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Antoine Bernard de Raymond

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Aligning competing risks? Global Food Security as a trade-offs-based approach to risk and food policy

Antoine Bernard de Raymond, INRA

Abstract: Since the 2008 world food crisis, many initiatives have emerged, at the intersection between scientific, economic, humanitarian and political fields, with a view to "feeding 9 billion human beings in 2050", and to taking up the global food security challenge. Those initiatives have often been criticized for promoting a neo-productivist agenda. By studying the case of the UK Global Food Security programme, this article shows that "Global Food Security" approaches not only re-legitimize production as such, but look to invent new ways of confronting production issues with health and/ or environmental issues, and thus of setting priorities. Potentially, this has major consequences for food policy and risk regulation. From this point of view, the UK GFS programme has become part of a movement which goes far beyond food security or agricultural issues as such. This movement consists in balancing principles of protection with economic imperatives. Whilst other approaches (such as agroecology) look for integration between these different objectives, this approach is trying to achieve coexistence between objectives perceived to be contradictory. It assumes that sustainability can only be achieved at a global level, and that science must provide the right tools to constantly find the right trade-off between competing objectives. I conclude by discussing how this approach pertains to a restructuring of capitalism towards an extractive economy, the related forms of regulation, and the challenges of this approach for social critique.

Keywords: food security; risk; sustainable intensification; dynamic policy

Introduction

In 2008, a sudden and brutal food price spike triggered unrest throughout the world, notably leading to "food riots" in cities in emerging countries such as Mexico, Indonesia, Senegal and Egypt. This brief yet violent episode – which had not been anticipated, with national and international organisations struggling to limit its impact – was a veritable wake-up call for the international community. United Nations (FAO) and multilateral (World Bank, G8, G20) institutions once again made food security a priority on the international agenda and recognised the need to take urgent action to avoid further food crises. During the L'Aquila Summit in 2009, the G8 member states pledged, over a three-year period, to invest 20 billion dollars in farming in developing countries. Other initiatives followed, also designed to facilitate agricultural investment in developing countries: in 2009, the G20 set up the Global Agricultural and Food Security Program (GAFSP), run by the World Bank; in 2012, the G8 launched the New Alliance for Food Security and Nutrition (NAFSN), with the goal of facilitating private investment in the African farming sector. These initiatives by the international community echoed regional initiatives such as Grow Africa, driven by the African Union and by the New Partnership for Africa's Development, launched in 2011, which was also designed to encourage private investment in agriculture, and initiatives supported by philanthropic foundations, such as AGRA (Alliance for a Green Revolution in Africa), created in 2006 by the Bill & Melinda Gates Foundation.

This reprioritisation of food security after 2008 resulted not only in an increase in international aid for agricultural development, but also in a reflection on the very notion of food security. Food security has been the concept behind international agricultural and food policies since the 1970s (Carolan, 2013; Maxwell, 1996; Mooney & Hunt, 2009), aiming to fight hunger and malnutrition. Following the 2008 crisis, a consensus rapidly emerged whereby *business as usual* was not an option, and that a profound change, on a global scale, in the relationships between agriculture and food was required (FAO, 2009). Through the category of food security, questions were raised concerning liberalism, agricultural models, diets and, more generally, the linking of food issues with other problems such as global

demographics, climate change, the environmental crisis and social inequalities. From this standpoint, there are two clearly distinguishable responses: Global Food Security and Food Sustainability (Lang & Barling, 2012). The first (Global Food Security) consists in improving the current system, by increasing global food production in order to avoid the imbalances between global supply and demand that caused tensions on the international markets; conversely, the second (Food Sustainability) does not involve correcting the existing system, but instead considering that this system is itself the problem and that it requires radical change by reorganising markets, promoting agroecology and transforming diets (Carolan, 2013; Lang, 2010; Lang & Barling, 2012; Marsden, 2013).

Global Food Security is embodied by the dominant international institutions (G8, G20, World Bank), multinational corporations (agribusiness companies such as Dupont, Monsanto, OCPgroup in particular), philanthropic foundations such as the Bill & Melinda Gates Foundation, and professional farmers unions in western countries (Garnett & Godfray, 2012). Food Sustainability is endorsed by NGOs in the development sector (Oxfam, the Catholic Committee Against Hunger and For Development) and by peasant organisations such as La Via Campesina and the Réseau des Organisations Paysannes et des Producteurs Agricoles d'Afrique de l'Ouest (ROPPA) (Thivet, 2012, 2015); it is especially embodied in the reform of the world Committee on Food Security (CFS), which added a civil society mechanism to this inter-state organ of the FAO, allowing "*those most affected by food insecurity*" to make their voices heard by international bodies (Duncan, 2015).

After 2008, food security was thus reprioritised, becoming a consensus frame for food issues. Yet underneath this consensus lie quite strong oppositions between Global Food Security and Food Sustainability. These two approaches do not benefit from the same status, in as much as Global Food Security is the dominant approach, backed by official international and regional institutions (G8, G20, World Bank, African Union, etc.) and multinational corporations, and can therefore easily mobilise large financial investments. It has thus been criticised by NGOs and the social sciences (Dibden et al., 2013; McKeon, 2015; Tomlinson, 2013) as a form of greenwashing, making it possible to maintain the status quo (*corporate farming, productionism, free trade*) on the basis of fallacious moral arguments (such as "feeding the world in 2050"). Paradoxically, although the crisis appeared to provide a window of opportunity for reformist strategies and projects for social transformation, it also opened the way for visions that reasserted quantitative issues, production and price imperatives, as against issues of sustainability, protection of the environment and public health, and well-being (Tomlinson, 2013).

In this article, I try to further the discussion on Global Food Security, and show that GFS not only reprioritizes production and technology, but also tries to articulate production with a wide range of issues, through a risk lens. I show the potential consequences of this approach in terms of land use policies and food regulations. Using frame analysis (Benford & Snow, 2000; Snow et al., 1986; Snow & Benford, 1988, 1992), and the notion of keying in particular (Goffman, 1974; Mooney & Hunt, 2009), I examine the internal variability of Global Food Security, taken as a new primary frame (Snow et al., 1986) of food security. I show that Global Food Security has both flat and sharp keys. While the flat key presents the simplest version of food security, based on increasing production to ensure a balance between global food supply and demand, the sharp key looks not only at production per se but also at how to articulate a range of competing objectives (such as production, health, environment, resource use, etc.), with a risk lens. More than a mere reassertion of neoliberalism, GFS comes across as an attempt at a transformation of liberalism, the outline and levers of which I will examine. In order to outline this sharp key, I study a specific research program dedicated to Global Food Security, the UK Global Food Security programme (UK GFS), an inter-agency scientific research programme that brings together the main funders of food-related research in the United Kingdom. I study the activities and publications of this research program. I show that from this standpoint, GFS not only reprioritises

production, but also tries to articulate production with a conservationist vision of ecology. GFS thus appears as a specific way of articulating multiple objectives, based on trade-offs, specialisation of spaces and compensation measures. In this sense, GFS is not only a technological project but also an attempt to profoundly change public policies and food regulations. I show that the latent issue of the debate between GFS and advocates of a radical transformation of food systems specifically relates to how different challenges (production, health, environment, etc.) are articulated: whilst other approaches (such as agroecology) articulate different issues by looking to integrate and harmonise them within the same spaces and processes (Chappell & LaValle, 2011; Wittman et al., 2017), GFS suggests that we pursue a single objective in a single place and time, that we separate activities and adopt measures of compensation so as to reach a global optimum.

From this point of view, GFS is part of a movement which goes far beyond food security or agricultural issues as such. This movement consists in questioning certain principles of protection (precautionary principle, public health, etc.), not by attacking them head-on, but by weighing them against economic principles. I conclude by showing how this movement reveals evolutions in capitalism, the reaffirmation of an economy of extraction, competition for primary resources, and an attempt to redefine liberalism. Finally, I show the challenges facing social critique to take account of the sharp key of a framework for collective action such as Global Food Security.

Framing and keying. Finding Global Food Security's sharp key

In order to study what is being acted out through the notion of Global Food Security, this article uses a frame-analytic approach (Benford & Snow, 2000; Ferree, 2003; Snow et al., 1986; Snow & Benford, 1988). Inspired by the work of Goffmann (Goffman, 1974), the starting point of studies on framing processes is individuals' or organizations' active work to produce meaning and to build interpretative models of reality. This approach therefore refuses to consider individuals or groups as "carriers of extant ideas and meanings that grow automatically out of structural arrangements [...] or existing ideologies" (Benford & Snow, 2000). A collective action frame, far from being a mere reflection of social structures, makes it possible to perceive, consider and structure reality and hence to act on that reality.

Frame analysis does not consider frames as homogenous and static entities, but instead looks at how they change, confront one another and compete within a multi-organisational field. The frame-analytic approach is less interested in the frames themselves than in framing processes. This is not a theory of collective representations, but of social change. Furthermore, frame analysis highlights the internal and external variability that may lie behind an apparent consensus (Gamson, 1995). A consensus frame, or master frame (i.e. a commonly accepted frame, conveying broadly shared objectives and values), can cover quite strong oppositions and ways of acting. As far as agrifood issues are concerned, notions of sustainability and food security typically fall within the scope of these consensus frames. It is virtually impossible to be against food security.

Using a frame-analytic approach, one can qualify Global Food Security as a new "master frame" (Snow & Benford, 1992) for agricultural and food issues. Research on master frames has taught us to mistrust the apparent consensus that accompanies them, and demonstrates the extent to which the most commonly accepted frames are in fact multiple differentiated frames of collective action frames, relating to entirely different significations and social groups (Gamson, 1995; Mooney & Hunt, 2009). Furthermore, Mooney and Hunt point out that the same cardinal frame can not only aggregate frames that are in reality differentiated, but also that it allows a certain internal variability, a phenomenon that the authors call "keying". The term is borrowed from Goffmann, who defines it as "*the set of*

conventions by which a given activity, one already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by participants to be something quite else" (Goffman, 1974, pp. 43–44). This notion refers to the dynamic nature of primary frames. For Mooney and Hunt (2009), a frame therefore contains two different keys, one flat and one sharp. Whilst the flat key is a simple version of a frame, without asperity, reinforcing the dominant institutions and meanings, the sharp key has a critical dimension in respect of said dominant institutions, making it possible to challenge them. So a given frame, apparently consensual, can be used just as much to support as to challenge dominant institutions. Mooney and Hunt go on to say that the sharp key provides the wherewithal to articulate different frames, to establish bridging between alternative frames. It is from this point of view that we are going to discuss Global Food Security in this article, its nature as the predominant new way of thinking. This also allows us to ask what might constitute an effective critique of this frame, and how a debate might be organised with alternative frames of the food security issue, such as food sustainability.

While the GFS' flat key corresponds to a reductionist thought process that reduces food security to balancing production (supply) with demography (demand), the sharp key aims to articulate a complex set of issues, in particular those put forward by those who criticise GFS: climate change, depletion of primary resources, environmental damage, diet change, etc. This GFS' sharp key is in some way a response to those critiques¹. One way of understanding GFS' sharp key is to look not just at discourse, but also at the concepts that GFS' advocates mobilise, at the way in which they work to make it operational, and to consider the consequences of their way of thinking in terms of regulation and policy making. Otherwise we are obliged either to ignore these consequences, or to describe them as "neoliberal policies". Although the changes brought about by Global Food Security are clearly related to liberalism, to qualify them all as "neoliberal" is to lose sight of the transformations of liberalism itself. Secondly, by describing global food security solely as a defence of the liberal status quo, one denies the mainstream any capacity for analysis or situational intelligence.

At the very least, a productivist project needs ad hoc institutions to be enforced. As Luna points out, *"ever since it has existed, there has never been any renewal of liberalism without a subsequent renewal of attempts to regulate it"* (2017, p. 179). Whilst the Global Food Security approach certainly corresponds to a project to renew liberalism, it remains necessary to observe, as such, the institutions, rules and concepts that relate to it. Secondly, critics of the GFS approach say that the latter only takes production issues into account and ignores other stakes: climate change, the depletion of natural resources, biodiversity, consumption, nutrition, waste, etc. Yet, all of these issues are mentioned, studied and covered in UK GFS' publications. When we look at the sharp key, the difference is not that the GFS approach ignores these issues, but that it articulates them quite differently. The concept of "sustainable intensification" (SI) plays a key role in how the sharp key organises the articulation between different objectives. Here, the central argument of SI's proponents is not only to increase global production, but to reflect on how to articulate objectives considered to be contradictory. In other words, the argument consists in looking for an optimum not just for one isolated objective but, on the understanding that the various objectives of public policies are intertwined and in competition with one another, to find an overall optimum by articulating a set of diversified objectives. In this way this approach re-orientates the debate on food, the environment and health towards risk management and, more specifically, defines it as a problem of risk-risk trade-offs (Wiener & Graham, 1997). It proposes to consider not one risk but a whole range of risks, which implies sorting them, setting priorities, measuring costs and making trade-offs. Hence, and above all, in order to widen the range of risks to take into account, it requalifies the notion of risk, and "economicizes" it. In other words, the

¹ See for instance the critique of sustainable intensification developed by Friends of The Earth (2012).

risk is not just the risk that technology might cause to health and the environment, but also the risk relating to insufficient production or price volatility. This renders commensurable values as varied as health, biodiversity, economic growth and purchasing power. And the operator that makes it possible to render these objectives commensurable is cost/benefit analysis, which then makes it possible to make trade-offs between these objectives.

Such an approach clearly impacts the very notion of sustainability, which is reduced to a trade-off between conflicting objectives, thus constituting a conservative vision of sustainability (Linder & Sexton, 2014).

Data and methods

The data used in this article come from an in-depth study of the UK GFS programme. This study is based both on interviews with the members of the programme (coordination group, advisory board), observation of events organised within the programme and documents from the programme (documents on programme orientation, calls for contributions, reports, journal published by the programme, individual publications, website, posts on the programme blog, social network accounts).

Between March 2013 and November 2015 I conducted 15 interviews with most of the members of the coordination group, including management and secretarial staff, and with certain members of the programme's advisory board². The interviewees were thus members of the research councils, ministries and charities taking part in the programme. All of the interviews were *semi-structured* and included questions on the educational and professional backgrounds of the interviewees, their work within the programme, the subjects of the debates between members of the coordination group, their points of view concerning the programme's orientations in relation to food security, and the events and research specifically related to the programme and in which their organisations had participated.

Analysis of the interviews (both actual content and systematic comparison) was supplemented by the gathering and analysis of public documents. The latter related to: conferences organised as part of the programme, with transcripts of the speeches and debates communicated by the organisers; guidance and organisational documents, along with the programme's communication documents and calls for scientific contributions; the *Insights* journal, published by the programme; scientific reports and individual or collective publications by the interviewees in academic journals or in the press, on the subject of food security; and finally the programme's website, blog posts on the site, and social network accounts linked to the programme.

The UK Global Food Security programme

Although GFS is a very widespread approach, taken up as a slogan by people and organisations, and used in different contexts, what is interesting about the UK GFS programme is that it acts as a scientific research programme that has explicitly set itself Global Food Security as its approach and objective. In a British institutional context, since the 1990s research has been organised into Research Councils that are both discipline-based and thematic. To avoid the partitioning and siloing effects that such organisation might cause, inter-agency research programmes are created (Lyall et al., 2013), articulated around transversal grand challenges. These transversal programmes are designed to last

² To consult the current composition of the coordination group, see:
<http://www.foodsecurity.ac.uk/programme/governance/programme-coordination-group.html>

between 10 and 20 years. They might involve not only research councils, but also ministries or even "devolved" administrations. There are currently 6 *cross-council research programmes*: Digital economy, Energy, Global Food Security, Global uncertainties: security for all in a changing world, Living with environmental change, and Lifelong health and well-being. Each of these transversal programmes has its own scope and its own means of coordination. Some of these programmes have centralised and hierarchical structures, others have forms of coordination that are more horizontal and informal. Some aim to coordinate and catalyse research council activities from a cognitive standpoint, whilst others have programmes for investing in *facilities*.

The UK GFS programme came into being in 2009-2010, following the 2008 food crisis. It brings together all food-related research funders, with a view to contributing to Global Food Security. The creation of the UK GFS programme was led by the Government Chief Scientific Adviser (Sir John Beddington) who in 2009 gave a public warning of an even greater food crisis that would likely occur around 2030. He described this future crisis as being the result of a "perfect storm", i.e. of the convergence of negative factors such as an increase in the world's population, diet changes, climate change and the depletion of fossil fuels and hydraulic resources³. According to Beddington, this *perfect storm* would lead to serious disruptions in the food system and to major political disturbances. In order to avoid this catastrophic scenario, Beddington encouraged countries to make every possible effort to double worldwide agricultural production by 2030. This alert, sounded by the Government Chief Scientific Adviser in the United Kingdom, was the trigger for new thinking about food security and for action to improve the food system.

The UK GFS Programme brings together the main funders of food-related research in the UK. It now includes 19 organisations (6 RCs, 12 Government Departments, 1 Charity), all of them having specific objectives and methods of funding. Furthermore, the programme was initiated by a leader organisation, BBSRC, which continues to play a central role in the programme with regard to both funding and the theoretical stakes. The programme is run by a leader, assisted by either one or two colleagues, depending on the period. It is endowed with a coordination group, made up from one representative from each of the member organisations. The programme's activity consists in creating a transdisciplinary research community around food security. The task of organising this research community involves informal meetings of the coordination committee, the organisation of public conferences, of meetings of experts, of research prioritisation workshops, the funding of interdisciplinary networks and the funding of research projects. These activities are essentially developed in three directions: firstly, the job of synthesising existing knowledge on different subjects and making it available to scientists, the general public and decision-makers via reports and publications such as the *Insights*⁴ journal; secondly, the identification of gaps and the introduction of research calls to fill these gaps⁵; and finally, communication with various publics in order to raise the profile of food security and to influence policy makers and funders of research, particularly at international level.

Framing sustainable intensification as the sole solution to the global food security challenge

³ <http://www.theguardian.com/science/2009/mar/18/perfect-storm-john-beddington-energy-food-climate>

⁴ For example, the programme has published reports and special issues on extreme weather events and farming, on food waste, on insects as food, etc.

⁵ Since its creation, the UK GFS Programme has led to various research projects, on soils, the resilience of the British food system, campylobacter (poultry bacteria), etc.

Like other initiatives, the UK GFS programme has taken up the slogan of "doubling global agricultural production to feed the world in 2050". Yet more specifically, the UK GFS programme suggests that we "produce more, on the same amount of land" and puts forward the sustainable intensification of agriculture as the sole means of achieving this objective. This objective and this concept (sustainable intensification - SI) help us to understand GFS' sharp key. Whilst the flat key relates to agricultural productivism and technological solutionism, this section shows that GFS' sharp key (notably characterised by SI) is not a vehicle for production stakes alone, but also for a broader logic for trade-offs between different public policy objectives. While GFS does reprioritise food production, the GFS' sharp key is a channel for a form economisation of risk; it is also deployed as a holistic approach which aims to articulate and prioritise different risks. Put differently, when discussing the concept of SI, one must consider not only the word "intensification", but also the meaning of "sustainability" that is carried by this concept.

At the very time when the UK GFS programme was starting to be implemented, a foresight study on the *future of food and farming* was looking to identify the challenges facing food security and the solutions that might be found (Foresight, 2011). This study also highlighted the plethora of stress factors impacting food systems (demography, climate change, depletion of primary resources, etc.) threatening global food security, and technology's role in meeting these multiple challenges. The foresight study suggested promoting technologies that would make it possible to meet both production requirements (to keep up with the increase in food demand) and the requirements for protecting health and the environment. More generally, the report identified *sustainable intensification* as the only way to meet all of these objectives (Cf. infra).

UK Global Food Security models the food security issue as a tension between the imperative of increasing food production and the need to simultaneously control constraints such as biodiversity and the protection of the environment. More specifically, this reflection articulates three problems: the need to increase agricultural production in order to meet the challenge of feeding 9 billion human beings in 2050; the need to reduce agriculture's negative impact on biodiversity and the environment; and finally (albeit in a latent manner) the land sparing/land sharing debate. Having already presented the terms of the first debate, let us look at the other two. The reduction in agriculture's negative impact on the environment relates to two ideas: firstly the damage caused to the environment by agricultural activity (deforestation, pesticide-related pollution, etc.) and secondly the depletion of non-renewable resources such as oil and phosphorous (Cordell et al., 2009) due to their use as agricultural inputs. This vision of agriculture-related environmental issues has led GFS proponents to recommend and target greater "resource efficiency", through new technologies that are more productive and use less inputs. Whilst other approaches see the integration of natural processes into productive processes (and hence less recourse to certain technological artefacts) as the solution to the health, environmental and economic problems affecting agriculture today, the foresight report reasserts, on the contrary, the role that technology plays in meeting these various challenges. Instead of being seen as a problem, these "resource efficient" technologies would make it possible to develop new solutions.

The land sparing/ land sparing debate began in the 1990s, in relation to the problem of reconciling agricultural production and the conservation of biodiversity (Fischer et al., 2014; Waggoner, 1996). Whilst many researchers recommend the greening of production, i.e. the introduction of natural processes into production activities so as to reconcile production and preservation of the environment (Altieri, 1995), others say that the ecologization of production leads to lower yields which in turn means expanding cropland. They believe that, paradoxically, the extension of cropland due to the use of more environmentally friendly production methods leads to less protection for the environment, because there is a reduction in the space available for action favouring conservation and biodiversity. In other

words, whilst on the scale of a single farm plot the greening of production might seem advisable, supporters of land sparing believe that on a global scale it may have negative consequences. GFS' sharp key is implicitly based on this debate and asserts that in order to meet the dual food and environmental challenge, we must manage to produce more *without extending cropland*, using technologies that will allow us to increase yields whilst at the same time reducing the amount of resources required (oil, phosphorus, water, chemicals, etc.)⁶. The GFS sharp key's response to the multiple challenges facing food systems thus becomes: "*Producing more on the same amount of land*".

For the authors of the Foresight report, *sustainable intensification* is the only solution to this challenge (food security) that takes the form of competing objectives. This concept, which originates in the world of development, has been re-appropriated by western countries over the last decade (Royal Society, 2009). As its name suggests, SI consists in sustainably intensifying production. For the authors of the Foresight report, this means increasing yields, improving the efficiency with which resources are used and reducing the negative environmental effects of food production (Foresight, p. 35). SI is sometimes presented via slogans or quantified objectives such as "Cereal production needs to increase by 50% between 2000 and 2030" or "doubling food production to feed the 9 billion". And indeed, certain groups and organisations (particularly agricultural unions such as the British National Farmers' Union) interpret SI as a new mandate to produce.

Yet scientists from the UK GFS programme claim that this is not their understanding of Sustainable Intensification (Garnett et al., 2013; Tara Garnett & Godfray, 2012). Of course, they demand the right to use GMOs should it become necessary, but they assert that their approach is not limited to the promotion of certain agricultural technologies. They say that SI should not be seen as an agricultural or agronomic model, or even as a predefined set of practices, but rather as a general approach to farming activities, independent of the agricultural model being followed (Garnett & Godfray, 2012). In order to achieve the objective of producing more without harming the environment and without extending cropland, this approach consists in trying to increase productivity per unit of production (plot of land, animal) whilst at the same time reducing the negative global impact of agricultural activities on the environment, on health or on animal well-being: "*the prime goal of SI is to raise productivity while reducing environmental impacts*" (Garnett et al., 2013).

What characterises SI is the idea that the different objectives that food systems must reach are competing, and that consequently they cannot be achieved through the same activities, in the same place and at the same time. This is what so radically distinguishes SI from agroecological approaches. Agroecology tries to harmonise different objectives by integrating natural and social processes into production (Warner, 2007; Wittman et al., 2017). SI's response is that because said objectives are competing, they cannot be achieved together and must therefore be achieved separately. SI therefore means that spaces must be separated and specialised: some spaces must be devoted to production, whilst others must be dedicated to conservation and biodiversity. SI thus reproduces a great divide between nature and (agri-)culture. This is why it favours an *a priori* contradictory alliance between biology (improving plants) and ecology (or environmental sciences), against agronomy.

Having established this principle of the separation of spaces, we still do not know where to produce or where to practice the conservation of biodiversity. So in order to make pertinent decisions, Sustainable Intensification involves making trade-offs between these objectives, in order to set priorities (contextually at least). In particular, this means having the pertinent metrics to achieve these trade-offs. It thus became one of the mantras of the UK GFS programme to construct the right metrics with

⁶ One might question the very idea that raising yields would help to limit the expansion of cultivated land (see Friends of the Earth, 2012), but that is a debate in its own right, one that I cannot take up here.

which to measure all the trade-offs, within their entire spatial and temporal range. In particular, the programme looked at the introduction of holistic models for land-use management, making it possible to integrate all of the ecosystemic services that the land provides: *"current modelling capabilities are not sophisticated enough to meet the full range of decision-makers' needs. [...] Consequently, an 'uber' integrated assessment modelling approach (uIAM) is required; IAMs that allow for the costs and benefits of an intervention at local scale to be balanced with those across the global market. Such an approach could help policy-makers understand trade-offs between land-based services at different scales; anticipate and manage problematic outcomes; and quantify the scale and nature of required demand-side interventions."* (Benton et al., 2018, p. 91)

Finally, given that (according to SI proponents) the pursued objectives cannot all be reached together, and depending on the context (temporal, spatial), priorities must be set, at what level can it be said that the desired objectives have been achieved? Again, in other words, at what level and on what scale should sustainability be sought? For the proponents of SI, sustainability can only be achieved on a global scale, which in practical terms means that it cannot be found at farm level, and hence be the object of compensatory measures elsewhere: *"There are many difficulties in making sustainability operational. Over what spatial scale should production be sustainable? Clearly an overarching goal is global sustainability, but should this goal also apply at lower levels, such as regions (or oceans), nations, or farms? Could high level of consumption or negative externalities in some regions be mitigated by improvements in other areas, or could some unsustainable activities in the food system be offset by actions in the non-food sector (through carbon trading for example)?"* (Godfray et al., 2010)

Expressed in this way, SI comes across not as a production model but as a tool for trade-offs between and for the distribution of activities and production models: *"SI is not designed to garner support for one particular set of possible social and economic outcomes. Instead, it is best envisaged as a pragmatic process of enquiry and analysis for navigating the issues and concerns"* (Garnett & Godfray, 2012, p. 24). Fundamentally speaking, SI operates by redefining the spatial and time scale of decision-making. Rather than being a decision-making tool at the micro level, it is a decision-making and distribution tool at a macro level. It thus involves new decision-making and regulatory tools on a meso or macro scale. It is not only a case of increasing production, but of deciding where it is possible/useful to intensify production, taking into account a range of competing objectives. First and foremost, the GFS sharp key is a way of organising space and arbitrating between activities.

Having established these principles for trading off between and for the distribution of activities, it is clear that, wherever possible, SI aims to intensify production and to increase yield per unit of production. SI proponents are therefore calling for a wave of investment in agriculture, so as to encourage innovation through R&D and find new technologies which will make it possible to increase yields and improve "resource efficiency". The UK GFS programme is thus supplemented by the Agri-Tech Strategy, which is designed to catalyse investment for innovation in agriculture by encouraging partnerships between academic research and private companies. The aim is to use all available technologies (transgenesis, nanotechnologies, information technologies, big data, etc.) to develop precision farming, i.e. an agriculture that is both productivist and resource-efficient.

These new technologies which make it possible to intensify production are designed to be used wherever yields have remained low, in regions where there has been no Green Revolution. Most particularly, SI should make it possible to *"close the yield gap"* (Godfray et al., 2010), especially in Africa, which is seen as the main reserve for arable land.

Consequences for risk management and food policy

As we have just seen, the GFS sharp key, as constructed through the concept of sustainable intensification, not only reaffirms a productivist and technological vision of food issues, but also acts as a vehicle for major potential changes to food policy.

In the last section, we saw that GFS has built up a risks frame for food security, and that it has taken up the task of requalifying risks by promoting an economic vision of risk which it weighs against a more classic technological vision that is applied in the fields of health and the environment. This economisation of risk alters the status conferred upon technology: whilst it certainly remains a risk factor, its role as a risk reduction tool is reaffirmed: "*Science and technology must play a leading role in meeting increasing demand over the coming decades*" (Beddington, 2009, p. 7). For the exponents of a Global Food Security approach, from the very outset this economisation of the notion of risk impacts *risk assessment* itself. As the Foresight report points out: "*Decisions about the acceptability of new technologies need to be made in the context of competing risks (rather than by simplistic versions of the precautionary principle); the potential costs of not utilising new technology must be taken into account*" (Foresight, 2011, p. 11). It is clearly a question of transforming risk assessment principles to counterbalance the principle of precaution (though without removing it). And, more broadly, it is about developing tools which make it possible to simultaneously manage multiple competing risks.

But the consequences are more far-reaching. In considering food security to be an expanded range of competing risks, the GFS raises the issue not of the regulation of one single given risk, but of the simultaneous regulation of several interconnected risks that feed one another (Wiener & Graham, 1997). The definition of what constitutes an optimal solution may therefore change. This problematic is already integrated into SI as it is understood by GFS proponents. On the basis of a plurality of competing objectives, SI concludes that there is no universal solution or "panacea" for the problems raised, and that contextual and dynamic trade-offs are required: in other words, the optimal solution lies not in the development of a universal or standard solution, but in the proper distribution in space and time of a plurality of solutions, each of which is insufficient per se, but which globally allow all objectives to be met. These trade-offs affect not only the choice between production and conservation, but also the choice between different agricultural models. This leads advocates of SI to reject both the idea of a Green Revolution in the form of a standardised technological package, and the idea that organic farming might be an ideal and universal solution to existing agricultural and food problems. It is not a case of purely and simply rejecting organic farming, but of nuancing its effect by showing that it is just one solution among many, sometimes useful but sometimes lacking in pertinence: "*an organic system is not necessarily a panacea for low environmental impact because it depends on how you do it and it depends where you do it. There isn't a one-size-fits-all recipe for sustainable agriculture, and say that if everybody does the recipe we will have a sustainable world because it doesn't work like that. So when the farming community asks for "clear and consistent messaging" about what makes sustainable agriculture we can't do it because there isn't a clear and consistent message as what is best to do depends on where you are. Yes we can drive resource efficiency within fields but actually managing the ecosystem services as whole is very place dependent and context dependent*"⁷.

This approach thus has consequences in terms of public policy and, more broadly, of society's choices. It consists in saying that a society's objectives cannot all be achieved at the same time, and that it must acquire the tools that allow it to measure the trade-offs between the different objectives, so as to establish priorities and to gain a clear idea of the consequences of the decisions that are made, from a multi-dimensional standpoint. One of the members of the UK GFS coordination programme thus

⁷ Tim Benton, *Meeting the Challenges of Food Security: implementing the Green Food Project, innovation, biodiversity and land use*, Westminster Food & Nutrition Forum, London, 5 March 2013, p. 42.

states: *"I think the way we think about sustainable intensification is essentially understanding what the trade-offs between these different outcomes are. It's about being clear about the decisions that you're making and being able to manage those decisions. So, if our country decides it wants to install vast amounts of deep water tube wells in an area to boost the productivity by providing irrigation water then that's fine as long as we're clued what the short, medium and long term implications of that are; in terms of environmental impacts such as, ground water depletion, other peoples' use of that water"* (Interview, member of the UK GFS Coordination group).

The consequence of this SI approach would be the development of public policies (agricultural in this case) whereby decisions relate to a context and will therefore evolve in space and time. This objective of sustainable intensification leads to recommendations which consist in choosing production models to suit local environmental constraints: *"You know, the future has got to be: 'farm hard where you can farm hard, where the environment is not too sensitive, farm softly where you need to farm but the environment is more sensitive, and protect where the environment is too important'"*⁸ (Interview, member of the UK GFS Coordination group).

As it has been imported into and reinterpreted in the United Kingdom as part of the debates surrounding the GFS, SI would therefore seem to be a meta tool for making a choice between different production models, depending on the context. But precisely, once integrated into the GFS approach this logic may be applied to many areas other than just agricultural production. This idea of simultaneously managing a plurality of competing objectives has consequences in terms of public policy which go far beyond mere agriculture. In particular, it leads to the notion that homogeneous and permanent measures are not pertinent to the challenges facing food systems, and that we must therefore shift over to contextual and dynamic measures. On this matter a member of UK GFS talked about *dynamic policy*, which (s)he described as follows: *"the approach of the food standards agency is to say: 'here is the threshold, and if there is a risk of going up the threshold, then that food should be wasted'. And what we have discussed in various meetings is, actually, as food prices go up, if the threshold is maintained, then all that means you're throwing away more food and it's more expensive to replace. So we then have a trade-off between the risk of getting ill from eating food that might not be perfect versus the risk of having someone not get any food at all. So you have a long-term malnourishment risk that we will trade-off against the short-term illness risk. So, that would suggest the need for more dynamic policy. So as food prices go up, here is the green area where it's safe, here is the red area where it's not safe and here is the orange area in the middle where, if you want to take the risk, you manage that risk. [...] But because governments like that very simple, very clean policy, and part of the issue is managing the system of all these indirect effects. So if you're too strict about food safety, then it makes people malnourished when they're poor."* (Interview, member of the UK GFS Coordination group).

One consequence of this approach to risks is the questioning, or relativisation, of a tool that is however central to the conventional approach to risks: the threshold. The threshold value, determined by expert knowledge, plays a crucial role in risk management, because it triggers action. Under *dynamic policy* logic, the threshold would not be an absolute criterion, but serves, in a manner of speaking, to define a grey area (surrounding its value) which is precisely that within which the trade-offs will take place, thus allowing a plurality of risks to be managed. Asserting itself here (as has indeed already been the case elsewhere) is the idea that it is not enough to manage one particular risk and that the optimal solution is to be found in the management of a set of risks. With these risks seen as being in competition with one another, it is necessary to trade off risks. And to carry out these trade-offs, it

⁸ Note that no mention is made here of what to do with this idea of specialisation over time, for example in an area where the environment has become over-sensitive due to intensive farming.

would seem necessary to produce measuring tools – whence the objective frequently affirmed by participants in the UK GFS programme to produce the right metrics. We thus arrive at the idea that developing proper risk governance means producing metrics that are sufficiently complex to correctly inform policy makers of the trade-offs between the different objectives (Benton et al., 2018). Although they are not formally linked to the UK GFS Programme, we can view the land-use management experiments currently underway in Scotland as an attempt to operationalize this approach. These experiments are designed to develop an "innovative approach to land use decision-making", by considering land use "in a collective and integrated way and to explore land use choices which would deliver multiple benefits"⁹. They have made it possible to set up frameworks that integrate uses of land "which fall outwith the statutory planning system, for example agriculture, forestry, peatland restoration, the water environment, biodiversity, etc."¹⁰, so as to prioritise and guide decision-making, and resolve conflicts between competing land uses.

Discussion

In this article I have examined the internal variability of Global Food Security's collective action frame. I have shown how above and beyond the flat key – the most visible version of this frame – there is a sharp key, which not only puts forward production issues per se, but also attempts to articulate a complex range of factors (production, price, climate change, environment, diet, etc.). This sharp key articulates these factors in a specific manner: because it sees them as being in competition, it uses trade-offs to articulate them. This leads to a new way of distributing activities, in both space and time. I discuss what such an approach reveals, from the standpoint of transformations to capitalism and attempts to regulate it, and finally from the point of view of social critique.

The GFS approach is frequently decried as a rhetorical tool for maintaining the status quo, or business as usual. In this article I show that things are more complicated than they might seem. Whilst GFS's flat key consists in rehabilitating productivist solutions (economic growth through technology and investment in agriculture), the sharp key would appear to reveal a significant change, that of a shift from a logic of abundance to a logic of (alleged) scarcity. This scarcity is not linked to any intrinsic weakness in production, but to a tension in respect of the ways the production is used. In other words, the GFS discourse also contains an aspect of vertical competition, which consists in turning demand-driven food chains into supply-driven food chains. Moreover, discourses on production can sometimes hide another concern, regarding *extraction*. Use of the term production does not relate solely to the output of productive activities, it also considers *inputs*. What is at stake for the advocates of GFS is not just production and yields, but also competition for access to primary resources (energy, water, land) and control of these resources. As Sassen (Sassen, 2014) points out, capitalism is currently oriented towards an economy of extraction. And in the case of GFS, underneath the general discourse on production, in the reflection upon "resource efficiency", we find an implicit concern for resources. In a similar fashion, the "perfect storm" model refers to a global disaster that would result from simultaneous water, energy and production crises. These extraction-related issues may have a strong impact on how capitalism evolves in years to come, and on how it is regulated.

Regulation issues are at the very heart of the GFS approach, at least as far as its sharp key is concerned. GFS relates not only to a search for technological control, but also to a way of dynamically arbitrate between the different objectives put forward as being contradictory. By highlighting the competition between objectives and by using a risk lens to place all of the objectives on the same level, GFS to some

⁹ <http://www.gov.scot/Topics/Environment/Countryside/Landusestrategy/regional>. Accessed, February 25, 2018.

¹⁰ Idem.

extent disputes a set of principles and protections that it has taken a long time to build. In particular, in a roundabout way it challenges the precautionary principle, not by calling it into question as such, but by using calculation logic to weigh it against other principles – something that might considerably restrict its scope. But once again, in order to identify the effects of GFS, we need to look not just at the discourse but also at the concepts and at the tools that are used to put it into practice. While GFS succeeded in being seen as the new predominant discourse of official UK institutions after the 2008 crisis, this does not necessarily mean that its supporters are managing to operationalize its concepts. Although they are certainly looking to influence policy makers, it is by no means certain that the latter accept the principles of dynamic policy. In very concrete terms, these tools are not being implemented at the present time. Also, GFS offers a relative amount of flexibility. While GFS advocates were initially heavily focused on production as the main lever for food security¹¹, over time they came to accept that land provided "ecosystemic services" other than production and that only taking production into account might lead to certain rural populations being excluded (Benton et al., 2018). Furthermore, they now recognise that if we are to achieve food security, there are solutions other than increasing production – such as reducing food waste or changing diets (Benton et al., 2018). On the other hand, these changes always take place within an approach that does not try to alter the existing food system, but rather to optimise it, by radicalising certain of its properties, and by balancing the role played by certain regulations and protection mechanisms.

Finally, the elements set out in this article raise questions relating to social critique. As I have shown, the tension between Global Food Security and Food Sustainability does not lie solely in the opposition between production-based thinking and diet-based thinking, but also in the different ways of articulating a wide range of issues: whilst the advocates of agroecology count on the integration and harmonisation of different issues (typically production and the environment), those who support GFS rely on arbitration between competing objectives, the spatial and temporal separation of activities and compensation measures. Perhaps an efficient critique of GFS should tackle the issue of trade-offs, and also discuss or reformulate the land sparing/land sharing debate that underpins it (see Kremen, 2015). The risk-risk trade-offs approach creates a certain number of problems. While it certainly has the merit of raising the issue of the multiplicity of and competition between risks, it reduces this issue to matters of arbitration techniques, whereas a significant amount of social science research has demonstrated the need to have a proper political approach to the plurality of risks, and to accept conflicts between different values (Bernard de Raymond, 2010; Callon et al., 2001; Chateauraynaud et al., 2010; Hood, 1996). Moreover, in deeming risk arbitration to be something that can be constantly revised, this approach leaves aside a crucial question in contemporary risk management, that of the irreversibilities engendered by technologies (Jas & Boudia, 2019; Torny, 2013).

Conversely, advocates of Food Sustainability should perhaps tackle the issue of trade-offs: does the multiplicity of the challenges facing agriculture and food mean that we sometimes have to make sacrifices and choices? If so, which ones¹²? And on the contrary, which values must remain non-negotiable? Moreover, this opposition between integration and harmonisation on the one hand, and specialisation and compensation on the other, goes well beyond agricultural and food issues and can be found, for example, in negotiations relating to climate change (regarding debates on carbon sequestration for instance). This opposition might therefore become a common thread for numerous conflicts and disagreements to come.

¹¹ Tellingly, sustainable intensification was endorsed by organisations such as the Syngenta Foundation. See: <https://www.syngentafoundation.org/sustainable-intensification>

¹² If we want food systems to be sustainable, to what extent should we change our diets and, more generally speaking, our way of life?

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