" was a social as well as ecological phenomenon. It disrupted the "natural" soil/nutrient cycle and in the process disconnected people from their farmland. Further developments in technology may have exacerbated this "rift" in ways that Marx could not have fully anticipated: the Haber-Bosch process was invented in 1913, and further breakthroughs in fertilizer production in the second half of the twentieth century allowed the developments in industrial agriculture we see now.

Marx's account of the metabolic rift has been thoroughly raked over within the socialist ecological movement, and its problems and implications perhaps most cogently presented by Jason Moore.¹⁶ Amongst the many criticisms of metabolic rift is one fairly straightforward one – Marx did not understand his soil science and (due to his over dependence on von Liebig) was too focused on soil chemistry to the exclusion of other properties equally important. Related to this, he seems to have assumed that pre-industrial producers had an unproblematic relationship with their soils and food production and underestimated the labour and knowledge required to "make" soils. His model of the country/city relationship of extraction and excretion was too crude. The relationship between the social and environmental alienations he described was under-theorised. And the theory itself was built on and contributed to the Cartesian division between "man" and "environment" which severely limited its scope and insights and is itself part of the problem.

Marx did not, of course, have Malawian smallholders in mind when he formulated his ideas on metabolic rift. He wrote in the context of large scale land expropriation and large scale industrialisation, a context in which what had come to be viewed as "nature" was under a massive assault and in which human beings were increasingly separated from their "natural" habitats to become cogs in industrial wheels. However, his theory placed a rupture in the soil nutrient cycle at the centre of this wider story of alienation, which (superficially at least) bears some resemblance to the arguments being made in the very different context of Malawi today. I am going to suggest that the history of Malawian agriculture and food systems points to something more complex than a "rift" – rather the evolution of a

metabolic system marked by “capitalism’s long durée reconfiguration of human and extra-human natures”. (Jason Moore).

Fertiliser often grabs the news headlines in Malawi. In January this year, President Mutharika was pictured in London having negotiated a deal with “tycoons” from Israel, France, Ukraine and Morocco, to build a fertiliser plant in the country.¹⁷ One of these “tycoons”, Nir Gess, told the media that as a result of the deal Malawi could be a “producing and exporting nation”, adding that “no tomato, cucumber or potato” would need to be imported into the country. In reality, tomatoes, potatoes and cucumbers are not pressing priorities in Malawi, but inorganic fertiliser containing nitrogen and phosphates is inextricably linked to the country’s political economy and food security. And there is also a polarised debate on the sustainability of this form of agriculture and experiments in other methods. Fertiliser is big business in part because a government seed and fertiliser subsidy programme has been fully in operation since 2005, with earlier antecedents. It’s perhaps not surprising then, that though it’s certainly possible to trace the major contractors supplying the government, following the fertiliser and the money is not straightforward and fertiliser companies (in my experience at least) are hard to get to talk.¹⁸ There is however a well-developed literature on the political ecology of fertiliser in Malawi, because it offers a compelling case study in food markets and food systems, government interventions, agribusiness and sustainability. What follows is a summary of a long and winding story which could (and probably should) be longer.

Around 80% of Malawi’s 18 million population and smallholder farmers, and some of those holdings are extremely small. Most cultivate between 0.5 and 1.5 ha. of land. Around 11% are classified as landless and only 13% cultivate more than 2 ha. Approximately 16% of the country’s land is held by estates (mostly growing tobacco and tea), a lasting consequence of a colonial “three-way” economy consisting of a mix of settler farming, labour migration and smallholder production. Maize, which has been grown in the country from at least the early nineteenth century is the dominant food crop, and occupies 60% of the cultivable land. Malawi’s increasing reliance on maize is striking, even by comparison with neighbouring countries. It makes up 60-70% of total food intake and a remarkable 48% of average protein consumption. The Malawian saying “maize is life” is a raw statement of fact. When the maize crop fails, or is reduced by drought, the annual hungry season and chronic malnutrition can easily flip into a more severe food shortage or famine.¹⁹ This is what happened in the early 2000s when the unfavourable weather combined with the effects of structural adjustment policies to produce the country’s most severe food shortage since at least the 1980s. What happened next is the subject of a well developed critical literature on the political ecology of food and fertiliser in Malawi.²⁰

Nitrogen is arguably the single most important limiting factor in maize productivity in Malawi, where soils are increasingly depleted.²¹ Beginning in the 1980s, President Kamuzu Banda, who like to boast (against all evidence) that no Malawian went hungry, began promoting hybrid maize and fertiliser to smallholders through the national parastatal ADMARC. Perhaps this marked the beginnings of the continuous maize monocropping that now largely characterises the country’s food production, but in comparison with farmers in Zambia and Zimbabwe, Malawians were relatively slow to switch to hybrids, valuing the qualities of their traditional flint varieties and “fixing” nitrogen in the soil through their

practice of intercropping with beans, groundnuts and pigeon peas. But by the early 1990s this was changing as new, more drought resistant hybrids were developed and, crucially, some subsidies for seed and fertiliser were made available to small farmers. This was also the time when Malawi's peculiar political economy under President Banda was beginning to unravel. When President Bakili Muluzi took over in 1994, western donors were firmly in charge of the purse strings and policies. Along with many other institutions, the country's impressive homegrown plant breeding programme was contracted, and subsidies axed. By the turn of the century food security in the country was fragile and volatile. Occasionally the country produced a surplus, some of which was stored in a national facility in Lilongwe as an insurance against future shortage. The donors, fixated on the implementation of a market ideology argued that when a surplus occurred this should be sold to neighbouring countries and when there was a shortfall the government would find a ready supply in the region – particularly from South Africa. As Tim Wise has recently revealed, in 1998, under donor pressure, the Malawi government allowed Monsanto to take over the national seed company, enabling it to eliminate competition and promote its own hybrid seeds unhindered by competition.²² The importance of this move would soon become apparent. When a series of droughts hit the country in the early 2000s, much of the existing stock of maize had been sold – either officially by the government, or corruptly by insiders. The regional market did not operate as anticipated, and the country slipped into a state of famine.²³

Coming to power in 2004, President Bingu wa Mutharika, an economist by training, instituted the Fertiliser Inputs Subsidies Programme (FISP), which was hailed by some as producing a “green revolution” and agricultural “miracle”. A targeted subsidy programme that aimed to benefit the poorest farmers – what's not to like? And at the time it certainly seemed like a courageous and principled move, enacted in the face of fierce opposition from the international donors on whom the country was so dependent. Not all criticism came from free market ideologues. Some worried about the long-term financing of the programme and what it would mean for other aspects of the government's already constrained budget; others pointed to the opportunities for corrupt practices and patronage that such a system implies. Monsanto, remember, was now the country's sole hybrid seed provider and made a concerted effort to eliminate the market for “local” maize varieties by redefining the concept of a seed. There were also voices expressing concern about the implications of this system for biodiversity and sustainability, though I have to admit that I paid them little attention at the time. In the years that followed the introduction of the programme, Malawi benefitted from better than average maize harvests and increased food security, at least at the national level. The policy was dubbed the “Malawi Miracle”, a triumph for government intervention and pro-poor policies.



Fertiliser distribution. Photo: Face of Malawi

As time has passed however, the debate, far from withering away, has become louder. Doubts have been raised as to whether the poorest (who are food purchasers as well as producers) have really been the major beneficiaries. The maize market remains volatile and unpredictable. The seeds and fertilisers don't always arrive on time, and as time is of the essence in a rain-fed single crop system (now also subject to the vagaries of climate change), this is a serious drawback. The transport costs for the imported fertiliser make it expensive in more than one sense, and a massive drain on government resources. The metrics are contested, but even without considering issues of sustainability, some recent analyses allege that the programme is not reaching its productivity objectives.²⁴

There has been no major famine, but the incidence of chronic malnutrition (particularly evidenced by "stubborn" rates of stunting) remains high. As a recent report indicates, a shocking proportion of the population does not consume an adequate number of sheer calories, let alone a diet that is sufficiently diverse to be healthy and this lack of diversity is becoming more marked, and more characteristic of rural than urban communities.²⁵ It is true that though dietary diversity can be achieved by individual farmers producing a more diverse range of crops, it can also be bought – so, for example, some argue that farmers who "fill the maize store" with hybrid maize grown with fertiliser, are more, rather than less, likely to have diverse diets.²⁶ But if the hybrid/fertiliser strategy itself fails to deliver under conditions of climate change and/or soil exhaustion, then this strategy, and the metabolism it supports, look far from sustainable.

Perhaps we can characterise the increasingly globalised food economy of Malawi as dominated by a Monsanto (now technically Bayer²⁷) metabolism? At the individual nutritional and biological level this involves diets that are marked by a lack of diversity, and by a kind of steady state of undernutrition which nevertheless rarely now tips into mass starvation.²⁸ Rising rates of type 2 diabetes and hypertension in rural areas, where, at least superficially, diets look relatively 'traditional', are in part the consequences of this. The Monsanto metabolic system continues to tie Malawians to the land, which most still occupy as a result of their community membership.²⁹ But they no longer exercise control over the

composition of their soil, the seeds they sow or the chemical content of the food they eat. This loss of control is manifestly unsatisfactory to many people, and they articulate this in part through talk of “poisoning”. They may be right – with this system comes increased use of both pesticides and herbicides, and though there are regulations governing their use, they appear to be ineffective.³⁰ However, because employment opportunities are so limited, and because staple food prices remain so volatile, no one wants to risk *not* growing as much of their own food as they possibly can, and if artificial fertiliser and hybrid seeds help to achieve a measure of self-sufficiency, then it’s clear why people are keen to get hold of these “inputs”.³¹ But food is not the only thing people need and so households necessarily engage in a constant balancing act involving daily calculations around labour and cash needs, as well as daily consumption. For the poorest households it often means selling much of the food you have grown using your subsidised seed and fertiliser (if you were lucky enough to get it) to meet immediate cash needs, then buying the same food at a higher price later in the season. It means selling your labour to neighbours or tobacco estates at peak agricultural periods to get food, rather than weeding your own plot.³² Malawian rural households, particularly the poorest ones, are deeply involved in food markets and dependent on food purchases, exchanging both their own-grown produce, and their labour for food. Though at the national level the Monsanto metabolism has (at least in the short run) ensured a kind of steady state of staple food supply, that steady state does not translate into anything like sufficiency at an individual or household level.



Promoting hybrid seed DK777 (Photo:Nyasa Times) DeKalb is owned by Bayer.

The argument for the damaging effects and unsustainability of the Monsanto metabolism at both an individual and collective level has been further strengthened by evidence for climate change, despite the touted drought resistance of hybrid maize varieties. As many commentators have noted and as the recent report on the African Alliance for the Green Revolution in Africa seems to indicate, this simplified, standardised form of agriculture promoted by an alliance of industrial and chemical agro-capitalists, foundations and governments, may in any case be burning itself out in the context of climate change.(see footnote 20). There has been a vigorous response from agro-ecologists, and food sovereignty activists, many based in universities in the USA, who advocate a “return” to versions of Malawian agrarian systems, with their emphasis on a varied and diverse array of staple crops (including older staples like millet and sorghum) and organic nitrogen fixing techniques. For the passionate advocates of these projects, this is the *only* way to secure

food security, health and the very survival of rural communities.³³ The push back from rural producers worldwide, who still make up just under a half of the world's population, exemplifies the kind of counter-movement anticipated by Karl Polanyi, and is a way of "healing" what Marx referred to as the "metabolic rift". But has there been such a "rift" in the Malawian case, or is this the wrong metaphor?

Soils, food and labour

As Hannah Landecker has suggested, Marx's rather mechanistic view of metabolism drew on the metaphors of the very system of industrial capitalism that he was critiquing: food in, waste out, energy generated. His imagined pre-industrial rural communities lived in harmony with nature, in a balanced metabolic system, characterised by homeostasis. Soils were constantly rebalanced through the judicious application of organic waste, itself derived from humans and other animals whose nutrition was apparently unproblematic.

Without speculating too wildly, there are some things that we can say about Malawi's longer term food and agrarian histories and the metabolic systems implied by them. Firstly, we know that agricultural systems by the mid-nineteenth century were both global and highly localised. Maize and cassava, the present day staples of what is sometimes termed "indigenous" agriculture, had already made an important mark. As James Mac Cann and others have convincingly shown, 'new world' crops have made a highly significant contribution to productivity in this part of Africa for centuries- but the cultivation techniques employed, the seeds that were selected and bred, were all carefully adapted to the varied ecological niches that characterised the Lake Malawi region and which had for centuries made it attractive for human settlement.³⁴ In some areas the long-distance ivory and slave trades may have stimulated more intensive production; but by the late nineteenth century the conflict and violence associated with slave raiding left other areas desolate and vulnerable to famine. In oral tradition, easily transportable dried cassava cakes were the food of choice in trading caravans. Imported staples like maize were grown alongside millets and sorghum and intercropped with legumes, including the 'Bambara nut' (originating in the Congo region) and the groundnut (from the Andes). Some parts of the Lake Malawi region may have supported permanent cultivation, but more extensive shifting cultivation systems were probably the norm in most places, at least until the early twentieth century (and in some places much later). It is clear from all the evidence we have (which is sparse until the twentieth century) that even in supposedly "simple" extensive systems, the micromanagement of the soil and water sources was critical to successful farming.³⁵

In many parts of Malawi by the mid twentieth century, soils (their structure, textures, microbial populations, chemistry and hydrology) had been transformed, sometimes irreversibly. Land alienation combined with increasing population densities had necessitated a shift to continuous cultivation, which often had implications for the labour input required. In some communities this happened just as more men made their way south as labour migrants. Colonial officials worried endlessly about soils, particularly when they were eroded, and "carrying capacity" - a concept with its own history. But as Kate Showers amongst others has argued, they largely saw soil conservation as "a technology that could remedy land shortage and allow for the persistence of certain European priorities, rather than an expression of concern about soil bodies themselves". If this was the beginning of a "metabolic rift", it was a very particular one. Marx had imagined the soils of rural England

being drained by the demand of industrial capital, and agriculturalists both physically and socially becoming alienated from the land. In his 'rift', agriculture became divorced from its biological foundations, and humans were separated from 'nature'. As we know, colonial capitalism in southern Africa worked through a rather different set of logics. In colonial Malawi, complete land dispossession and the 'alienation' associated with that was less common than the experience of continued dependence on land in shrinking quantities for both food and cash needs and this in turn required a continued close attention to soils, seeds and cultivation methods. Basically, most people then and now, and particularly women, were required to be agricultural experts, whether they liked it or not.

An insight into what an agrarian metabolism looked like in the late 1930s and 40s (when my elderly interlocutor was growing up) is provided by the very detailed observations that went into the Nyasaland Nutrition Survey of 1938 and its follow-up studies.³⁶ Problematic in various ways, the survey nevertheless usefully combined a consideration of biological metabolism with observations of agricultural labour and its energy requirements, cash exchanges and food intake. Surveying three villages with different ecological conditions also allowed a comparison of the social organisation of labour processes as it interacted with these material constraints and possibilities. One village was on a steep slope: the villagers here had to work considerably harder to produce the same amount of food as those in a village on the high plateau. They also complained most about "hunger", though in fact this was the only village of the three in which, overall, calories exceeded calculated requirements. Soil quality and rainfall varied across the villages, as did the amount of cultivable land at their disposal. The plateau villagers had access to extra land at a distance from their houses, but struggled to supply the labour required to protect it against birds and animals. The third village was on the lakeshore, where conditions favoured the production of cassava rather than the maize which dominated in the other two villages. Cash had permeated the food economy of all three villages, to a greater or lesser degree, as had labour migration. While around 50% of men were away for work in the escarpment and plateau villages, 70% were away from the lakeshore villages, most of them working on tobacco estates in Southern Rhodesia (though to varying degrees they returned for the peak agricultural season). This placed particular pressure on women's labour, and this was navigated in a variety of ways. In all three villages beer was an essential food (especially Vitamin B) and also a commodity which made possible the recruitment of male labour by women. In all three villages women also sold their labour for food or cash when they had to – even sometimes when their own fields were waiting to be prepared or weeded.

Seasonal hunger, as many people in Malawi today will tell you, was, and to some extent is, "normal". Not normal was or is three meals a day – a norm often assumed in nutritional education but scoffed at by older people in particular as a kind of modern fad. If the bodies of these agriculturalists achieved some kind of metabolic stability, it was not through regular eating. Neither was food evenly distributed within communities though there was a powerful ethic of sharing. A more detailed analysis of the ups and downs in calorie intake revealed that though seasonal fluctuations in food supply were a major factor, consumption patterns were influenced by an array of other circumstances and by their interaction. In the lakeside village seasonal variations in the supply of the staple food, cassava, were less marked than in areas where maize was the staple. Cassava is relatively drought resistant and can be harvested all year round. Despite this, some families regularly went hungry,

most often because they lacked the ingredients for the *ndiwo* or side dish to accompany the cooked cassava porridge. A common observation of rural Malawian eating practices then, and now, was that a meal was only a meal when it was composed of both staple starch *and* a side dish (which might be vegetables, pulses, fish, or more rarely in the 1930s, meat). One without the other, whichever way around, did not constitute a meal. Food and meaningful nourishment were two different things. The careful and sensitive observer, nutritionist Jessie Williamson, found it hard to disguise her amazement when she watched women skip cooking the family meal though they had maize in their grain stores. In the absence of sufficient ingredients for *ndiwo*, there was no point in going to the bother of cooking *nsima*. For example, in the lakeshore village one 'eating group' composed of members of a poorer family collectively consumed less than half their normal calorie intake one day because the only side dish available consisted of wild leaves. But the same group exceeded its calorie intake by around a third on another day because there was plenty of cheap fish available – consequently, the women cooked three full meals that day. Another eating group consisting of three adults and three children also consumed a third more than their normal calorie intake one day in December 1938 because they “ate twice because the side dish was so good (white ants) – ate more porridge than usual”. An unexpected visitor turning up before dinner reduced the normal calorie intake of another household substantially. A supply of beer could increase calories, as it did for one group in the hill village in April 1939, who ate three meals one day and drank beer in addition. But at the peak of the period of agricultural labour, beer brewing for the purpose of summoning communal labour left the women too exhausted to cook, and the children searching for “scraps”.

The more or less predictable fluctuations of seasonality in this largely rain-fed agricultural system was a central feature of the social metabolism of these communities. The seasonal experience of hunger (*njala*) was so common as to be unremarkable, though the depth and length of duration of that *njala* varied considerably from one family group to another and one village to another and one year to another. This regular occurrence of *njala* is very well remembered by older people in Malawi today and is still a marked feature of Malawian rural communities.³⁷ To some extent, what Hannah Landecker calls the “industrial” model of metabolism – calories in and calories out – was shared by the subjects of these colonial nutritional studies as they moved through the year with its varying demands on labour and varying supplies of food. They may not have matched the exactitude of the scientists' calculations of basal metabolism and calories burned through every conceivable agricultural (and to a lesser extent, household) activity, but “native dietetic theories” included a clear appreciation of the volume and type of energy provided by different foodstuffs – in particular between those that gave you a quick surge in energy and those which provided more sustained capability for work. For example, it was well known that the (otherwise less desirable) *nsima* made from whole grain maize (*ngaiwa*) was more sustaining than that made from the more refined flour.

Food and labour were deeply enmeshed. Though self-sufficiency in basic food production was an ideal probably held by everyone surveyed, the reality was that this was unattainable by most, due to lack of land or the right kind of land, lack of labour (especially in villages where men were absent as migrants), sickness or disability, drought, crop diseases or poor post-harvest storage. Exchanging labour for food or buying food with cash was common in

these rural communities even in the late 1930s. As in Malawi today, casual labour (*ganyu*) performed by women could be a sign of household food insecurity, stress and poverty – but it also worked to redistribute food between households at different stages in their lifecycles, or with access to different kinds of land and to support women heading households. In 1939/9 the researchers were surprised to find that the population of what they regarded as the least food secure village actually appeared (on average) to have consumed a surplus of calories in the lean period (December to April) which had largely been obtained by women exchanging their labour for food in other villages.. This strategy had inevitably entailed removing labour from their own fields, and perhaps placed their own future production in jeopardy, but presumably this was a calculation that they made knowingly, within the constraints that they faced. Much depended, of course, on the food security of other households and a favourable exchange for their labour. When there was a more general food shortage in the area things would look different. And it's worth noting that households in this village apparently rarely had the opportunity to offer hospitality to others– not a minor matter in a cultural context awash with sayings and proverbs emphasising the fundamental importance of generosity and sharing of food.

I've recounted this in some detail because, as Mindi Schneider and Philip McMichael have argued, while Marx thought in terms of largely rigid pathways, we “need to think about how capitalism and agroecosystems encounter and reshape one another”, and to do this necessitates “not only an ecological understanding of agrarian systems but also focus on agricultural practices or particular times and places.”³⁸ It is clear from the accounts left by the NNS and other evidence that the agrarian systems of even quite remote parts of Malawi had been deeply impacted by colonial capitalism by the late 1930s. These impacts had not resulted in the separation of humans from “nature”, and neither had agricultural production been divorced from its biological roots – in part of course, because those divisions had never existed in this way. In particular, as I think this example shows (and as Schneider and McMichael also argue) we need a more embodied and less abstracted appreciation of labour than that implied by Marx in his account of the metabolic rift. If we think metabolically then it follows that the social organisation of labour must be a central consideration. The colonial scientists working on the Nyasaland Nutrition Survey certainly appreciated the metabolic implications of labour at one level but what their data more inadvertently revealed was that metabolism was more than calories in, and calories out. It was also more than a calculation (that they also performed) of daily protein and micronutrient consumption and of child growth, though these things were important. What they showed was a social metabolism, based in agricultural production, that involved a set of complex balancing acts – between short term energy expenditure and consumption with longer term food security, with the fluctuations of seasonality, the willingness (or not) of the better-off to share with or employ the labour of the needy, between the depletion of male labour and the benefits of cash, between the labour needed to maintain the soil and the labour required to cook for and feed newly weaned children. The *knowledge* involved in making these balancing acts balance was considerable – as Jessie Williamson in particular showed in her extensive study of local botanical terms and the usages of ‘wild foods’ and the amazingly rich female terminology of food processing. But though knowledge, expertise and judicious strategies of labour allocation and land use were central to these villagers’ lives, there was much that was less amenable to control – the beer fermentation which went bad, a season of poor rains or locusts, the “lucky” find of the white ants, the onset of a

sickness that left a woman unable to prepare her fields for the next season, the return of an injured labour migrant, the death of a child that caused a rupture in social relations. Some went hungry beyond the 'normal' seasonal *njala*, many children died of disease and adult Malawians remained small of stature.

"Healing the Rift" ?

Advocates of agroecological and food sovereignty approaches talk of "healing the rift", in direct reference to Marxist rift theory, but also to the 'epistemological rift' implied by agro-industry's active suppression of local practices and knowledge systems. On the pages of the *Journal of Peasant Studies* you will find a lively debate between them and Henry Bernstein, amongst other critics.³⁹ In the case of Malawi that I have been discussing here, the theoretical arguments over the existence or non-existence of the 'peasantry' and its precise relationship to capital make little difference to the realities of the country's 80% of population engaged in agriculture. These farmers have not, for the most part, been "dispossessed" by capital in the way that the food sovereignty movement often envisages. They have been engaged in highly unequal relationships with, firstly, a colonial and racialized system of migrant labour, and with a local set of actors engaged in export production. But this engagement has been active, producing new levels of inequality within rural areas. Their knowledge of soils and other aspects of ecology, and their social organisation of labour have been central to the ways in which both local and international capitalism have operated in this region, as well as being essential to the very survival of the population, albeit under often under conditions of extreme poverty. Arguably the more recent effects of the fertiliser subsidies and the involvement of agro-industrial capital in the food production system has indeed produced a new shift, if not a rift, in the socio-ecological metabolic system, as farmers have become critically dependent on both imported chemical fertiliser, and on industrially produced seeds, along with the pesticides and herbicides that so often accompany them. Against this apparent agro-industrial hijacking of rural production is pitched a food sovereignty and agro-ecological movement.

Many of the agro-ecological projects pursued on a small scale in Malawi are idealistic in a manner which is in some ways easy to critique.⁴⁰ They largely disregard the marked inequalities that we know exist in rural areas of Malawi and talk instead in terms of cohesive communities. Most often they focus on areas where land is not in very short supply and don't seem to have a great deal to offer to the many millions cultivating tiny patches of degraded land. They sometimes slip into the misleading language of 'indigeneity' when describing crops which in fact are localised imports. They appear uneasy with the realities of wage labour and labour migration – though the data apparently shows that these are major contributors to food security, as they were in the 1930s/40s⁴¹ – and imply a "return" to a balanced social and biological metabolic system, the existence of which I have called into question. The considerable labour requirements associated with some of their soil fertility methods (for example the composting of legume residues) falls disproportionately on women. This is sometimes acknowledged but is represented as a "rift" in the social metabolism of these communities which can be addressed through participatory methods addressing gender inequalities.⁴² They argue against productivity metrics, but end up using them for the very obvious reason that food security in Malawi is so often on a knife edge, it is not easy to ignore questions of productivity. Their relationship to 'science' is ambivalent, since the agrarian ecological scientific knowledge of the communities they work with is

central to any success they might have, but 'science' is sometimes externalised as a threat represented by Monsanto, GMOs and other alien technologies and opposed to 'indigenous knowledge'.

And yet, many of the arguments made by agroecologists in the context of Malawi are powerful and not easily dismissed. Though the evidence is certainly not straightforward, it would seem that the productivity gains of the hybrid/fertiliser "miracle" have both been exaggerated and/or are coming to an end. As soils become further depleted and acidified, so what Malawians call the soil "addiction" to chemicals maybe reaching a tragic conclusion.

The missing "middle" here is the more localised scientific knowledge that is produced by Malawi's plant breeders and agrarian scientists, which has been undermined by funding cuts and the "one seed/one fertilizer" fits all approach of the agro-capitalists and their government agents.⁴³ The metabolic homeostasis imagined by Marx to characterise pre-industrial agrarian communities, with its regular and easy exchanges between farmers and the soils that supported them, could only have been dreamt up by urban intellectual. Neither has the total dispossession of agrarian communities been everywhere characteristic of the workings of the capitalist system. In the case of Malawian agrarian communities over the long term, farmers have worked to maintain viable food production systems and human health through their version of what is now known as "precision agriculture" – through careful highly localised soil preservation strategies, through a willingness to innovate and openness to new technologies, and also through an uneven engagement with wage labour systems. But these were always precarious balancing acts, full of uncertainties. The drift towards the adoption of artificial fertilisers and "improved" seeds, beginning in the 1990s, but massively accelerated from the early 2000s, can be seen as a kind of reversal of the past metabolic system in which human bodies, enmeshed with their environments, experienced frequent ups and downs and short term deprivations, but in which a kind of longer-term stability and sustainability was aimed for and sometimes achieved (but, it should be noted, this was also in a demographic context of high levels of infant and child mortality). Artificial fertilisers and hybrid seeds, on the other hand, offered the promise of greater season to season staple food security (at least in the medium term), and for some the "three meals a day" of the modern nutritional imagination, but at the considerable cost of long term soil fertility, biodiversity and of any meaningful control over what, exactly, goes into those meals and into bodies. There may be no "return" to an imagined indigenous agriculture, but there might still be an understandable desire for control.

I am reminded of a woman farmer I met in the late 1980s, somewhere on the Phalombe plain between Blantyre and Mulanje. She was sitting outside her house selecting her seeds for the following planting season. I asked her what seed qualities she was looking out for. I hadn't anticipated such a long reply. I'm trying, she said, to get back to the kind of maize seeds I had before these new things were introduced (a reference to much earlier seed exchange programme)– they stored better, they pounded better. She went on to detail a long trek she had made on foot, to distant relatives over the border in Mozambique, seeking out the old maize seeds from them, and also coming back with some millet seeds that she was planning to experiment with in a few rows of her garden. Experimentation was at the heart of her practice. Had she been offered subsidised Monsanto hybrid seeds and fertiliser

I am sure she would have tried those too. But hopefully she would have also have kept a stash of her own seeds wrapped into her *chitenje*.

¹ My thanks to Julie Livingston for her comments on an earlier draft of this paper and to Misheck Nkhata for insights on the translation and meanings of “metabolism” in Malawian languages.

² The quote is from Jason W Moore.

³ I am thinking here of recent important critical work on race and the concept of the Anthropocene, including Kathryn Yusoff, 2019, *A Billion Black Anthropocenes or None*, London: Verso. Hannah Landecker, 2016, ‘Antibiotic Resistance and the Biology of History’, *Body and Society*, 22: 19-52; Hannah Landecker, 2011, ‘Food as Exposure’: Nutritional Epigenetics and the New Metabolism’, *Biosocieties*, 6 : 167-184; Hannah Landecker, 2013, ‘Post-Industrial Metabolism: Fat Knowledge’, *Public Culture*, 25: 495-522; Hannah Landecker, ‘The Metabolism of Philosophy in Three Parts’, 193-1224 in *Dialectic and Paradox: Configurations of the Third in Modernity*, eds B. Malkmus and I. Cooper, Bern: Peter Lang, 2013

⁴ This research forms part of a collaborative project on Chronic Disease in Africa, generously funded by the Wellcome Trust: www.chronicdiseaseafrica.org.

⁵ I am using “type 2” as shorthand here, but there is an important debate on diabetes typologies: Lauren Carruth et al., ‘Disaggregating diabetes: new subtypes, causes and care’, *Medicine Anthropology Theory*, 16 December 2019. For a much earlier critique of diabetes typology and its (doubtful) relevance to the South African context see my discussion of the work of George D. Campbell: Megan Vaughan, ‘Sugar and diabetes in postwar South Africa’, in Megan Vaughan, Kafui Adjaye-Gbewonyo and Marissa Mika (eds), *Epidemiological Change and Chronic Disease in Africa: Social and Historical Perspectives*, forthcoming, UCL Press, 2020.

⁶ Anthony Ryan Hatch, 2016, *Blood Sugar: Racial Pharmacology and Food Justice in Black America*, Univ of Minnesota; Anthony Ryan Hatch, Sonya Sternlieb and Julia Gordon, ‘Sugar Ecologies: their metabolic and racial effects’, *Food Culture and Society*, 22 (2019): 595-607; Harris Solomon, 2016, *Metabolic Living: food, fat and the absorption of illness in India*, Duke University Press; Emily Yates-Doerr, 2015, *The Weight of Obesity: hunger and global health in postwar Guatemala*, Univ of California Press; Amy Moran-Thomas, 2019, *Traveling with Sugar: Chronicles of a Global Epidemic*, Univ of California Press; Kathryn Yusoff, 2019, *A Billion Black Anthropocenes or None*, London: Verso; Emily Mendenhall, 2019, *Rethinking Diabetes: Entanglements with Trauma, Poverty and HIV*, Cornell Univ Press.

⁷ Megan Vaughan, ‘Conceptualising Metabolic Disorder in Southern Africa: Biology, History and Global Health’, *BioSocieties*, 14 (2019): 123-142; Moffat J. Nyirenda, ‘Non-communicable diseases in sub-Saharan Africa: understanding the drivers of the epidemic to inform intervention strategies’, *International Health*, 2016, 8(3): 157-8.

⁸ Tim Ingold, Gisli Palsson eds, 2013, *Biosocial Beginnings: Integrating Social and Biological Anthropology*, CUP: Cambridge; Maurizio Meloni, Simon J. Williams, P.A Martin eds, 2016, *Biosocial Matters: rethinking sociology-biology relations in the twenty-first century*, Wiley-Blackwell:Chichester.

⁹ Brian Morris, 2004, *Insects and Human Life*, Berg; Brian Morris, *Chewa Medical Botany*, Hamburg: Lit

¹⁰ Megan Vaughan, Albert Dube, Hazel Namadingo, Amelia Crampin, Levie Gondwe, Green Kapira, Joyce Mbughi and Maisha Nyasulu, 2018, ‘Dietary Change and Noncommunicable Disease: results of a small-scale study of the views of older Malawians’, *Wellcome Open Research* : <https://wellcomeopenresearch.org/articles/3-158/v1>

¹¹ Megan Vaughan, ‘Conceptualising Metabolic Disorder in Southern Africa: Biology, History and Global Health’, *BioSocieties*, 14 (2019): 123-142.

¹² see Julie Livingston’s critique of the growth model of ‘development’: *Self Devouring Growth: A Planetary Parable Told From Southern Africa*, Duke, 2019.

¹³ On the meaning of food and *njala*, see Elias Mandala, *The End of Chidyerano: a History of Food and Everyday Life in Malawi, 1850-2004*, Heinemann, 2005.

¹⁴ Karl Marx, *Capital*, vol 3, New York: Vintage, 1981; John Bellamy Foster, 'Marx's Theory of Metabolic Rift: Classical Foundations for Environmental Sociology', *American Journal of Sociology*, 105 (1999): 366-405. *Monthly Review* bibliography on metabolic rift theory: <https://monthlyreview.org/commentary/metabolic-rift>

¹⁵ Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch and the Transformation of World Food Production*, MIT Press, 2000.

¹⁶ References too numerous to cite here, but include: Jason W. Moore, ed, 2016, *Anthropocene or Capitalocene: Nature, History and the Crisis of Capitalism*, Oakland, PM Press; Jason W. Moore, 'Marx's Theory of Metabolic Rift', *American Journal of Sociology*, 105 (1999): 366-405; Jason W. Moore, 'Metabolic Rift or Metabolic Shift: Dialectics, Nature and the World-Historical Method', *Theory and Society*, 46 (2017): 285-318.

¹⁷ <https://www.nyasatimes.com/malawi-to-have-a-fertiliser-manufacturing-plant-mutharika-secures-deal-in-uk/> Leading the delegation of "tycoons" were Israeli businessman Nir Gess and one Asif Akbar. Nir Gess (you guessed it) is not his real name and my colleague, Haim Yacobi, has been unable to trace him in the Hebrew language press. Asif Akbar is equally elusive. <https://www.dw.com/en/malawi-turning-urine-into-a-source-of-wealth/a-52809077>

¹⁸ Stephanie White lists the major fertiliser suppliers (as of 2019) in 'A TEEBAgriFood Analysis of the Malawi Maize Agri-Food System', Global Alliance for the Future of Food, 2019; Blessings Chinsinga, 'Agro-dealers, subsidies and rural market development in Malawi: a Political Economy Enquiry', WP 031, www.future-agricultures.org, 2011.

¹⁹ Jessica Kampanje-Phiri, 2016, *The Ways of Maize: Food, Poverty, Policy and the Politics of Meaning among the Chewa of Malawi*, Lambert Academic Publishing.

²⁰ Amongst others..... Blessings Chinsinga, 'Seeds and Subsidies: the Political Economy of Input Programmes in Malawi', *IDS Bulletin*, 42 (2011) 59-68; E. Chirwa and A. Dorward, *Agricultural Input Subsidies: the Recent Malawi Experience*, OUP, 2013; Stephanie White, 'A TEEBAgriFood Analysis of the Malawi Maize Agri-food system', Global Alliance for the Future of Food, 2019; GRAIN, 'Unravelling the 'miracle' of Malawi's green revolution', January 2010.

²¹ Stephen Carr, 'The Challenge of Africa's Nitrogen Drought: some indicators from the Malawi experience', IFPRI, Policy Note 19, March 2014; S.S.Snapp, 'Soil Nutrient Status of Smallholder Farms in Malawi', *Communications in Soil Science and Plant Analysis*, 29 (1998): 2571-2588.

²² Tim Wise, *Eating Tomorrow: agribusiness, family farms and the battle for the future of food*, NY: The New press, 2019; Rachel Bezner kerr, 'Seed struggles and food sovereignty in northern Malawi', *Journal of Peasant Studies*, 40 (2013), 867-897.

²³ Stephen Devereux, 'The Malawi Famine of 2002', *IDS Bulletin* 33 (2002): 70-78

²⁴ See the recent critical report on the Alliance for the Green Revolution in Africa (AGRA) in which Malawi participates : *False Promises: the Alliance for the Green Revolution in Africa*, Rosa Luxemburg Stiftung, July 2020; Wise, *Eating Tomorrow*; White, *TEEBAgriFood*

²⁵ Rachel Gilbert, Todd Benson and Olivier Ecker, 'Are Malawian Diets Changing? An Assessment of nutrient consumption and dietary patterns using household-level evidence from 2010/11 and 2016/17', IFPRI, Working Paper 30, December 2019.

²⁶ For this argument see Stefan Koppnair, Menale Kassie and Matin Qaim, 'Farm Production, market access and dietary diversity in Malawi', *Public Health Nutrition*, 20 (2017): 325-335; S.S. Snapp and M. Fisher, "'Filling the maize basket" supports crop diversity and quality of household diet', *Food Security*, 7 (2015), 83-96.

²⁷ Monsanto was bought by Bayer in 2018 and became part of its crop science division.

²⁸ Reimer Gronemeyer, Michaela Fink and Jonas Metzger, *Maize and Malnutrition in Malawi*, GIS, Geissen, 2015.

²⁹ Most land is held under communal tenure, but especially in densely populated areas of the south this has not prevented the development of informal (as well as formal) land markets. Land reform programmes, driven by neoliberal concerns around the “inefficiencies” of customary tenure, have often stumbled.

³⁰ Jacob Jeketule Soko, 'Agricultural Pesticide Use in Malawi', *Journal of Health Pollution*, 8 (2018).

³¹ Bob Baluch, Todd Benson, Alvina Erman, Yanjanani Lifeyo and Priscilla Mkweta, 'Malawi's Challenging Employment Landscape, IFPRI, MASSP Working Paper, 2019.

³² Martin Whiteside, 'Ganyu Labour in Malawi and its Implications for Livelihood Security Interventions', ODI, AgREN, Network Paper 99, January 2000; Deborah Bryceson, 'Ganyu Casual Labour, famine and HIV/AIDS in rural Malawi: Causality and casualty', *Journal of Modern African Studies*, 44 (2006): 173-202. On promotion of herbicides and reduction in demand for ganyu: T.J. Bouwman, J.A. Andersson and K.E. Giller, 'Herbicide induced hunger? : Conservation Agriculture, Ganyu Labour and Rural Poverty in Central Malawi', *Journal of Development Studies*, 2020.

³³ Soils, Food and Healthy Communities <https://soilandfood.org>.

³⁴ James MacCann, *Maize and Grace: Africa's Encounter with a New World Crop, 1500-2000*, Harvard Univ Press, 2005.

³⁵ Note: Colin Trapnell's detailed soil surveys in neighbouring Northern Rhodesia from the 1950s; Kate B. Showers, 'A History of African Soils: Perceptions, Use and Abuse' in John R. McNeill and Verena Winiwater (eds), *Soils and Societies: perspectives from environmental history*, White Horse Press, 2006. Plus William Beinart

³⁶ Original papers in library of LSHTM. Edited version : Veronica Berry and Celia Petty (eds), *The Nyasaland Survey Papers, 1939-43: Agriculture, Food and Health*, London: Academy Press, 1992; Cynthia Brantley, *Feeding Families: African Realities and British Ideas of Nutrition and Development in Early Colonial Malawi*, 2002.

³⁷ On the meaning and history of hunger and food in another part of Malawi see Elias Mandala's wonderful book, *The End of Chidyerano: A History of Food and Everyday Life in Malawi, 1860-2004*, Heinemann, 2005.

³⁸ Mindi Schneider and Philip Mc Michael, 'Deepening, and Repairing, the Metabolic Rift', *Journal of Peasant Studies*, 37 (2010): 461-484.

³⁹ Summarised in Kees Jensen, 'The Debate on Food Sovereignty Theory: Agrarian Capitalism, Dispossession and Agroecology', *Journal of Peasant Studies*, 42 (2015): 213-232.

⁴⁰ <https://soilandfood.org> is a major example – though it is important to note that there is also auto-critique and nuance. See especially the work of Rachel Bezner-Kerr (Cornell University) who is centrally involved in this initiative and soil scientist, Seglinde Snapp (Michigan State University).

⁴¹ Joseph Kangmennaang, Rachel Bezner-Kerr and Isaac Lunginaah, 'Impact of migration and remittances on household welfare among rural households in Northern and Central Malawi', *Migration and Development*, 7 (2018), 55-71 – analyses the impact of remittances in households involved in the Soils, Food and Healthy Communities project.

⁴² Rachel Bezner Kerr, Catherine Hickey, Esther Lupfaya and Laifolo Dakishani, 'Repairing or reproducing inequalities? Agroecology, food sovereignty and gender justice in Malawi', *Journal of Peasant Studies*, 46 (2019): 1499-1518.

⁴³ But see the extensive work of soil scientist Seglinde Snapp and her colleagues who (unusually) cross this polarised debate: <https://www.canr.msu.edu/people/snapp>