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Configurations of agency and power in the academic discourse on the Green Revolution in East Africa

Saurabh Arora

Agency

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About the author

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Contents

Acronyms

AGRA	Alliance for a Green Revolution in Africa
FAO	Food and Agriculture Organization
FOSCA	Farmer Organization Support Center for Africa
GR	Green Revolution
HYV	High Yielding Variety
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
ISFM	Integrated soil fertility management
KARI	Kenya Agricultural Research Institute
MVP	Millennium Villages' Project
NERICA	New Rice for Africa
NGO	Non-Governmental Organisation
PPP	$1.25/day/person
SSA	Sub-Saharan Africa
WTO	World Trade Organization

Abstract

In this paper I perform a discourse analysis of the academic literature on the Green Revolution in East Africa, governed by two questions: what form or shape is given to agency in each GR study? And, which agencies are considered prime movers that play leading roles in the narratives and which others are relegated to subsidiary roles? A wide variety of figurations of agency are mapped, including socio-ecological events that are Malthusian or critical, heroic individuals, technology and its users, as well as relational entanglements between social, ecological and technical entities. Yet, the analysis reveals that the process of adjustment and adaptation between different social, ecological and technical entities, *in practice*, on farmers' fields and beyond, is largely unarticulated in the GR discourse. Central among prime mover figurations are national governments, donors, scientists, market-based approaches and agricultural intensification technologies. I argue that such figurations help legitimate government and donor driven GR efforts in the last decade and a half, which are delivered largely through market mechanisms. Subsuming heterogeneous entities into unified groups such as East African smallholders, or Sub-Saharan African soils, some studies may depict their actions as homogeneous. Such homogenisation masks relations of power within groups and obscures the ontological multiplicity of things. Homogenising depictions of (inefficient) smallholders and (depleted) soils may also help steamroll the use of standardised modern technologies such as inorganic fertilizers.

1. Introduction

In the last few decades, a number of attempts have been made to get a Green Revolution (GR) off the ground in Sub-Saharan Africa (SSA). Most of these attempts are viewed as unsuccessful, particularly in comparison with Asian successes in rice and wheat yields (Djurfeldt *et al*. 2005). Yet hopes for a new GR in SSA continue to be alive. Several strong commitments to an African GR have been made during the last decade. Perhaps the most prominent among them is the Alliance for a Green Revolution in Africa (AGRA), supported by the Gates and Rockefeller Foundations (Toeniessen *et al.* 2008). Annual African GR Forums are now attended by representatives of many African Governments and by international firms. The East African region, and especially Kenya, has been at the centre of this renewed thrust for a GR (Odame and Muange 2011).

The new proponents of an African GR call for harnessing the 'best' science and technology for agricultural innovation (e.g. Pingali 2012). They also promote the building of better market infrastructures for poverty reduction. Critics, on the other hand, argue that such a techno-fix and marketisation-based approach ends up disregarding and marginalising more viable African agricultural alternatives (e.g. Holt-Giménez 2008). Rather than rehearsing this debate in the present paper, I focus on the different *figurations given to agency and power* in published academic studies on the GR in East Africa (focussing particularly on Kenya). To map the figurations, I ask what 'flesh and features' are given to agency defined as the capacity to act (Latour 2005: 53). In doing this, I follow the studies closely and make no prior assumptions about who/what can act. Actors can be (individual) humans, nonhumans, or any relational combination between them. To map power, following Stirling (2014), I ask how asymmetrically structured is agency in a GR study, which actors are considered prime movers, and which others are relegated to subsidiary roles working for or against the prime movers?

Mapping these configurations of agency and power in GR framings is important for three reasons. First, it allows one to document a range of agencies that are considered instrumental for achieving a GR in the academic discourse. Figurations of successful agency and prime-mover power, afforded to some entities, may be used as justifications for promoting and sustaining them. Conversely, figurations of detrimental or failed agency, presented in the form of critique, may be used to create space for alternatives. Second, mapping figurations allows one to distinguish between agencies cast as individuals (e.g., a farmer, an organisation) and as relationally constituted. For relational agencies, what constraints and affordances are identified as important for success or failure? And what constraints and affordances are identified: are these restricted to humans (social relations) or are things (ecological and technical entanglements) also brought into the picture? Third, mapping these figurations allows comparative analyses between different framings of prime movers and subsidiaries, as well as of relations that are social, ecological and/or technical.

In order to select the academic studies on the East African GR, I relied on Scopus. I selected all studies listed in Scopus by searching for 'green revolution' in combination with 'East Africa'. To this selection, I added the studies revealed by searching for 'green revolution' with Kenya. This yielded a total of 25 studies in the GR-East Africa-Kenya selection. Barring two studies, one each from 1975 and 1984, all were published in the last 15 years (since 2003). One of the 25 studies is in the German and, due to my linguistic limitations, had to be excluded from the analysis. Thus, for the discourse analysis, I address my questions on figurations of agency and power to each of the remaining 24 studies. A small subset of these studies is generally critical of the technology-driven intensification implied by conventional GR initiatives, particularly when it comes to sustainability (e.g. Tully *et al*. 2016; Wood *et al*. 2015; Brooks 2014; Thompson and Scoones 2011; Goldberger 2008). These studies thus allow me to map figurations of detrimental agency associated with GR technologies or interventions. Yet, a bulk of the mapping of figurations of agency and power is from studies that are not generally critical of the GR and therefore

prone to associating successful effects with technologies and GR-promoting institutions (as well as markets).

2. Conceptual Anchors

Following Latour (2005: 71) and Giddens (1984: 14), agency may be treated as the capacity to act, by 'making a difference' on/to 'a state of affairs. Here, making a difference does not stand for *ex nihilo* production (of decisions and outcomes). Neither can it be reduced to a cause to effect linearity. It includes the making of various non-deterministic and non-linear effects.

I examine *what figurations are given to agency* in a GR narrative. In other words, what 'flesh and features' are ascribed to agents so as to 'make them have some form or shape' (Latour 2005: 53). This form or shape in conventional figurations may be individual humans and collective groups (or networks), women and men, farmers and workers, firms and non-governmental organisations (NGOs), scientists and governments. Figurations of agency may also be one or more nonhumans such as insects, plants, technologies, policies, plans, economic indicators and models. Many of these nonhumans are developed and deployed by humans, and may not be separable from their human developers and users in the real world. In this paper, my focus is on *representations* of humans and nonhumans as doing things and producing specific effects. I map the depictions of humans and nonhumans, in GR narratives, as making a difference to a state of affairs.

Additionally, figurations of agency could include social structures such as (traditional) norms and (informal) rules that shape human actions and interactions. According to such depictions, structures have the capacity to make a difference to human states of affairs. Structures are thus given agency. Structures could also be depicted as processes, as structuration in which rules and resources are (gradually) transformed (Giddens 1984: 25). Figurations of agency as processes may go beyond structures, to include processes the diffusion of a technology, the implementation of a policy, the growth of a plant, or the marketing of a crop.

In addition to mapping who or what is given the capacity to act, in the selected GR narratives, I also map how the effects of this agency are represented. Effects may be situated anywhere on the gradient between an immensely positive achievement to callous neglect and disastrous failure.

Empirically, states of affairs may be framed in accordance with particular missions or objectives, at different scales and in different contexts. Examples of missions include project implementation, agricultural input delivery, climate adaptation, or sustainable development, in which one or more actors (e.g., farmers and bank managers) make a difference (e.g., through technology adoption or credit provision). In general, figurations of agency to people or things are made possible by the active or passive presence of others. These others constitute states of affair which are acted upon.

The second question that animates the discourse analysis is related to power as asymmetrically structured agency (Stirling 2014). I map the framings of power in discourse. These framings are important to study not only to appreciate how power is written into academic discourse,[1] but also because they are performative. In various non-linear and uncertain ways, framings move beyond the page and contribute to transforming people's social practices and subjectivities (Callon 2007), by becoming embedded in policies, strategies, projects and other interventions.

[1] The relation between power and discourse has been central to much Foucauldian discourse analysis (see e.g. Hajer and Versteeg 2005; Dryzek 2013). Discourse analysts have focussed on contestation between competing discourses deployed and mobilised by different actors, power exerted by an authoritative or dominant discourse, and disempowering effects that may be produced by discourses. My aim in this paper is somewhat more specific. Rather than focusing on discourses as wholes, I try to capture the implications of discourses for power, by focusing on how they represent agency and power in the GR narratives.

To map depictions of power, I explore how a narrative accounts for difference between members of a collective entity in society (e.g. a class, a tribe) and nature (e.g. trees, soils). When difference within a collective is not account for, the *essentialised* group may be understood through the lens of a representative agent. And when difference is accounted for, I attempt to map how any within-group asymmetries and hierarchies are represented.

I also map which agencies, individual or collective, structural or processual, have the status of prime movers in a text conferred on them. A prime mover is the leading agency populating a narrative. It has a transformative effect on a focal state of affair. It may even transform multiple states of affair. Picking its prime movers, and often treating them as autonomous, a text may use them as points of reference. A prime mover is then presented as an inevitable force: others must act in reaction to it. These others' agency is thus made subsidiary to the prime mover. They react to the prime mover, but do not respond to any of their other social, economic or environmental concerns. Or they may subsume these other concerns in their reaction to the prime mover. This reactive agency of subsidiaries may either be presented as working *for* the prime mover, as an assistant in influencing a state of affairs, or it may be presented as working *against* the prime mover, resisting or rejecting it, dialectically. When a subsidiary agency is a collective entity such as a tribe or a social group, I also map how narratives account for difference within them, as noted earlier.

The concepts outlined above, of agency and power, may be used to map any depiction of action. In the East African GR narratives, I aim to capture which entities are given the agency and power to act. In performing the discourse analysis, however, I do not focus on the agency of the authors of the narratives. I do not map how the GR narratives articulate the agency of their own authors. And I do not focus on the motivations that drive authors and future 'owners' of discourses. Clearly the interests and preferences of the authors and owners may be reflected in the content and deployment of discourses. But I do not trace these interests and preferences. Nor do I attempt to map the processes through which they may enter the discourses. I am only interested in mapping what is said in the texts, who does what and whose agency is conferred the status of a prime mover? After carrying out this mapping, I discuss the implications of these configurations of agency and power depicted in the academic discourse on a GR in East Africa.

3. Figurations of Agency and Power

In the East African and Kenyan literature on the Green Revolution, I encountered a wide range of figurations of agency. Contrary to much social theory that considers agency to be an attribute of humans only, (individualised) nonhumans were routinely given agency in the narratives. Among these nonhuman entities are technologies as well as forces of nature.

Figurations of agency may often be *individualising*, centred on a unitary human or nonhuman who may be given the credit for or the burden of acting. Such depictions marginalise the individualised entity's relations that afford and constrain action, as well as structural forces that condition individual action (Giddens 1984; Latour 2005). Individualising narratives may sometimes account for multiple agencies that act side by side. In such narratives, agency to influence a particular state of affairs is thus pluralised. Depictions of pluralised agency may make explicit how different human and/or nonhuman actors work alongside each other. The latter depictions of agency are *relational*. In these depictions, action is presented as distributed across many interconnected entities that participate in influencing a state of affairs, mediating each other's influence. Interconnected entities may either afford or constrain each other's actions. In relational figurations of individual agency, it may be made explicit how an individual's agency is afforded or constrained by her relations with human and nonhuman entities. In this way, the collective behind the individual is brought to light (Callon and Law 1997).

Below, I begin with some figurations of agency ascribed to socio-ecological events and processes such as population growth and rainfall patterns, classifying them as Malthusian and Critical agencies. This is followed by a discussion of individualising figurations of agency. In addition to heroic scientists and governments, these include modern technologies and some economic models and indicators. Finally, I discuss figurations of relational agency.

3.1. Socio-Ecological Events: Malthusian and Critical Agencies

Of the processes that are given agency in the GR narratives, particularly interesting are figurations of what I call Malthusian agencies. These focus on versions of rapid population growth which is given the agency of creating widespread hunger, afforded by stagnant grain yields and cultivation area (Kijima *et al*. 2006; Otsuka and Yamano 2006). The same rapidly growing population also presented as producer of socio-economic changes such as land disputes and fragmentation, and erosion of 'customary' land laws (Fleming 1975). These changes are presented as if the latter laws have never had to deal with changes in population levels in their history. 'High human population growth rates' may also further complicate the challenges of food insecurity and poverty in Africa 'resulting from poor crop yields' (Khan *et al.* 2014: 334).

In the form of assumptions that growth of rural population produces scarcity of 'better' land (Belshaw 1984), which pushes people into urban areas (Otsuka and Yamano 2006), Malthusian agencies may also be embedded into policies and models for planning the future of agrarian and structural change. Figurations of Malthusian agencies may also be used to create space for proposing alternatives, to address the damage they are depicted as causing. Consider the agency ascribed to 'decreasing land *per capita*', resulting from population growth, which leads to the 'adoption of improved varieties by smallholder pigeonpea farmers [that] is key to increasing their output and incomes' (Simtowe and Muange 2013: 164).

What I refer to as Malthusian agencies are, in general, manifest as crises arising out of population growth, which produce large-scale socio-economic effects. Milder and smaller crises may also be presented in the form of a critique of extant situations. This critique may be based on ascription of negative agency, of producing discontent and failure, to some entities and processes. The negative effects are made explicit in order to create space for the promotion of a narrative's preferred

alternatives. The role of these critical agencies in narratives is clearly highlighted by Goldberger (2008). She argues that in Kenya:

> Organic agriculture NGOs emerged because of widespread discontent with the research orientation, technology dissemination practices, and social/environmental externalities associated with the green revolution. *Stories* about the 'failure' of the green revolution regime – part of the larger critique or 'deconstruction' of formal agricultural technoscience – created space for new institutions (NGOs), new agricultural ideas (e.g., organic farming), new research methods (e.g., participatory approaches), and new information dissemination strategies (e.g., farmer-to-farmer training).
> Goldberger 2008:277

Here, according to Goldberger, the critique of the GR assumes the agency of opening up actual space for the promotion of non-intensive agricultural methods.

'Conventional forms of development interventions', often donor-funded, are depicted as creators of 'accountability challenges because of their propensity to create power imbalances, competition among local development partners, and a mind-set of dependency and marginality among beneficiaries' (Ndiame *et al*. 2016: 201). Here the authors construct a supposedly unified and homogenous category, 'conventional forms of development interventions', to launch a critique. The critique serves to create space for the authors' own favoured intervention of the Farmer Organization Support Center for Africa (FOSCA). In the latter half of the authors' narrative, FOSCA is the prime mover. It empowers farmers, stimulates linkages between farmers and extension services and furthers collaborative relationships (Ndiame *et al*. 2016).

Critique may also be directed toward an extant non-GR situation to promote intensive agriculture. For example, the agricultural sector in Africa is criticised for its 'poor performance' and is predicted to lead to an increase its food imports in the future (Toeniessen *et al*. 2008: 234). African agriculture, not yet 'an engine of economic growth', is criticised for the lack of poverty reduction that can be achieved through urbanisation (*ibid.*). This critique lays the foundation for the furthering of some agencies such as 'African Governments, the international community, and the private sector to reverse trends by stimulating gains in agricultural productivity' (*ibid.*). Similarly, the public sector-based distribution of food, and development of agricultural technologies, in Kenya may be considered a failure, in order to create the space for market reform to further 'the push for liberalisation of the cereal input sector' (Odame and Muange 2011: 79). In pushing this liberalisation, agency of the critique joins forces with that of the World Bank and the International Monetary Fund, with their structural adjustment programs (Odame and Muange 2011).

3.2. Individualising Agencies

Included among nonhuman figurations of agency are some economic indicators and models (of change). These models and indicators present a socio-political and socio-ecological situation or process in narrowly economic terms. In this way, on the page, they economise a complex reality of diverse socioeconomic relations that underpin economic production and exchange. Examples of such economising agencies include the *poverty line* that represents poverty in terms of a number, such as $1.25/day/person (PPP). This figure individualises people, isolating them from their socio-ecological relations, in order to then perform comparisons between them. Individualised persons, households or villages below poverty line then become targets of development interventions, to improve livelihoods and practices.

Other economising agencies such as agricultural *productivity growth* may be argued to reduce poverty, often mediated by the 'model of structural transformation; (Jayne *et al*. 2003: 255). Here productivity growth may be measured for an individualised farm, village, region or country. In order to achieve this

productivity growth, development interventions are designed to transform impoverished smallholder agricultural realities (Toeniessen *et al*. 2008). Yet other economising agencies include the concept of 'market failure' (and missing markets) due to which productivity growth and technology uptake are argued to be low (Toeniessen *et al.* 2008: 238). Similarly, (high) transaction costs and asymmetric information may be given the agency of slowing down the delivery of results from public-private partnerships (Scoones and Thompson 2011: 6). Interestingly, legal entities not directly associated with economics, such as 'trade and licensing arrangements and restrictive domestic laws in the seed industry', may be presented as economising agencies by producing 'inadequate competition and high input prices' (Odame and Muange 2011: 79). Even agriculture as a whole may be given the economising agency of influencing 'national economies through forward and backward linkages' (Toeniessen *et al*. 2008: 233).[2] And 'the [homogenised] Asian experience', mapped using long-term panel data on agricultural incomes and data on nonfarm labour markets, given the agency to strongly suggest that an African GR must be realised to increase 'the ability to participate in nonfarm activities in Sub-Saharan Africa' (Otsuka and Yamano 2006: 397).

Agency is ascribed to statistical models and correlations, which indicate that most smallholders have 'limited potential to break out of poverty through high-return off-farm activities' (Jayne *et al*. 2003: 260). This indication then becomes performative, by making the policy case for 'improving access to land among the most land-constrained smallholder households' to reduce poverty (Jayne *et al.* 2003: 271).

The performative power of claims associated with (numerical) indicators and models may depend on the assumption that they represent reality adequately and accurately (Callon 2007). Numbers (and statistical correlations, revealed by models) thus may be equated to actual realities of development and underdevelopment of agriculture, through claims such as 'organic agriculture is severely underdeveloped in Africa' as 'certified organically managed farms – approximately 119,140 farms on 1,025,898 ha – represent a mere 0.2% of the continent's total agricultural' (Goldberger 2008: 275-276). In this depiction, numerical data are believed to adequately capture the underdeveloped reality of organic agriculture in Africa. No issues with missing data, their incomplete coverage, the models' partial representation of a complex reality, their uncertainties and ambiguities, are revealed or discussed. Generalised figures such as this may also mask important 'variations through time and space' (Scoones and Thompson 2011: 2).

3.2.1. Heroic Individuals

Figurations of individualising agency can be GR heroes (Sumberg *et al*. 2012), especially when it comes to scientists such as Norman Borlaug, often referred to as the father of the GR. Borlaug may be isolated from his own colleagues and celebrated as an individual scientist who 'transformed the breeding of wheat' and thereby playing a central role in averting 'the Malthusian tragedy (Pollock 2008). If relational constraints, such as the lack of availability of equipment and trained colleagues on Borlaug's agency, are identified they appear to place emphasis on Borlaug's heroism in overcoming all obstacles placed in his way. Borlaug is accorded the role of a prime mover in the narrative.

Other scientists figure as ushering in new technologies such as 'large-scale molecular genomics' that provide access to 'previously inaccessible sources of genetic variation' (Philippe *et al*. 2009: 539). The latter 'could be exploited in breeding programmes'. Researchers' heroic agency may not be confined to the breeding laboratories and programmes, but rather extend to their actions in exposing individual farmers to new technologies (Simtowe and Muange 2013: 162).

[2] Acknowledging the economising agency of agriculture through its linkages, investments by donors such as The Rockefeller Foundation promote agricultural intensification for poverty reduction and multi-sectoral economic growth in Sub-Saharan Africa (Toeniessen *et al*. 2008). Economising agencies are thus embedded in donor strategies and end up producing divergent effects on farmers' lives and lands.

Figurations of individualising agency to produce significant farm-based effects may be given to outputs of scientists' discovery and development processes. For example, improved varieties (of Sorghum in Ethiopia) developed by scientists are depicted as 'widening the genetic base' on farms (Mekbib 2008: 355). Fertilizers are given the sole credit of quickly reversing 'decades of soil nutrient depletion and have a quick impact' (Nziguheba et al. 2010: 105). Technologies with proper names such as *Sonalika* and *Siete Cerros*, semi-dwarf varieties of wheat that are made resistant to stem rust, are given the agency of forming 'the backbone of the green revolution; (Hodson 2011: 95). Generally, in these figurations, the role of farmers in adapting and adjusting the technologies to work on the farm is marginalised.

Heroic agency may also be ascribed to individualised ecological entities. For example, Philippe *et al*. (2009: 538) attribute to trees (undifferentiated) the agency of being the 'best protectors of soil fertility' (Philippe *et al*. 2009: 538). This recognition of trees' agency is then used to justify a call for 'shaded cultivation' of coffee, and conditions for reforestation are argued to exist in all relevant countries. Generalising positive agency to nonhuman entities, especially as they are individualised, may thus be performed to promote the further deployment of the entities, often through their commodification.

3.2.2. Unwanted Individuals

Agency of some individualised techno-scientific and ecological entities may be presented as unwanted. For example, the phenomenon isolated by scientists as genetic erosion, defined as 'the loss of genetic diversity', is given the agency of reducing 'the short-term viability of individuals and populations, the evolutionary potential of populations and species and the direct use of genetic resources' (Mekbib 2008: 352). Processes such as 'erratic weather patterns and increasing climate variability (Ingram *et al*. 2010)' may act to worsen the 'uncertainty of obtaining higher yields' (Scoones and Thompson 2011: 2). Similarly 'unpredictable weather patterns' may be given the agency of producing 'the erratic nature of agricultural input demand' (Odame and Muange 2011: 85).

On Sub-Saharan farms, Gilbert (2012) argues that depleted soils produce an average *stagnating* yield of grain crops, 'at around one tonne per hectare since the 1960s (Gilbert 2012: 526). Using a statistical average to make a general claim about soils in SSA, Gilbert (2012) ends up obscuring all agro-ecological diversity within the region. Soils across SSA are homogenised and thus individualised.

Insect pests are argued to work against 'efficient production of cereals in Africa, with lepidopteran stemborers, such as the indigenous *Busseola fusca* (Fuller), and the invasive *Chilo partellus* (Swinhoe) being the most important in most parts of Africa' (Khan *et al*. 2014: 334). These pests work as (negative) prime movers by attacking crops and causing yield losses. Similarly, leaf rust and stem rust, identified as diseases of wheat, and treated as individualised agents, are presented as producing important economic damage to cereals. Prominent among these was a Ugandan race of stem rust (Ug99) with a 'broad virulence range', which is given the agency of overcoming most 'resistance genes' in wheat (Hodson 2011: 97). Similarly, yellow rust as pathogen is presented as possessing the ability to 'adapt and acquire new traits that give it a competitive advantage' (*ibid.*: 104). Yellow rust is depicted as an 'exotic incursion', most likely from Europe into Australia, and blamed for producing 'significant production losses' (Hodson 2011: 96). Globalisation is made responsible for many 'exotic incursions'. Resulting 'stem rust epidemics' then serve as the 'driving force' in the development of rust control and mitigation efforts (Hodson 2011: 94). In this way, stem rust and its epidemics are treated as prime movers, for and against which other forces work. Globalisation manifests as a subsidiary force, working *for* the rusts by facilitating exotic incursions. Resistance *against* rust is inserted into semi-dwarf varieties of seeds by scientists such as Norman Borlaug. National and international mitigation efforts are enacted against rusts, and presented as if stem rusts provided the sufficient conditions required for these efforts to emerge. Thus, multiple local, national and global agencies are presented as subsidiary, reacting to the stem rusts. Yet farmers are largely missing from the picture. They do not even seem to have the reactive subsidiary agency, working for or against the stem rusts.

Individualising the agency of farmers, it may be depicted as detrimental (to the farmers themselves and for market or value chain development in African agriculture), producing unwanted effects. Some examples include the figuration of individualising agency of a (woman) farmer, named Catherine: the effect produced by her farming action is undesirable, in the form of a failing crop (Gilbert 2002). Farmers' attempts at organising themselves to 'achieve economies of scale' are considered ineffective (Toeniessen *et al*. 2008: 238). As a result, they are unable to drive down transaction costs to improve access in farm-input and capital markets. This generalisation about farmers' ineffectiveness is claimed to apply to 'most rural areas' (*ibid.*). The ineffective individual farmer is thus made representative of the majority of farmers in Sub-Saharan Africa.

Rural communities isolated from their surroundings (individualised) are brought into the picture as weak, lacking 'a common voice and resources needed to hold local [development] organisations to account' (Ndiame *et al*. 2016: 200). Southern African farmers' continuous cultivation practices are argued to reduce soil fertility (Rowntree and Fox 2008: 42). Thus, when the agency of farmers is actually accounted for, it is often presented as homogeneously ineffective and problematic. Representations of farmers' agency are thus essentialising.

3.2.3. Individualising Use

The production of technology's effects may be centered on the individualized process of its use, or practice. For example, increased fertilizer use may produce "bountiful harvests" and nearly triple maize yields (Gilbert 2012: 527). Fertilization is also given the agency of decreasing the "diversity of plant communities" (Wood *et al*. 2015: 745). Similarly, "high rates of N fertilizer use in agroecosystems" are attributed the agency of causing some environmental damage in the form of "increased concentrations of nitrate (NO3) in ground and surface waters" and "increased soil emissions of nitrous oxide" (Tully *et al*. 2016: 1907-8). And practices of the "more intensive management" type, associated with GR technologies of the 1960s, are presented as having "transformed wheat production systems" (Hodson 2011: 95).

Individualizing figurations may be given to structural forces such as the 'tradition' underpinning some farmers' practices. Consider for example, the homogenisation of farmers' pre-GR "non-intensive management practices" which do not produce crops, but rather *under* which "traditional wheat cultivars with long growth cycles were grown" (Hodson 2011: 94, emphasis added). Tradition appears to rule the roost here. Yet these 'traditional wheat cultivars' and pre-GR practices, as depicted by Hodson, were not adaptive or innovative. Nor was it heterogeneous. Tradition was thus essentialised.

More favourable depictions of farmers' traditional practice of "diversified farming" consider it adaptive and useful for "spreading risk in uncertain weather conditions as well as to meet dietary needs" (Brooks 2014: 22). Brooks also recognizes that "farmers rely on informal seed systems to provide locally adapted varieties" (2013: 23; similar claim made by Odame and Muange 2011: 87). Thus, structures such as traditional practices and informal seeds systems are not considered static but as evolving over time in providing "locally adapted varieties". This evolution takes place "through intergenerational transfer of knowledge and expertise and traditions of reciprocity and mutual support" (Brooks 2014: 22).

3.2.4. Individualising Organisation

The importance of actions by a range of individualised non-state organisations is widely recognised in the literature on East African GR. These include NGOs, private corporations that develop and market farm-inputs, and agro-dealers. Prominent among non-state organisations are donors such as the Rockefeller and Gates Foundations (Toeniessen *et al*. 2008). The Rockefeller Foundation, for example, is given the agency to 'build the national and international research resources necessary to generate and disseminate agricultural interventions that can increase the productivity, profitability, and sustainability of small-scale farms in developing countries' (Toeniessen *et al*. 2008: 235). It experiments with subsidies that are 'market smart'. In turn such subsidies 'stimulate demand for fertilizer and seed from private markets by providing farmers with targeted vouchers redeemable at local shops to help

cover the cost of specific inputs' (Toeniessen *et al*. 2008: 237). The Rockefeller Foundation is thus depicted as a prime mover, for which other agencies play subsidiary roles.

The new green revolution in Kenya is promoted by the AGRA, which is supported by the Rockefeller Foundation and Gates Foundations. AGRA is given the agency of establishing its Agro-dealer Development Programme and investing millions of dollars into it (Odame and Muange 2011).[3] AGRA, individualised, sets its own goals and operationalises its mandate by providing funding and technological assistance across the agricultural value chain (Ndiame *et al*. 2016).

Other international organisations such as the Food and Agriculture Organization (FAO) are given the agency to promote agricultural solutions such as 'greener, cheaper' alternatives to inorganic fertilizers (Gilbert 2012: 525). Similarly, CGIAR[4] organisations such as the International Food Policy Research Institute (IFPRI) make predictions about Africa remaining a ' "troubled region" in terms of imbalance between food demand and supply' (Toeniessen *et al*. 2008: 234). Nationally, the Kenya Agricultural Research Institute (KARI) given the individualising agency of redirecting 'some of its wheat research efforts to address the problems faced by smallholders' (Makanda and Oehmke 2007: 42).

Some local development organisations, argued to be overly focused on their own survival, are given the agency of maintaining the status quo (as far as poverty is concerned), in order to continue using 'the plight of the poor to ensure a never-ending stream of funding from donors' (Ndiame *et al*. 2016: 201).[5]

3.2.5. Decision-making and Implementing Agencies

Farmers as a unified group may be individualised and given the agency to make decisions about resource use on their lands (Rowntree and Fox 2008). This recognition of farmers' decision-making agency is used to call for 'effective policies that sustain land productivity', which are based on development practitioners' empathy with the farmers (Rowntree and Fox 2008: 40). Resource-poor farmers in Kenya, unified as a group, are presented as agents who make choices, of buying 'small quantities of certified seeds' from agro-dealers, while mainly using seeds sourced from their informal networks (Odame and Muange 2011: 85). Farmers may decide not to grow a variety when it does not perform well 'for yield and resistance against various biotic and abiotic stresses' (Mekbib 2008: 354). In addition to making decisions and choices, farmers may figure as perceivers of phenomena such as genetic erosion in the form of 'loss of variety' on the farm (Mekbib 2008: 354).

Farmers as a unified homogenous group may be presented as implementers of 'the grand plans of scientists, international donors and governments' to improve soil fertility (Gilbert 2012: 525). It is recognised, however, that this agency may unfold differently depending on the plans being pushed. For instance, in the case of labour-intensive practices such as no-till farming, farmers may be depicted as slow adopters (*ibid.*).

Differences among farmers may be recognised when Ugandan women farmers are presented as achieving lower yields than men (Kijima *et al*. 2006: 265), while acknowledging that it is not clear why the authors' analysis has revealed this 'result'. Similarly, Matsumoto and Yamano's (2013: 209) regression results indicate that, while the education level of men in a household is associated with the adoption of High Yielding Varieties (HYVs) of seeds, 'the education level of women in the household in Uganda has a negative association with the HYV adoption'. The reasons, again, for this 'unexpected

[3] Not quite a non-state organisation, the Washington Consensus structural adjustment programs are attributed the agency of producing a decline in fertilizer use in Africa (Nziguheba *et al*. 2010: 77).

[4] Consultative Group on International Agricultural Research

[5] The agency, to enhance the credibility of local non-state organisations, is given to 'well-written reports' (Ndiame *et al*. 2016: 200). The reports also supposedly encouraged donors to provide more resources to the organisations.

result' are unclear. In these figurations, farmers are not presented as homogeneous, as gender differences are acknowledged. Yet the acknowledged difference is rather problematic, as women farmers are considered to be lagging behind male farmers (for unspecified reasons). Women farmers as a sub-group are also homogenised.

Arguably the most important figurations of individualising agencies are given to African governments and policy. In these figurations, the state is often the prime mover (sometimes with relational constraints), with other agencies playing subsidiary roles. The Government, in Uganda, develops grand strategies to achieve their 'overarching development goals of poverty and food insecurity reduction' (Kijima *et al*. 2006: 252). It resettles people into villages across East Africa supposedly to promote agricultural improvement (Belshaw 1984; Fleming 1975). In Kenya, the Government built a public sector to develop and disseminate new technologies during the 1970s and 80s (Odame and Muange 2011: 79). It carries out market reform (Brooks 2014). Many governments in Africa align with international donors and scientists to promote agricultural technologies such as 'large doses of inorganic fertilizers" (Gilbert 2012: 525). The Kenyan Government collaborates with non-governmental organisations (Goldberger 2008). It also spearheads 'strategies for a new Green Revolution [in Kenya]' (Odame and Muange 2011: 78). As part of these strategies, 'modern farming inputs and technologies' are generated, promoted and used (*ibid.*). The agro-dealers who distribute these inputs play a subsidiary role to government strategies.

The state is given the credit of producing the so-called 'Malawi miracle' (Gilbert 2012: 526), by subsidising fertilizers and improved seeds. The miracle, 'according to government figures', involved a near tripling of maize yields between 2005 and 2009 as fertilizer use was almost doubled. In this sense, the agency of doubling yields in Malawi is pluralised, distributed between the state and the technologies it subsidises.[6] Yet the technologies play subsidiary roles to the state's prime mover.

Brooks (2014) corroborates this Malawian success story. She also gives credit to Malawi's 'input subsidy programme', which has led to surplus production of maize, while also functioning as a 'social protection mechanism that has reduced the need for food aid' (Brooks 2014: 19). A similar mechanism in other parts of SSA, in the form of a 'robust stimulus to agriculture' is ascribed the agency to trigger 'growth in non-farm sectors' and generate 'rural purchasing power for goods and services' (Jayne *et al*. 2003: 272).

Often the agency of success or failure of programmes for agricultural intensification and diversification may be centred on the government. The latter is then treated as the prime mover. Government policy is made responsible for 'realising a Green Revolution in Africa' to enhance food security and to raise farmers' incomes (Otsuka and Yamano 2006: 397). Similarly government policy, and public sector investment for developing labour and service markets, is treated as a 'key determinant of the magnitude of the [nonfarm] growth linkages to be derived from agricultural growth' (Jayne *et al*. 2003: 273). Nonfarm employees and farmers act as subsidiaries, in responding to incentives provided by the state to seek nonfarm employment (Jayne *et al*. 2003; Otsuka and Yamano 2006), to intensify agricultural production (Belshaw 1984; Kijima *et al*. 2006; Toeniessen *et al*. 2008),[7] or to diversify crops for climate adaptation (Brooks 2014).

In Kenya, the British Colonial Government set up price supports for European colonial settler-farmers, slapped tariffs on imports and restricted 'the marketing of produce grown by Africans' (Makanda and Oehmke 2007: 35). The same government also set up research institutions 'after World War II to

[6] If the state of affairs being transformed here is maize yield, this may viewed as a figuration of relational agency: the government (with its subsidy programme) is afforded by fertilizers and improved seeds.

[7] Brooks (2013) rightly criticises some official discourses that reduce farmers' (subsidiary) agency, in agricultural intensification, to 'consumer choice' of agricultural technologies. Such consumerisation of farmers leads, for instance, to a disregard of agro-biodiversity issues and a range of other social and technical challenges faced on the farm.

strengthen agriculture in East Africa' (*ibid.*: 36). Individualised colonial government policy resettled local people in 'emergency villages' (Fleming 1975: 50). Promoting agrarian settlement (of land), the policy's passive objects were the people who were resettled.[8] The individualised land title assumed the agency of putting an end to insecurity of tenure under 'customary law'. It also supposedly gave 'the poorest smallholder access to credit' and provided the foundation for increasing agricultural productivity in colonial Kenya (Fleming 1975: 57).

The government as a prime mover resettled people on land considered under-utilised. Farmers who were (forcibly) resettled played a subsidiary role by working as desired to raise agricultural production (Fleming 1975; Belshaw 1984).[9] When the resettled people were presented as opposing or leaving the settlements, their agency was used to reaffirm faith in the state's narrowly rational planning: people were considered wrongheaded and their opposition situated in a background of widespread 'political agitation' in Kenya (Fleming 1975: 50). Or they were considered archaic, led by 'those with an interest in maintaining the existing system' (Fleming 1975: 47). People's reasons for leaving the settlements were also reduced to debt or the lack of savings from settled agrarian production (Belshaw 1984). In this way, then, the settled agriculturalists' agency was situated *for or against* the state with its rational planning as the prime mover.

The Colonial Government in Kenya is presented as the rational prime mover that decided against allotting more land to the Kikuyu, opting instead for intensification to 'improve the methods of farming on the land already allocated to the tribe' (Fleming 1975: 50). Note how this depiction is underpinned by the assumption that the colonised Kikuyu were not using lands effectively and their cultivation methods needed improving. This is a case of disqualification of the practices of the colonised farmers (Arora 2017), rather than simply giving them subsidiary roles.

Moving into post-colonial Kenya, Kikuyu farmers are depicted as playing similar subsidiary roles. They are presented as initially unenthusiastic toward the Government's land consolidation programme. But they 'co-operated in the process', according to Fleming (1975: 51), as soon as they 'saw the advantages to be derived from this process'. In the end, the programme 'spread rapidly throughout the Kikuyu area'. Noticing the success, it appears that other tribes demanded the same process to be applied in their areas. Here, Fleming (1975) unifies and homogenises not only the Kikuyu but the other tribes in Kenya too. Critically however, this unification is restricted to the Kikuyu's subsidiary agency in favour of the government. Differences within the Kikuyu are clearly acknowledged when they act against the government, their oppositional agitation is argued to be limited to 'some sections of the tribe (Fleming 1975: 51).

3.3. Figurations of Relational Agency

Contrary to the expressions of faith in the agency of the state and its rational planning, developing country governments' agency may sometimes be presented as weak. This weakness may manifest in the form of 'the state's inability to meet the basic needs of the majority of the Kenyan population', due to the 'structural adjustment programs imposed by the International Monetary Fund' (Goldberger 2008: 276). The same structural adjustment programs force a transition from the state's focus on land (reforms) to markets, promoting 'privatization of government agencies, liberalisation of markets,

[8] In fact, the state was given the agency to remove people as it pleased, and at low 'net cost' if it was strong enough (Belshaw 1984: 273). Similarly forests, unified and homogenised, were treated as passive objects that could be relocated by state policy 'from high rainfall areas to less favourable ecological zones such as semi-arid areas' (Belshaw 1984: 274).

[9] It is interesting to compare the figuration of passive agency given to the farmers here with that of a 'pioneer [male] farmer' named Lord Delamare who 'began commercial production of wheat' in 1904, colonial Kenya (Makanda and Oehmke 2007: 35). Delamare was a hero, the prime mover of one section of the narrative. He helped set up the British East Africa Maize Growers Association, hired a wheat breeder named G.W. Evans and established a 'wheat experimentation centre in Njoro, 120 miles west of Nairobi (*ibid.*).

removal of government from agricultural markets, and elimination of subsidies' (Toeniessen *et al*. 2008: 238).

States, supported by donors, favour 'private sector actors and mechanisms' for the promotion of GR technologies such as fertilisers and other farm-inputs in Kenya (Brooks 2014: 19). However, this reform, it is argued, only furthers the agency of those larger companies that can absorb high transaction costs in procuring and delivering the subsidised technologies, which leads to market concentration. Similarly, Odame and Muange (2011: 79) present the Kenyan Government's agency of being 'actively involved in input provision'. In this, the Government is presented as receiving backing from the AGRA, the FAO and The World Bank.

In these figurations, the state's agency relationally afforded by donors and constrained by structural adjustment programs, but also the agency of large private firms, is afforded by the state through its privatisation policies. Figurations of relational agency focus on the identification of constraints, and the mutual alignment or affordance between disparate actors. I begin with some examples of the latter.

3.3.1. Aligning Relational Agencies

Odame and Muange (2011: 86) attribute prime mover status to a powerful network formed by an alliance between philanthropic, state and NGOs, which combine 'substantial external funding' with 'local elite interests' to dominate the agricultural policy agenda in Kenya. Similarly affording each other, the 'new wave of sustainable development and the reality of World Trade Organization (WTO) have led to new quality trends in commodity sector', which further the imposition of environmental quality criteria on countries that produce the commodities (Philippe *et al*. 2009: 526). Another example of mutually aligning relational agency lies in the depiction of participatory interventions, where development administrators work with communities to assess 'potential interventions for the local situations' (Nziguheba *et al*. 2010: 78). Participatory agency may also be taken into account through collaborative research interventions (Khan *et al*. 2014: 335-336). For example, a range of institutions including International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the University of Nairobi and KARI collaboratively develop and release early-maturing varieties of pigeonpea (Simtowe and Muange 2013: 163).

Mutually aligning fertilizer use and 'legume rotation practices' are given the credit of significantly increasing crop yields (Wood *et al*. 2015: 749). The role of farmers in these actions are made explicit by Wood *et al*. (2015: 745). In order to perform legume rotation, it is farmers who 'replace short-rain maize crops with fast-growing leguminous tree, shrub or herbaceous species'. The same combination, of fertilizer use and legume rotation practices, was also attributed the figuration of failed agency for another state of affairs, by not improving 'measures of soil quality, such as total soil C' (Wood *et al*. 2015: 750).

In many figurations of plural agencies acting in concert, relations between them are not made explicit. For example, depleted soils, scarce water supply, pests and diseases (leading to crop losses), poor infrastructures, 'use of traditional crop varieties', and 'inequitable land-distribution patterns' join together to produce 'low farm productivity in Africa' (Toeniessen *et al*. 2008: 233). Conversely, the agency to steadily increase '*per capita* staple food crop production' in most developing countries may be attributed to different green revolution technologies, including high yielding varieties, pest control, irrigation, fertilizers and mechanisation (Nziguheba *et al*. 2010: 76). The millennium villages' project (MVP) package of agricultural interventions focussed on mineral fertilizers and improved seeds given the agency of doubling maize yields (Nziguheba *et al*. 2010: 92). The MVP package is also presented as the prime mover in this narrative. Farmers enter as subsidiary actors who adopt technologies and learn, all in reference to the prime mover.

Technologies may also sometimes be ascribed the relational agency to produce harmful effects. Fertilizer use is presented as possibly leading to burning of young maize plants, 'in plots receiving high

doses of fertilizer, because low rainfall left fertilizer undiluted long enough to damage plant roots' (Tully *et al*. 2016: 1917). Plural technologies combined in 'intensive agriculture' figure as causing 'environmental damage, such as water pollution and greenhouse gas emissions', while driving 'increases in crop production' (Wood *et al*. 2015: 744). Intensification also alters 'the composition of soil microbial communities' (*ibid.*).

Based on statistical analysis, Mekbib (2008: 355) identifies a number of factors that cause genetic erosion in Sorghum (in Ethiopia). These include drought, falling farm size, reduced yields from some varieties (leading to their discontinuation), and the rise of other crops such as *Khat* and maize. In this way, the agency to produce genetic erosion is pluralised, yet relations between these plural agencies are not made explicit.

The mutual affordance between fertilizers and soil organic matter is explicitly accounted for, as part of an integrated soil fertility management (ISFM) strategy (Toeniessen *et al*. 2008: 237). In ISFM, fertilizers greatly increase 'the production of organic matter', while 'organic matter in the soil improves its water-holding capacity and increases the efficiency of fertilizer use by crops' (Toeniessen *et al*. 2008: 237-238). Similarly, the agency to produce *variation* in soil Nitrogen pool is ascribed to soil texture (e.g., clayey or sandy), which is in turn afforded by 'farm management' (Tully *et al*. 2016: 1917). Here, Tully *et al*. (2016: 1917) are arguing that fertilizers' agency is mediated by both soil type and climate, which 'will combine to create very different outcomes for both farm productivity and N cycling across the [Sub-Saharan African] region'.[10]

Afforded by other entities, even small farmers are depicted as able to act to extricate themselves from 'traditional' attachments and to make money. A farmer, depicted as a 'he', breaks 'away from tribal restraints in measure', after realising the benefits that he can 'achieve through the application of advanced technology' (Fleming 1975: 48). Similarly, Toeniessen *et al*. (2008: 236) show farmers as responsible for obtaining 'higher and more stable yields'. Yet this agency is relationally afforded by 'enhanced soil productivity combined with more resilient crop varieties' (Toeniessen *et al*. 2008: 236). And farmers' agency to increase farm profits is enabled by the 'presence of fairer and more efficient markets' (*ibid.*). The agency of African farmers as a group is afforded by their land (which is argued to be 'adequate to provide food security') and by intensification of production through a combination of 'genetic and agroecological techniques that require only small amounts of additional labour and capital' as well as by 'greater access to markets' (Toeniessen *et al*. 2008: 235). Here farmers' agency to act in the new GR programmes is explicitly contingent on their land, capital, labour, technology (e.g., 'resilient crop varieties') and better market access.

Figurations of relational agency are given to women farmers too. Beyadi, in southern Malawi, who also works as a schoolteacher, tends to her bountiful maize gardens to help 'feed her family of six' (Gilbert 2012: 525).[11] The author states explicitly that Beyadi's successful maize farming is not just down to her own efforts. Her success, according to Gilbert (2012: 525), 'is also due to what she feeds the soil. Beyadi borrowed money from a European friend to purchase two 50-kilogram bags of chemical fertilizer for this growing season'. Relational affordances, both technological (chemical fertilizers) and social (money-

[10] This raises the important question whether hybrid (social-ecological-technical) figurations of relational agency, by being attentive to the different ways in which humans and nonhumans interact on the farm and beyond, are better able to do justice to the agro-ecological diversity in regions such as SSA.

[11] Compare Beyadi's agency with that of her neighbour Catherine, 'an unmarried mother of four'. Where Beyadi's maize 'stands tall even in the lashing rain', the maize on her neighbour's field is yellowed and bows low (Gilbert 2012: 525). Beyadi's taller moral standing is thus presented as playing a supportive role in furthering her agency as a successful farmer with tall maize standing in her fields.

lending European friend), of the successful and progressive woman farmer's agency are thus clearly brought into the picture.

On the flip side, in new GR programmes 'farmers are incentivised to devote more land and other resources to maize cultivation', which discourages them from their traditional practice of diversification, inducing 'higher levels of maize dependence' and vulnerability (Brooks 2014: 22). Outside GR programmes, in instances of formally sponsored organic agriculture, farmers' agency is relationally afforded by training received from NGOs, in performing meticulous practices after receiving training from technical experts (Goldberger 2008: 285). Women farmers, in particular, felt empowered by possessing detailed knowledge of organic agriculture.

3.3.2. Manifesting Agencies

Farmers may be ascribed the agency of learning. Yet this agency is often latent, until made manifest by their encounters with new technology such as New Rice for Africa (NERICA) in Uganda (Kijima *et al*. 2006). As active learners, farmers are able to achieve higher yields, especially if they have past cultivation experience with the same crop. The new technology is the prime mover in the narrative, which more than doubles crop yields. Farmers, as learners and even if they are experienced, play (successful) subsidiary roles.[12] Other subsidiary actors taken into account include, soil fertility, relatively high rainfall, and some application of fertilisers (Kijima *et al*. 2006: 266).

Farmers are given the agency of practicing 'non-certified organic farming', especially in regions that are 'resource-poor or agriculturally marginal': this agency is made manifest by constraints posed by resource poverty and marginality, due to which they 'have no choice but to rely on locally available natural resources to maintain soil fertility and to combat pests and diseases' (Goldberger 2008: 275).

Farmers' agency, of having successfully achieved 'optimal nitrogen application level' in Kenya, is brought to the fore by market forces such as 'relative price change over time' (Matsumoto and Yamano 2013: 218). Having afforded precedence to market forces, this recognition of farmers' relational agency is then used to claim that 'a market-based approach, such as reducing the inorganic fertilizer price or increasing the maize price or both, would be effective in encouraging farmers to use more inorganic fertilizer in Kenya' (Matsumoto and Yamano 2013: 217). Here farmers' agency, by reacting to prices, is considered as subsidiary to the prime mover of a market-based approach.

Households' and communities' agency, in the form of adaptive capacity, is considered latent until made manifest by crises such as famines. People act by carrying out farm-based adaptation and migration that includes moving to areas where 'famine crops' such as Cassava can be grown (Brooks 2014). Households' and communities' agency here is, in a specific way, relationally afforded by the constraint of a crisis.

3.3.3. Constraining Agencies

Farmers' agency to achieve high yields argued to be relationally constrained by 'the profitability of the crop and the farmers' ability to save and reinvest in agricultural inputs or other income generating activities' (Nziguheba *et al*. 2010: 91). Beyond farmers and their communities, relational constraints may be recognised on the agency of agro-dealers (e.g., in Kenya) in 'providing inputs and information to producers and hence delivering the Green Revolution' (Odame and Muange 2011: 85). These constraints include 'weaknesses in the regulatory framework' and the agro-dealers' lack of working capital to adequately stock or expand their businesses' (*ibid.*).

Local and national organic agriculture NGOs in Kenya bring different actors together around 'common objectives, such as promoting a sustainable agricultural alternative to the Green Revolution'

[12] This representation of farmers is confirmed when Kijima *et al*. (2006) depict them as lacking knowledge and learning capabilities outside the triggering zone of modern technologies, e.g., for sustainable soil management.

(Goldberger 2008: 272). In this process, the NGOs are depicted as prime movers.[13] Other actors, including 'foreign donors, farmers, agricultural researchers, and the Kenyan state', act as subsidiaries by allowing themselves to be rallied behind a common goal by the NGOs (Goldberger 2008: 272). The same organic NGOs also act as prime movers in extending the boundaries of formal agricultural science, through the inclusion of 'indigenous farming knowledge/practice that had been previously decreed by GR pioneers as "traditional and thus not scientific" ' (Goldberger 2008: 272). In this process, scientists play a subsidiary role by including the indigenous knowledge and farmers by letting their knowledge be included by scientists. Farmers allow themselves to be given a voice by the NGOs (Goldberger 2008: 278).

Despite being presented as prime movers, relational constraints and affordances of the NGOs' agency are readily recognised by Goldberger (2008). The constraints might come from donors who make unrealistic demands and to whom the NGOs are accountable. They may also come from the NGOs' own local constituents who have high expectations (Goldberger 2008). Affordances are provided by [linkages with] extension services, research institutes and universities, as well as donors.

Agency of political processes, constituted relationally by 'power dynamics and contested politics', is taken into account. These processes are argued to underpin the win-win narratives of a new Green Revolution in Africa. They define as legitimate some particular pathways for the future, while at the same time constraining the development of many others.

> The technological focus of breeding efforts [is] on certain key crops and varieties through particular breeding or genetic engineering techniques, which means that other 'orphan' crops or alternative breeding strategies get short shrift, with limited funds, low prestige and inadequate R&D.
> (Scoones and Thompson 2011: 16).

Constraints may also be acknowledged on the successful agency of modern technologies such as hybrid seeds. For example, Philippe *et al.*'s (2009: 534) attribute the agency of producing 'substantial expected genetic progress for yield' to 'multi-trait selection in a hybrid population'. They then acknowledge that selection for higher yield was difficult without reducing fertility, because 'selection for productivity and fertility were opposite (*ibid.*). Here, the constraint that is made explicit relates to the technology development process. The figuration of relational agency of technology thus excludes agro-ecological and climatic factors influencing the yield-increasing potential of newly developed seeds.

For an African GR, it is recognised that processes (including agro-ecological ones), such as erratic rainfall, lack of soil nutrients and poor infrastructure of roads and railroads, place limits on the effectiveness of the higher-yielding varieties developed by international research centers (Toeniessen *et al*. 2008: 235).

Figurations of successful relational agency include 'green solutions' such as 'nitrogen-fixing legumes' and 'fertilizer trees' (Gilbert 2012: 526-527). In their efforts to 'capture nitrogen from the atmosphere', the legumes (e.g., pigeonpea and soya beans) are relationally afforded by 'bacteria in their roots' (Gilbert 2012: 526). Farmers' agency in this narrative is restricted to the planting of the 'legumes next to grain crops'. Other green solutions such as organic manure (derived from livestock), similarly isolated from farmers' practices, and are given the agency of increasing long-term fertility (Rowntree and Fox 2008).

Figurations of technology's agency as relationally constrained may also be used to appreciate technology's poor results. For example, 'external fertilizers' are given the agency of producing 'low returns on *degraded* soils' (Matsumoto and Yamano 2013: 198, emphasis added). In turn the low returns

[13] Interestingly, when made explicit by Goldberger (2008), the NGOs are led by male rather than female directors.

is presented as forcing 'farmers to reduce the already low inorganic fertilizer application, which in turn may contribute to further land degradation' (*ibid*.). Here degraded soils and farmers act as constraints on the fertilizers' possibilities for producing effects that are considered desirable and positive. Similarly, low soil moisture is argued to constrain the fertilizers' agency of increasing productivity (Tully *et al*. 2016).

4. Discussion and Conclusions

In the foregoing, I have recounted a wide range of figurations of agency in the East African GR narratives as well as relations that afford and constrain agency. Yet, to a significant extent, what remains hidden are the actual ways in which the constraints and affordances on agency are negotiated in practice, particularly the practices carried out on the farm. So while it is clear that constraints and affordances on farmers' agency are posed by technologies, land and other resources, (erratic) weather patterns, (degraded) soils, government agencies, NGOs, agro-dealers, traditions and customs, how farmers adapt and adjust to the constraints and affordances are largely not articulated. Studies do invoke the term practices, of crop rotation (Wood *et al*. 2015), as well as 'proper agronomic practices' (Nziguheba *et al*. 2010: 104), but *how different social, ecological and technical entities adjust and adapt to each other in practice*, how they become entangled with each other on and off the farm, is largely not discussed.

The conclusions of this paper are in two parts with a final part on future directions. In the first, I discuss the performative implications of ascriptions of prime mover status to (individualised) agencies. This enables a discussion of how different figurations empower and disempower particular agencies, in relation to their performative effects. However, at the outset, I must clarify that multiple shifting figurations of prime movers are encountered across different sections and passages within a single GR study. So my conclusions in the following apply to specific figurations, which may recur across studies, but are not meant to be generally applicable to all East African GR studies. In the second, I discuss how power is associated with the (non-)representation of cultural difference within social groups, and of the difference between things as they are known and enacted in specific socio-ecological situations. Finally I present some directions for future research.

4.1. Appropriation of Agency by (Individualised) Prime Movers and Commodification

A critical aspect that is obscured in most studies is uncertainty about action. In particular, studies that attribute agency to individualised humans or nonhumans did not pause to wonder if this action might be mediated by other entities near and far. An appreciation of the involvement of mediators makes any attempt to capture and represent action uncertain (Latour 2005) in at least two ways. First, courses of actions, as one thing leads to another, may not be *a priori* determinable (Wynne 1992). Second, any prior facts and artefacts used in the narrative for supporting claims may themselves be uncertain and partial. Obscuring these uncertain aspects gives a sense of completeness (of having captured reality fully) to narratives, which would be lacking if their claims and statements were admitted to be uncertain. Undergirded by this sense of completeness, narratives assume the authority and legitimacy to inform policy and design development interventions, thereby enhancing the chances that they are performative.

The obscuring of uncertainties also makes it easier to ascribe the status of successful prime movers to some agencies, especially those that are individualised. The usual suspects here are heroic individual scientists such as Borlaug, national governments and international donors.[14] In agronomic narratives, they may also be individualised modern technologies. Such figurations empower their subjects in two ways. First, the figurations give credit to the prime mover for work that is actually carried out by a wide range of agencies including, especially, farmers and their lands. This appropriation of credit is performative: it serves as a justification for directing continued resources to the prime mover, be it a scientific institution, a national government or a technology (that may be subsidised). Conversely, by not giving equal credit to farmers' agency or to that of their lands, and often treating them as

[14] Relational constraints/affordances on the prime movers are also recognised by many narratives, as mapped above. For example, post-colonial government as the prime mover may be presented to be constrained by international forces such as donors or by their own citizens. This was different from the unconstrained agency of British colonial government.

subsidiaries to the usual prime movers, these figurations potentially disempower farmers, by leading to: a) situations in which financial (and other) support reaches the farm only through a prime mover such as the national government or a modern technology; b) reductions in the flow of financial and other resources to the farmers; or c) lack of support for developing *diverse and adaptive* farm-based solutions rooted in farmers' collective learning abilities, in their informal networks for exchanging farm-inputs, to sustain local agro-ecologies (Scoones and Thompson 2011; Brooks 2014).

Second, these figurations may serve the purpose of legitimising large-scale techno-scientific interventions, for example under the rubric of the Green Revolution (GR), in East African agriculture. Such interventions may be spearheaded by the government and the heroic scientist. They may be supported by a powerful donor and centred on technologies marketed by large corporations. And they may be presented as controlling disease epidemics, eradicating hunger, reducing poverty and creating economic prosperity. In this way, the success stories not only legitimate the prime movers' actions but also help empower them further by informing government policies and strategies. As some of these prime movers (such as large agribusiness corporations) already hold disproportionate amounts of power in contemporary societies, such individualising prime mover figurations may further entrench the status quo of high income/wealth inequalities and unequal relations of (cultural-political) power.

Beyond individualised technologies, scientists, governments and donors, prime mover figurations are given to market-based approaches (including prices, subsidies and other incentives, often tied to technologies such as chemical fertilizers). Closely aligned with these depictions are multiple forces that foster commodification of agriculture, including through the efforts to promote a new African Green Revolution in the last decade.[15] These forces include donor funds; international agricultural research institutions; agricultural and development economists with their growth models and poverty indicators; various government departments, including national agricultural research systems; development NGOs helping implement poverty reduction or sustainable development goals; transnational corporations pushing farm-inputs and those hoarding commodities; national agribusinesses; local agro-dealers; large farmers and land-grabbing contractors; interlocking technologies in intensive agriculture; assumptions of availability of sufficient land in Africa; diverse ecological relations transformed into natural resources; value chains involving auditors and third party certifiers as well as super-retailers of food in the global north that sell the same fresh produce round the year. These forces of commodification do not form a single unified system that one can neatly delineate, and help replace, but rather a disparate and disorderly assemblage (of variously entangled social, ecological and technical forces) that transcends multiple scales, silos and disciplines. The wide reach and expansion of these forces of commodification may in fact be a product of their disparate and disorderly organisation in extensive assemblages.
The effects produced by some (individualising and relational) prime movers may be negative. Examples of such prime movers include insect pests, plant diseases such as leaf and stem rust (and their epidemics), genetic erosion, depleted soils and rapid population growth. Yet the dramatic effects produced by most of these prime movers are used to create space for the promotion of techno-scientific solutions such as stem-resistant varieties, inorganic fertilizers, and integrated pest management. The figurations of negative prime movers thus serve a similar purpose as critique (as discussed in the sub-section titled Malthusian and Critical Agencies).

4.2. The Power of (Non-)Representation of Difference

Beyond prime movers (and subsidiaries), power often figures in the East African GR studies in the form of homogenisation and atomisation of diverse people and things in action. Difference is obscured in this way and whole tribes and farmers in a region, country or across SSA, may be presented as acting in

[15] Individualising agency on a technology gives the impression that the technology is effective by itself and once adopted it will lead to an improvement of agricultural productivity on every farm. Mass adoption of technology as a commodity (a fertilizer, a pesticide or a seed variety) then paves *the* way to growth in agriculture and beyond.

concert (often through a representative agent), for instance in following government and donor prescriptions to intensify agriculture.[16] Ecological entities such as trees and soils may also be presented as undifferentiated, often across SSA (Gilbert 2012; Philippe *et al*. 2009). Homogenisation of entities that constitute a particular group (or category) may serve three performative effects. First, it aids mass commodification of a modern technology. If soils on all farms across Africa are depleted, and if that causes stagnating crop yields, then all farmers must adopt fertilizers to improve productivity. And governments and donors must make this happen through policy and other development interventions. Homogenisation helps (social) scientists provide general prescriptions for policy. If trees are always good for coffee farms, then a single policy for shaded cultivation can be designed and implemented across a country, region or the continent.

Second, by marginalising heterogeneity within a group, homogenising depictions obscure unequal relations of power, and cultural and epistemological hierarchies within the group are thus occluded (Arora and Romijn 2012). Neither all (male and female) smallholders nor all Kikuyu tribe members are equally powerful decision makers. Neither are all, or even most, African soils (and lands) the same texture, nor all scientists able to take this agroecological diversity into account (compare for example Tully *et al*.'s 2016 concern with diversity and variation in SSA with Toeniessen *et al*.'s 2008 general claims about the continent). Homogenisation thus *depoliticises* complex social groups based on landholding, gender and expertise.

When GR narratives do account for difference within a social group, it is important to consider how the difference is represented. Consider two depictions of gendered relations of power in the East African GR studies. First, Ugandan women farmers' agency is presented as weaker than their male counterparts, both for increasing rice yields and for HYV adoption (Matsumoto and Yamano 2013; Kijima *et al*. 2006). Both studies claim that reasons for this result are unclear. Second, a woman farmer in Malawi named Catherine figures as a bad farmer with 'stunted, yellowed stalks' in her maize field and she is 'an unmarried mother of four' (Gilbert 2012: 525). Unlike her progressive neighbouring farmer (also a woman) named Beyadi, who doubles as a school teacher, Catherine did not adopt chemical fertilizers. In this figuration, the author makes an association between Catherine's poor performance as a 'backward' farmer and her supposedly 'low' moral standing as an 'unmarried mother'. Both these depictions are clearly problematic. They highlight that difference must be tackled without naturalising hierarchy, without passing individualising moral judgments, and without essentialising sub-groups (and subcategories) such as 'progressive women farmers'.

Third, homogenisation of entities belonging to the same category such as soils and fertilizers obscures the ontological multiplicity of things. Things not only manifest differently across different farms and regions, but are also enacted and known differently in a soil scientist's laboratory and in a farmer's field (see Mol (2002) on ontological multiplicity; for an agricultural analysis see Arora *et al*. 2013). This ontological multiplicity is, in general, not articulated in the GR studies analysed in this paper. Obscuring the ontological multiplicity of things may limit efforts to challenge and contravene extant hierarchies between different ways of knowing which situate 'modern' techno-scientific objects (knowledge, artefacts) as universally valid and effective. The same obscuring may also allow the developers and promoters of 'modern' objects to disqualify other 'vernacular' ways of knowing, including the multiple ways in which the modern artefacts may be adapted and adjusted on farms (Arora 2017). Recognising the ontological multiplicity of things may make it possible to appreciate the validity of divergent ways of producing and using knowledge and artefacts. A specific setting such as a laboratory may actualise only some aspects of an object of knowledge, while other aspects may be known in a farmer's field. Recognising this multiplicity may be critical for articulating and practising new terms of engagement

[16] Yet internal heterogeneity within a group, such as the Kikuyu in Kenya, is made explicit when it comes to depicting opposition to the state. Resistance appears to be driven only by some members of the tribe, but acquiescence to the state is practised by all (Fleming 1975).

between different ways of knowing, which reconfigure epistemological and cultural hierarchies, and pave the way for democratic collaboration and divergent learning between scientists, planners, designers, extension agents, development administrators, farmers and workers (Arora 2017).

4.3. Directions of Future Research on Agency and Power in Discourse

Finally, some directions for future research on configurations of agency and power in discourse. First, it might be useful to extend the study to include policy documentation on agricultural intensification from the national governments as well as the East African Community. Comparisons between figurations of agency and power in policy documents and academic studies may also then yield further insights on the issues of difference, depoliticisation and disorder raised above. Similar comparisons may be carried out between studies focussed on different (Anglophone, Francophone and Lusophone) regions of Africa.

Second, in addition to authors' academic disciplines, it might be interesting to explore questions of style. Does a critical style of presentation have to be underpinned by attributing negative agency to entities in order to create discursive space for preferred alternatives? How is a style in which (individualised) agency is presented as an attempt or trial or experiment, rather than as an achievement or responsibility, related to forces of commodification discussed above? How is the admitting of uncertainty in knowledge related to styles of articulation and presentation of results? Does an examination of styles of research reveal similarities and differences across scientific disciplines which defy conventional classifications between sciences considered soft and hard, natural and social/cultural, qualitative and quantitative, systematising and interpretive? Explorations into styles of inter- and multi-disciplinary presentation might also yield insights into the dynamics of such research, particularly in terms of inclusion of inputs and insights from the more 'marginalised' disciplines in the collaboration. Ultimately, questions of style may enable detailed examination of how research presented as neutral may be political, through the entanglement of the studied worlds with researchers' moral values, beliefs, professional obligations, available equipment, persistent doubts and collective creativity as well as political-economic pressures and interests associated with the promotion of a green revolution which the researchers may be exposed to.

Third, although rarely encountered in the East African GR studies, emotions and feelings may be given the agency to produce significant effects. For example, Pollock (2008) attributes agency to 'anxiety about food shortages' in driving the Rockefeller foundation to set up the Cooperative Wheat Research and Production Program in Mexico (where Borlaug was based). Figurations of agency given to affect may therefore be interesting to explore further.

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