Journal of Agrarian Change

Reproducing vulnerabilities in agri-food systems: tracing the links between governance, financialisation and vulnerability in Europe post 2007-8.

Terry Marsden, Ana Moragues - Faus and Roberta Sonnino

Reproducing vulnerabilities in agri-food systems: tracing the links between governance, financialisation and vulnerability in Europe post 2007-8.

Abstract

Interconnected sets of vulnerabilities have emerged in the European food system since 2007-8, raising concerns about food security in a region with arguably some of the most advanced and prosperous economies and environmental governance frameworks. Historically this is suggesting the current 'double jeopardy' problem in food system vulnerability– with systemic declines *both* in sustainability (the ability of the food system to ecologically renew itself) *and* food security (the ability of a population to access sufficient nutritional foods and feed itself). By focussing on both drivers and impacts of food system vulnerabilities in the EU and UK, this paper explores a grounded and relational approach to financialisation- recognised as a key expression of recent growing vulnerabilities.

Through the prism of the current socio- economic pressures facing food producers, and the emergence of potentially 'stranded assets' in the agri-food system more generally, the analysis seeks to show how the *combined* relationships between neo-liberalised governance and the market volatilities encouraged by new rounds of financialisation are creating 'nested' vulnerabilities. As we conclude, a critical, grounded and systemic understanding of food system vulnerabilities thus becomes a key feature and precursor for potentially developing more resilient agri-food systems -- both regionally and globally.

Key words: food vulnerabilities, financialisation, stranded assets, neo-liberalism, food systems.

1. Introduction: tracing the links between food governance, financialisation and nested vulnerabilities.

The paper first provides a conceptual and empirical overview of food system vulnerabilities with reference to the EU and UK. This provides a basis for then developing a more focussed and grounded examination of the role of financialisation as a driver of a range of interconnected and nested vulnerabilities during this recent period. We focus here specifically upon the links between financialised exposure of the farm producer sector, and then the even more recent vulnerabilities which are emerging within this more financialised system as increasing limitations to the exploitation of carbon-based assets become recognised.

In recent years following 2007-8, the food system has witnessed the intensive application of complex financial products whose 'fictitious' value is linked to fixed and ordinary assets like farm land, bushels of corn or wheat, or the myriad of products placed upon corporate retailers shelves. This re-commodifying and 'rebundling' process in the face of growing food shortages and price rises has been centrally facilitated by neo-liberalising states (as in the UK), which contemporaneously withdrew public systems of support (austerity) whilst stimulating private- risk financialisation. Following and developing a food *system* perspective, therefore, signals that these co-processes of neo-liberalising governance and corporate financialisation have combined and far- reaching effects not only upon the food production sector, but also on consumers and the complex varieties of firms

and actors operating between producers and consumers. In short, this points us in the direction- as much of the succeeding analysis demonstrates- in needing to trace the contextualised and nested linkages between: (i) neo-liberalising food governance, (ii) the socio-political impacts of financialisation and, (iii) the relatively recent deepening of nested vulnerabilities both for producers and consumers.

What we postulate here is that there is the need to conceptually and empirically explore the revised and systemic interconnections between these three spheres. Isakson (2015: 571) in a special issue of the Journal of Agrarian Change devoted to financialisation, attempts to link the (re-)production of vulnerabilities (among farmers) with financialisation:

'Vulnerability is contextual and dynamic. It is produced through evolving social relations and articulated within a specific socio-ecological setting (Taylor, 2015). The commodification of agriculture and agrarian relations, the deterioration of ecological conditions and growing inequality resulting from agricultural modernisation and the rollback of state protections under neo-liberal restructuring... combined, these processes have helped produce a global peasantry, that, in many ways is highly vulnerable to the contemporary risks emanating from climate change and increasingly volatile market conditions'. He concludes (557): 'Financial means cannot substitute for the socio and ecological foundations of security.'

The recent conjunctions between neo-liberalist food governance, new rounds of financialisation, and indeed its relationships with setting off a wider and deepening set of social vulnerabilities is creating, overall, as we shall analytically examine below, a food landscape which is far more volatile, not just in market terms. For as Visser *et al* in the same special issue (2015) suggest, key areas needed for further research on finanicalisation involve tracing thorough the very social vulnerabilities and volatilities which it inherently creates; and identifying the diversity of 'actors in context' who promote the drivers, strategies and discourses of the processes as they unfold. They argue (2015: 547):

'To what extent are these drivers, strategies and legitimating discourses simply about the management of risk, and to what extent are they about generating profit at the expense of others? Such research is crucial in order to gain a deeper understanding of the rise of finance in agriculture, and the possibilities and limitations of regulation'.

As we shall witness below, this very process of construction of nested vulnerabilities is not unique to producers; it also heavily affects the food security of consumers. In the succeeding analysis we will bring a variety of evidence together from EU and UK sources to examine the rise of nested vulnerabilities in the contemporary food system and point to the critical and socio-political location of financialisation in this process. This involves: (i) some of the key results from an extensive media analysis during the years since the crisis erupted (2007-8); (ii) a set of selected expert interviews conducted in the UK, and (iii) a Delphi survey of European experts concerning what they regarded as the main drivers of food system vulnerabilities. The first part of the analysis (section 4) focusses upon the identifying the interdependent key sets of *drivers* (including financialisation) of food vulnerabilities, as identified by key stakeholders and experts in the UK and EU food policy community. In the second part of the analysis (section 5) we examine the more *grounded social and economic impacts* of these vulnerabilities upon UK farm producers, state policy and the future possibilities for a redirection of financial investments as a result of their impacts upon carbon-emissions and climate change more broadly.

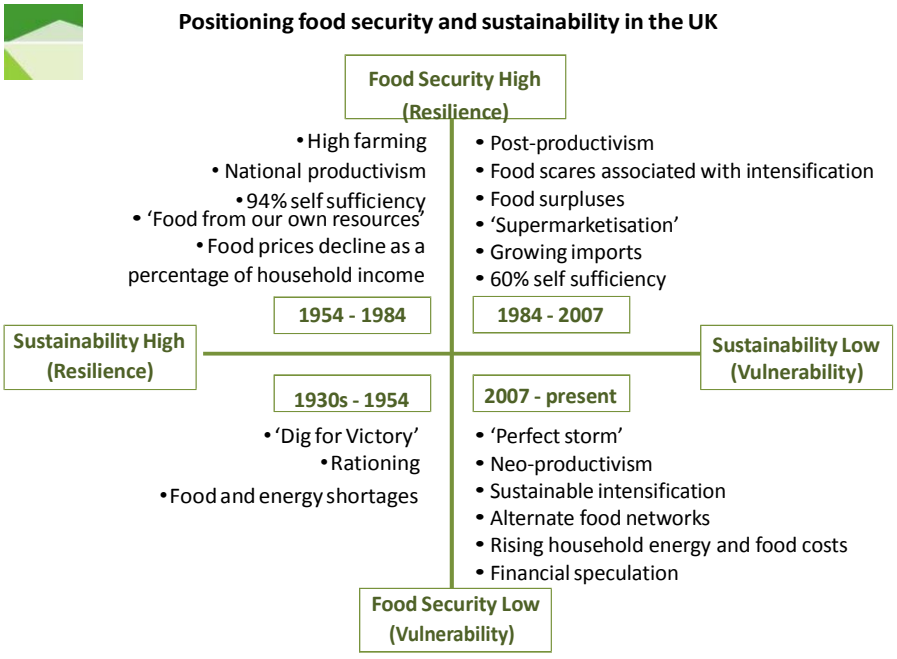
2. New volatilities and nested vulnerabilities in the food system

The global food, fuel, financial and resulting fiscal crisis (FFFF) emerging from 2007-8 has led to the rejuvenation and reproduction of a series of interconnected food system vulnerabilities that cover both food unsustainabilities *and* food insecurities. As figure 1 below attempts to summarise in historical perspective, the production and consumption arenas in the food system have become more systemically connected and more vulnerable over recent years. Since 2007-8, it can be argued that *both* the sustainability and security dimensions of food have diminished compared to earlier governance phases, when both the security and sustainability of the food system was at higher levels. Now both realms are seen to be in crisis. The combinative nature of this crisis has been documented for some time both in Europe (see, for example, Marsden, et al. 2010; 2013) and in North America, where the corporate private-interest model has recently been discussed as an expression of a wider crisis associated with a persistent neo-liberal form of food regulation (see Wolf and Bonanno, 2014; Busch 2014). As Bonanno (2014:27) argues:

> 'The limits of neo-liberalism are theoretically clear and empirically evident. Arguably, the crisis of the regime can be seen more as a demonstrated fact rather than a hypothesis. Additionally, existing contradictions make it problematic to argue about the existence of an organised system. Neo-liberalism appears more like a project in crisis, rather than a regime. Yet, and despite claims of economic unsustainability and lack of substantive democracy, neo-liberalism remains the dominant ideology and, in many instances, the preferred political choice of the second decade of the twenty first century.'

The food system is a central subset of these new contingencies, and it is one that, as we shall delineate in this paper, openly displays their contradictions and vulnerabilities, thereby reducing the overall legitimacy of the neo-liberal food regulatory system as a whole (see Ostry et al, 2016).

Figure 1: The changing balances between food security and sustainability in the UK food system



The paper attempts to identify and discuss the onset of interconnected food vulnerabilities through a focus on the food system in the EU and UK, where, since the start of the FFFF crisis, we have witnessed both the rejuvenation of the private- interest, corporate-led governance model, and an intensification of its social impacts and vulnerabilities; such that a renewed discourse around 'food security' has emerged (see Feeding Britain Report 2014; UK National Report, TRANSMANGO, 2015). This is leading to a new set of conjunctures which are far more unstable in comparison with the late 20th century, which delivered what seemed to be abundant and socially legitimate food provision at a relatively cheap price for the majority of the population. Under the current conditions, by contrast, we can expect more volatile and nested vulnerabilities in food nutritional and provision systems operating at the same time and in parallel spaces. For instance, as we shall depict, we are witnessing the continued intensification of production and supply of food and the consequent removal of formerly viable farm businesses, at the same time as a growth in alternative food networks (AFNs) is occurring as a reaction to these trends. What is clear, and UK governance seems particularly prone to this, is that there is a lack of coherence and proactivity on the part of the State to act (and especially to positively intervene) in and on behalf of the wider public interest; over and above its private interest obligations to corporate (and increasingly financialised) private food interests.

These dynamics are tending to devalorise and disempower significant groups of consumers and producers, such that value is continually abstracted from both by the more concentrated and financialised corporate manufacturing, catering and retailer sectors. This is more evident today than it was a decade ago, when the dominant private-interest food governance model could rely upon fairly stable and abundant procurement of food materials from around the world at a relatively cheap and (albeit externalised) cost. At the same time, general levels of economic growth and universal state welfare spending also tended to uphold the effective demand and consumption of food goods for the majority of the low- income population. Prior to the ongoing FFFF crisis emerging from 2007-8, whilst there was a general recognition that the food system was increasingly ecologically unsustainable (see figure 1), its ability to secure food for the majority of the population was largely taken for granted.

As Moore (2016) and Marsden and Morley (2014) have recently pointed out, today the emerging conjuncture of resource depletion, on the one hand, and the continued withdrawal of national state welfare nets on the other, together with the upholding of a continuing neo-liberalising and financialised corporate food system, have led to the production of a new set of nested and recombinant food security vulnerabilities.

The current conditions have also further stimulated the corporate controlled 'financialisation' of key aspects of the food system, as growing scarcities have led, in turn, to new rounds of speculative financial investments in land and key natural resources (see Ouma, (2016). New forms of market instruments and investments are developed for financial and investment gain, thus often promoting short-term and ephemeral gains and volatilities in agri-food markets (see Burch and Lawrence, 2009; Clapp, 2014; Fairburn, 2014; Isakson, 2014b). One reaction to the crisis has thus been to continue to shift financial resources to resource based 'safe-havens' and 'land grabs', further reducing social and public- good investments that target vulnerabilities and inequalities.

These transformations, we argue here, will require innovative forms of food governance to replace the current withdrawal of national-state food policy in the face of the dominant corporate and financialised food governance model. The related postulates underpinning this argument which we begin explore in this paper include the following:

(i) Since 2007-8 and the emergence of the FFFF crisis there has been a political metamorphosis between national state polities and corporate financialisation. A common effect of this has been a further concentration of control over natural resources, infrastructure and food-based capital.

(ii) This process is deepening and reproducing food vulnerabilities and inequalities, while at the same time promoting separate and autonomous "translocal assemblages" (McFarlane, 2009) in the wider NGO and civic sectors. This is an outcome of ongoing efforts to ameliorate some of these vulnerabilities and to create new social and physical infrastructures that enhance (in the medium to long term) food system resilience.

(iii) The dual and contested transformation process at play is creating new territorialised 'niches' at the same time as the neo-liberal financialised model becomes a source of basic vulnerability itself (see our discussion below on 'stranded assets', section 5) in that it tends to deepen both food unsustainability and food insecurity.

(iv) Both financialisation and its nested vulnerabilities in food systems need empirically grounding in more fine-grained analyses that tease out the economic and social relationships and dependences these concepts imply. For instance, in order to re-build more resilience and adaptive capacity in food systems it is necessary to fully address the embedded ways in which vulnerabilities and financialisation *are working together*. This provides a more integrated conceptual basis for understanding vulnerability (see Adger 2006; Blaikie, 2004) as 'the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of the capacity to adapt' (Adger, 2006).

(v) Critical in mediating the changing balances between the onset of nested vulnerabilities and the (potential) creation of adaptive capacities and resiliences is the question of the types and modes of food governance. These even in their most neo-liberal forms, play a critical role in conditioning these balances. As even the conservative International Monetary Fund has recently come to recognise:

> 'In sum, the benefits of some policies that are an important part of the neo-liberal agenda appear to have been somewhat overplayed. In the case of financial openness, some capital flows, such as foreign direct investment, do appear to confer the benefits to growth claimed for them. But for others, particularly short-term capital flows, the benefits to growth are difficult to reap, whereas the risks, in terms of greater volatility and increased risk of crisis, loom large' (Ostry et al 2016:40).

(vi) It follows from these postulates, as we will address in the conclusion, that the elimination or reduction of nested vulnerabilities in food systems, and their attendant capacities to build more resilience, will require systemic and governance attention, and indeed a shift and innovation in how the financialised 'markets' are managed within (as well as beyond) their specific institutional contexts.

3. Investigating vulnerabilities: Research Methods

To better understand the nature and outcomes of the UK's food system vulnerabilities, a media analysis was conducted using a total of 475 text units from eight main British newspapers[1] in the 2010-2014 period. The text units were selected from the lexis-nexis database introducing 'food security' or 'food poverty' as key words, which resulted in a total of 2572 articles. The text units were selected according to their relevance, source, topic and number of articles in that source. The qualitative software NVIVO was used to code and characterise a total of 21 vulnerability drivers and 18 food system vulnerabilities that are associated with both immediate and more basic causes and with a diversity of food security framings.

The media and expert stakeholder analysis was followed at EU level with a dephi-survey of food policy stakeholders from the policy, NGO and food business sectors (see Marangus Faus et al, in press). We present below (box 1) some of the key quotations which focused upon aspects of financialisation as key drivers in the global food system.

The main aim of this study was to identify global food system drivers and vulnerabilities that affect EU's food and nutrition security. To include as many different perspectives on the European food system as possible, we carried out a Delphi expert survey, where interviewees are considered as informants on a specific subject, rather than being the object of research themselves. The research process entails different rounds of individual interviews, which are designed to avoid direct confrontation, maintain anonymity and avoid a pre-framing of issues as contentious as food and nutrition (Monney and Hunt, 2009). The overall aim of this method, which has proven especially useful to elicit opinions on complex issues such as climate change (Doria et al., 2009) or public food and health policy (Aschemann-Witzel et. al., 2012), is to facilitate consensus while also identifying divergent opinions that can provide the basis for policy changes or new research agendas (Rayens and Hahn, 2000).

At the start of the research process, we identified – together with nine European research groups from different countries - 98 stakeholders with expertise on global and European food security from different backgrounds (civil society organisations, private sector and the public sector) and different areas or stages of the food chain. Potential participants were contacted a minimum of two times each. In the end, a total of 45 international experts participated (39 in the first round and 27 in the second round), which formed what is normally considered a typical sample size for a policy Delphi method (Rayens and Hahn, 2000). This sample is also characterized by a high geographical diversity, since it included participants from 11 different countries and different sectors (18% private sector, 43% public sector, 36% civil society organisations, 2% public-private partnership). The selection of experts was made in consultation with 9 academics from different European countries working on food security.

Section 5 of the analysis which focusses more specifically upon the impacts of financialisation and vulnerabilities is based upon additional key interviews and analysis of secondary data which followed the earlier surveys mentioned here.

4. Exploring the anatomy of vulnerability in the post 2007-8 UK and EU food system

The UK is a particularly illustrative national example of contemporary and nested food system vulnerabilities. Following the decline in Keynesian welfarism and agricultural productivism of the

[1] The newspapers selected included: the Guardian, Telegraph, The Sun, The observer, The Independent, The evening standard, The Daily Mail and The Mirror.

1970s, corporate retail expansionism has driven the internationalisation of food supply and consumption. This has fuelled a growing dependency on food imports since the 1980s, which today constitute 40% of all food consumed in the UK (DEFRA, 2014b). The report 'Agriculture in the UK 2013' (DEFRA, 2014) shows that the value of imports of food, feed and drinks is nearly twice as high as the value of the exports (£40.2 and 18.9 billion respectively). In terms of production, almost half of the agricultural area of the UK is dedicated to cereals, with just 3% of the arable area dedicated to horticultural crops -- a percentage that has been in constant decline since the 1980s (DEFRA, 2014). Smaller farm holdings are disappearing at a faster rate than those over 100 hectares, despite a general increase of agricultural area.

Despite these negative trends, the UK food sector as a whole is expanding, providing 13% of national employment, and contributing 7.1% to the national Gross Value Added (DEFRA, 2014c). The manufacturing of food products shows a high concentration of turnover amongst a few large companies, which together provide almost 60% of the overall employment in the sector (BIS, 2012). Food retailing is highly concentrated; at least two-thirds of sales are accounted for by four retailers (Tesco, Sainsbury's, Asda and Morrison's), with non-multiple stores together reaching just 8% of UK grocery market shares in 2012. Recent grocery share figures (from Kantar Worldpanel[i] (September 2014)) show a sharp increase in discount supermarkets as a result of what some commentators refer to as "the supermarket price war"[ii]. Meanwhile, independent stores and wholesale markets have continued to decline, but there has been a rapid growth in the number of farmers' markets, indicative of the resurgence of interest in the quality and provenance of food (PMSU, 2008).

One of the main concerns for the UK's population today is food prices, which have increased by 18% in real terms between 2007 and their peak in August 2012 (DEFRA, 2014c). This has affected mainly low-income households, who have purchased more pork, poultry and eggs than fruit, fish or more expensive meats (DEFRA, 2014c) -- a dietary trend that contravenes the Government's recommended "eatwell plate"(DEFRA, 2013). In England, 64% of the population is overweight, especially amongst low income families (HSE, 2013).

Government figures now estimate that there are around 13 million people in poverty in the UK -- that is, one in five people (Department for Work and Pensions, 2014). Alternative sources state that four million people suffer from food poverty (Gordon et al., 2000)and that around three million people suffer from undernourishment or are at risk of being underfed (Brotherton et al., 2010). Not surprisingly, the UK has recently experienced a significant expansion of charity-run food banks, with estimates of around 500,000 residents now reliant on food aid (Lambie-Mumford et al.,2014).The factors identified by food aid organisations as important drivers leading people to seek food aid include both immediate problems that lead to sudden reductions in household income (such as job losses and problems associated with social security payments), and on-going, underpinning circumstances (such as continuous low household income and indebtedness) that constrain the opportunity of purchasing sufficient food to meet household needs (Lambie-Mumford et al., 2014).

a. *Exploring the drivers of nested food system vulnerabilities in the UK*

A first stage of the analysis consisted of identifying the main Food and Nutrition Security (FNS) vulnerability drivers highlighted by the media analysis. In the context of this research, vulnerability drivers are defined as threats to the food system that may affect its capacity to deliver food and nutrition security for all. As Table 1 shows, a total of 21 vulnerability drivers were characterized and

classified according to ecological, social, economic, political and technological dimensions,and with different levels of importance (++ most mentioned, + mentioned, rarely mentioned).

Table 1. **Vulnerability drivers identified in the UK media analysis**

These results were then discussed with six experts –covering the agricultural sector, anti-poverty groups, union representatives, sustainability and food chain experts-- through phone interviews to refine set of vulnerability drivers and their interrelations (see table 2 below, the boxes in purple contain the modified vulnerability drivers).

Table 2. UK Vulnerability drivers with input from stakeholders

Box 1 deepens this vulnerability analysis by containing the qualtitative Dephi survey responses and extracts from Round 1 of the survey. There we posed the question to European experts: 'What are the key drivers of change of the global food system at the moment?' We can see here the linkages which are made by the respondents between neo-liberalised governance and financialisation as a major driver, especially since 2007-8.

We can see here through this empirical evidence both at national (UK and EU levels) the linkages between governance and financial drivers and FNS nested vulnerabilities. They identify specific areas exposed to perturbations that might potentially cause food and nutrition insecurity for specific vulnerable groups or for the society as a whole (Adger, 2006). Vulnerabilities do not represent problems or weaknesses *per se*; they have to be considered in connection with the drivers that are likely to affect the system, as well as include the level of sensitivity, exposure and adaptive capacity of the system/sub-systems affected.

The main UK **ecological vulnerabilities** comprise declines in soil fertility, biodiversity, production (in terms of yields, losses or polluting effects associated to agriculture), and water (including water footprints and overall water management). **Socio-cultural vulnerabilities** encompass how the vulnerability drivers identified above might affect people's lifestyle, health and wellness as well as social inequality and incomes. Other vulnerabilities of this kind include information, and particularly the lack of accessible and transparent information, people's skills and unethical behavior, which can ultimately affect democracy and participation of society in the food system. One important type of **political vulnerability** identified revolves around the fragmentation of policies affecting the food system, combined with weaknesses in public regulation and enforcement. These vulnerabilities are illustrated by examples such as controversies around food labelling schemes, sugar taxes or food frauds, but also through the shrinking of the welfare state and the emergence of private initiatives performing those functions -- for instance, the institutionalization of food banks or the tendency to regulate the food system through private standards.

There are several **economic vulnerabilities** connected to political vulnerabilities, such as the concentration of power, food markets and logistics. The capacity to influence purchasing habits through choice editing and influencing consumers' behavior is also considered a potential vulnerable area. The analysis shows that reliance on imported foodstuffs and other inputs such as energy, feed or water might constitute a state of potential insecurity. Access to land and other resources constitutes a key area of potential insecurity, jointly with the financialisation of food. In fact, food is increasingly becoming a financial asset to be traded over time (e.g. hedge funds) and space. The growth in financial packages by banks, agricultural commodity trading firms and investment funds is creating more volatility in food prices, as well as land and commodity markets. Finally, **technological vulnerabilities** comprise how the vulnerability drivers identified above might affect food safety and hygiene, the reliance on non-renewable inputs or the policies and politics around research and development of technologies, including the management of property rights and public access to knowledge. This last element is connected with the political dimension and also includes how resources are allocated for R&D and how this influences what problems are tackled and what knowledge is created.

Our media, expert and Delphi analysis (see Box 1) shows that vulnerabilities cannot be considered in isolation, particularly when assessing their relation to food and nutrition security outcomes; that is, availability, access and utilization of good food for all and the stability and control of these outcomes(see FAO, 2008). For example, social inequality and low incomes, skills, information, lifestyle, health and wellness might affect utilization while at the same time also leading to select food stuffs that are not appropriate for a healthy diet. Of particular importance are the system vulnerabilities that affect the stability and control of FNS outcomes, which include two main issues. On the one hand, the Delphi results (see box 1) show there is a set of political and economic nested vulnerabilities mainly encapsulated under financialisation, power concentration and the fragmentation and weakness of public regulation. On the other hand, ecological vulnerabilities linked to resource depletion and degradation also play a key role in providing stability and control of FNS outcomes. In the case of the UK, losses of biodiversity and soil fertility are particularly relevant.

INSERT BOX 1

5. Managing the impacts of financialisation and vulnerability

a. Grounding *Financialised vulnerability*

As we see from the vulnerability analysis above, both in the media and especially amongst stakeholders and Delphi questions of economic drivers associated with the concentration of power, financial speculation, land concentration and competition, price volatility and surges, have come to the fore as both important expressions and drivers of vulnerability in the contemporary EU food system. Here we wish to concentrate further on these sets of nested vulnerabilities by looking at their expressions and impacts over recent years, and then consider how such financial and economic vulnerabilities could be reduced.

It has indeed been common in the academic literature to highlight the growth of 'financialisation' as one key feature and indeed reaction to the unfolding global FFFF crisis. Whilst financialisation has a long and varied history in its relationship with agriculture especially (see Chayanov, 1966; Kautsky,

1988; Cronin, 1992), recent writers have pointed to the growth in financial ('fictitious') speculation in the agricultural land base as a particular feature of the reactions to the overall financial crisis of 2007-8. As Ouma (2016: 2) aptly summarises:

> 'It is not surprising that finance recently turned its eye to farmland and food production…. It sounds convincing, as finances growing interest in all things agricultural seems a textbook case of Harvey's idea of the spatio-temporal fix (Castree, 2009; Harvey, 1982), after crises and devaluations in established domains of finance, capital sought greener pastures, extending its operational space into geographies in which it was not much interested in… Indeed , since 2007-8 farmland and agriculture is framed as a thing you should bet on'.

This (re-newed) penetration by finance into land and agriculture, which has occurred during a growing agrarian crisis and food regime instability and volatility (see McMichael, 2012, 2013; Fairburn, 2014), can be seen as a 'new frontier' with regarding the spatial 'fixing' of accumulation, especially in the global South (see Ouma, 2014, 2015). Here we wish to argue the need to adopt a more grounded and embedded understanding of 'financialisation', especially in relation to its interconnections with other complexities of the food system as a whole. We agree with Ouma (2016:2) when he argues that: (i) 'financialisation' of farmland may mean different things in different agrarian contexts; and that (ii) it is valuable to view financialisation not so much as an external force (essentially an exogenous driver onto the system), but rather incorporate it into the historical and geographically variegated and grounded performative 'action space'. This leads us to examine the varied entry points for further 'exploring the variegated operations of agri-finance formation'.

In our analysis, the growing financialisation in the food systems of Europe has reinforced both market vulnerabilities, especially in: (i) farm gate prices and (ii) the time-space volatilities associated with general financial investment and food futures markets, which has in turn given more volatility to agricultural commodity markets across the board. To explore how these new rounds of financialisation are creating interconnected vulnerabilities in food system dynamics, we will nowfocus on each specific expression of the problem.

b. Rejuvenating Farm-based cost-price squeeze volatilities: the combined effects of financialisation and deregulated market exposure.

Since the inception of the FFFF in 2007-8,far from benefitting from the renewed interest of financiers in farmland and all things agricultural, UK farmers have overall faced a more intense and indeed more volatile market context, higher input costs and a depreciation of their farm household incomes. Despite the investors claims (Jim Rogers)'s claim that 'farmers are going to be driving Lamborghinis: stockbrokers are going to be driving tractors' (Quoted in Harding, 2012; Ouma, 2016), and that no matter how bad things get, we all have to eat' (The Economist, 2009), British and European farmers more generally have experienced a growth in vulnerabilities across the different sectors. Whilst agricultural and forestry land prices have escalated as many cash-rich financiers and other urban rich have seen farm land as a key 'safe haven' for investment during periods when other investments have seemed too risky, strictly agricultural producer returns on investment have continued to decline.

The relationships between renewed financialisation and the farming community are far from linear. In fact farms have been closing, with recently over half of all dairy farmers arguing they are thinking of quitting the sector in the next few years and at least six farms foreclosing weekly in England and

Wales during 2015-16. The volatility in markets, the disproportionate buying power of the corporate retailers and processors, as well as their increasingly selective processes of recruiting 'dedicated suppliers', have combined to increase the structural vulnerability of the sector. By 2016, hardly any farm sector in the UK was experiencing stable or rising incomes due to these factors. This has led bodies (not least the Farmers Unions, Farmers for Action and recently the Agricultural and Horticultural Development Board)[2] to hold fora and lobbying sessions on managing this increasing amount of volatility (see Farmers Weekly, Feb, 2016). Wheat futures markets, milk, horticulture and beef and pigs markets have all been declining, mostly as a result of the exposure to the increased financialisation of the markets.

Both the Westminster House of Commons and House of Lords Select Committees have recently completed cross-party studies and enquiries about this price volatility (see HoC, 2016, HoL, 2016)[3]. The latter report named 8 key combined drivers for the increasing price and financial volatility: weather shocks in supplying countries, declining stocks, lowinvestment, trade policy of export and importing countries, increasing demand for bio-fuels, rising demand in developing countries (especially India and China), financialisation of agricultural commodity markets, and higher carbon based oil and fertiliser prices. We see here important parallels with our earlier media and stakeholder and Delphi analysis in that financialisation is embedded as a driver of vulnerability, and directly interlinked with related aspects of resource depletion and uncertainty over carbon –based supplies. Farmers become a fulcrum and a bell-weather for being increasingly exposed and having to manage these combined and 'nested' vulnerabilities; all of which have different space-time components.

This is, however only half the picture regarding producer vulnerability, as the strictly financialised market vulnerabilities have combined with further deregulation of state support structures that were originally designed in the immediate post-war period to improve the resilience of farming incomes and prices. In particular the reform of the EU's Common Agricultural Policy from commodity price support towards decoupled payments has increasingly exposed farmers to the now more volatile and speculative market prices across most of the production sectors. These deregulations are thus increasing market exposure (HoL,2016: 22):

> 'According to DEFRA, the intensity of market intervention has declined significantly as a result of CAP reform since the early 1990s, leaving EU markets more open to respond to fluctuations of supply and demand…. De-regulation has meant that farmers have now to actively manage their own price risk. Clearly this is a huge challenge for the industry, which requires broader and new sets of management skills, beyond the traditional physical skills…. Despite the decline in Market intervention…the EU retained a number of market management tools, including intervention buying and export subsidies.'

These latter potential measures are not, however, comprehensive, and combine with other related perturbations associated with the recent Russian food trade embargo and the removal of milk quota regulations that are increasing the exposure of producers to market volatilities. It is a double (state and marketised) edged sword, just coming at a time, as we shall see below, when some policy

[2] The authors have been in regular conversations and discussions with these groups as part of the overall primary and secondary research with stakeholders. The Farmers for Action group has led a sustained campaign to promote the role of producers and to lobby government for 'fairer prices for farmers'. The Agricultural and Horticultural Development Board is a major 'levy agency' for the promotion of farm products and innovation in the sector.

[3] Marsden has been a member of the Rural Economy House of Lords Group which promoted these inquiries.

makers are beginning to ask of the production sector to become more 'resilient', produce more, more sustainably and with less carbon inputs.

How to cope with these combined and more financialised vulnerabilities becomes a major challenge for the farming community, since, as some commentators predict, it is likely to lead to a decline in the overall resilience of the productive sector, to reduce capacity and investment in productive capital and infrastructures and to trigger further rural depopulation (Marsh, HoL, 2016). For many policy-makers who do not envisage or indeed advocate a return to more comprehensive post-war farmer price support, the main solution to these conditions is to build up the Darwinian individualised adaptive capacity and resilience of the farm businesses that remain, and concentrate upon supply side policies (like upgrading the business skills and planning/ management skills of the farm population). This individualised and neo-liberalised notion of resilience (see Davoudi, 2016) is seen as one of the main antidotes to the combined systemic vulnerabilities that the UK and European farm production sector are now facing. As the recent HoL report (pp15) concludes, for instance:

> ' A degree of price volatility sends crucial market signals, which inform production and investment decisions. It also provides incentives for innovation and efficiency gains... Preparedness for price movements will assist farmers in their investment and business decisions, but will not eliminate risk.'

in sum, financialised vulnerabilities as experienced in the UK food system post 2007-8 have become embedded and nested within a wider set of interlinked vulnerabilities that become expressed, relationally, on the farm production sector. More financialised and speculative markets have combined with both more deregulated policy changes, and the continued growth of a highly oligopolistic food processing and retailing sector, to further expose the relatively de-concentrated farm sector to conditions that are seriously affecting its medium and long term resilience.

During this period, corporate retailers have tended to be more concerned with the more intense horizontal competition they have faced, especially from the retail discounters, which has then further intensified price pressure vertically down the line to their processor and farm suppliers. This process of intensification of margins and prices continues to generate shareholder dividends for investors in the corporate retailers. In the absence of a strong political commitment to develop state farm policies to protect the national farm infrastructures (as was a feature of the earlier stages of policy , see figure 1), it is likely that these systemic vulnerabilities will continue to inflict a neo-liberalised Darwinian struggle on to the farm sector; one which, for many, will presage further intensification of production on a smaller number of farm businesses. One recent example of this has been given by the recently appointed Office of Groceries Code Adjudicator (GCA, 2016,), which found the retailer Tesco guilty of delaying payments to their suppliers and externalising their own financialised risks to the upstream sector.[4] With regard to the inquiry on how Tesco overwhelmingly focus upon meeting their own financial targets), she tellingly concludes:

> ' Tesco staff seek agreement from suppliers to the deferral of payments due to them in order to temporarily to help Tesco margin. I saw internal Tesco emails suggesting that payments should not be made to suppliers before a certain date in order to avoid

[4] After a protracted process led by producer and food supply organisations, and several Competition Commission enquiries into corporate retail practices, the UK Coalition government of 2010 agreed to establish an independent Grocery Code Adjudicator who would have some powers to independently explore complaints about retailer supply chain practices on suppliers.

> underperformance against a forecasted margin. I found that Tesco knowingly delayed paying money to suppliers (sometimes up to 24 months) in order to improve their own financial position'.

Referring again to our systems conceptual model, we can conclude here then that the dominant regime in agri-food has been incorporating new rounds of financialisation at the same time as deregulating the role of state intervention in the production sector. These effects, in turn, are transmitting a wider cocktail of combined vulnerabilities onto the farm sector, which in itself is becoming less ecologically, socially and economically resilient. Here financialisation becomes an embedded source of vulnerabilities, and it is, in many ways, only a means of transmitting these around the system as a whole. It is somewhat ironic perhaps that the very ecologically-based reasons for this new round of financialisation (the global food supply crisis) is in itself then promoting- through the active articulation of the nested connections we outline here- more ecological and economic vulnerability at the local farm level itself. This, indeed, is one advantage of adopting a critical systemic view of food system vulnerabilities as a hybrid socio-technical system that produces different power relations and multi-regime interactions. Such view, as we have attempted to demonstrate, allows us to understand how vulnerabilities become embedded and reinforced not only by individual components but in a combined sense, which creates overall levels of disfunctionality in the system as a whole.

c. The rise of stranded assets on agri food: exploring the evolution of the food-energy-finance nexus

A second and related entry point with regard to the location and impact of financialisation in our conceptualisation of food vulnerabilities relates to very recent realisations about continued resource depletion and climate change. In particular, the recent announcements at the global level of both the revised Sustainable Development Goals and the landmark commitments by 196 countries to limit carbon emissions (Paris COP21) are suggesting the possibilities of significant changes in state and financial investment strategies (see Marsden in press). As we argued earlier, our conceptual model proposes to incorporate not just the significance of the dominant food regime butalso multi-regime interactions into our thinking, especially concerning the increasing bio-economic and nexus relationships between energy, food, fibre and finance. Again, here we see financialisation as an embedded and grounded set of relations that in fact lubricate, in a variety of ways, the power and commodity relations of this important nexus. Indeed, with the rise of the bio-economy (Brunori, 2013; Marsden and Farioli, 2015), multi-regime interactions are beginning to play out in setting potential conditions for a real (but highly contested) post-carbonised transition. This inevitably means a renewed emphasis upon the bio-sphere for obtaining the resources to live and be secure.

A significant push factor for the post-carbon transition in the nexus as a whole could now be developing with the rise of what some investment analysts have been calling the rise of 'stranded assets' (see Caldecott et al 2014). As many leading banking and financial leaders have been proclaiming this recently (see Carney, 2015), this expression suggests that a new set of nexus vulnerabilities are developing FOR the financial sector itself, with regard to its considerable over-reliance upon carbon based asset investments. There has been a spate of recent national divestments in carbon-based assets, such as that occurring in Norway in 2015 and those set in motion by key financial players, such as Morgan Stanley, Citi group and Wellsfargo and Co. A combination of spatially variable pressures and restrictions in exploiting coal, oil and gas deposits

following COP21 seems to suggest that we are beginning to witness the end of the 'multi-trillion dollar agri-bubble'(Business Green, 2013), and that financial investment firms need to rethink their medium and long term investment strategies, such that they do not fall victim to what the Governor of the Bank of England Mark Carney (2015) has called the 'tragedy of the horizons'.

This is beginning to suggest that the investment in agricultural and agri-food resources, which especially from 2002 has been the longest commodity boom since 1945, is coming to an end. Global farmland asset values ballooned during this period, rising by more than 400% from 2002. 'Stranded assets' that suffer from unanticipated or premature write-offs, downward revaluations or conversion into liabilities can be caused, it is increasingly recognised, by a new and combined set of environmental and associated regulatory risks and vulnerabilities. These are highly entwined in the agri-food regime and spill over into other multi-regime interactions. They include, for instance, 'first nature' climate, water and soil events and shocks to supply; new and more comprehensive government regulations regarding carbon pricing, air pollution regulation planning and protected areas management; falling clean technology costs (e.g., solar PV in China, onshore and offshore marine, tidal and wind systems); and the rise of open source and translocal cooperative knowledge sharing (see Caldecott, 2015). More specifically with regard to the agri-food sector, we can include the regulations restricting the expansion of GM, the creation of new pests and pathogens as a result of it, the disruption of biotic communities in agro-eco-systems and irreparable losses or changes in species diversity or genetic diversity with species.

More broadly, we see here how both first (ecological) and second (human-induced) natures are indeed beginning to' kick back' upon the process of financialisation of carbonised resource exploitation, when the latter represents over a third of main stock market investments (see Carney, 2015). These emerging disinvestment financial strategies could hold significant opportunities but could also create further vulnerabilities for the agri-food system. Again, it will depend on how these processes are managed and governed. What is becoming clear is that when environment-related risks materialise and become communicated across places and spaces, they can result in stranded and devalorising assets across the increasingly vulnerable and financialised supply chain. Given that there has been so much agri-food investment over recent years, this could create more intense volatility in investment withdrawals, leading potentially to the exacerbation of the spread of pest and diseases, and, for instance, the changing nature of bio-fuel regulations. What is clear is that the potential challenge of stranded assets in agriculture is currently being intensified by the ongoing global agricultural boom, which in turn is feeding off high commodity prices and poor investment returns in other sectors.

We are witnessing, in other words, a new set of vulnerabilities at the heart of the financialised capitalist-ecology system, which are suggesting social, political and ecological 'limits' to the carbonised spatial fixes (and speculative bubbles)that this has created, especially over last the decade (see Moore, 2015). As Moore has argued, this could perhaps presage the beginning of the end of 'cheap natures', whereby capitalist accumulation can no longer rely upon externalising its carbon-based exploitative vulnerabilities, in a systemic context where this is also increasingly no longer seen as publically legitimate. It also challenges, as Carney (2015) suggests, the in-built cognitive short-termism displayed in the recent past both in the financial sector and in many state bodies.

Overall, the arrival and the incidence of 'stranded assets' could be the 'tip of the iceberg' for renewed and refreshed long term investment in renewable energies like solar, marine and wind; and indeed could promote farm-based diversification and multifunctionality such that farms become

(again) part net contributors to the post carbon food-energy nexus. Reflecting on our conceptual model of food system vulnerabilities, we need to see the arrival of 'stranded assets' as conceptually far more than a part of a financialisation factor or 'black- box' in the model. It is more of a macro-landscape change and multi-regime factor affecting the inter -connected sets of dominant regimes across the food, energy, bio-economy sectors, which is then likely to have profound effects upon the rest of the system interactions outlined in our model.

6. Conclusions: from vulnerabilities to resilience in agri-food system futures?

The paper has explored the emergence of recent systemic and nested vulnerabilities in the agri-food system with reference to the UK and EU food sector in particular. First, we have outlined the recent confluence of both food insecurities and food unsustainability since 2007-8 (figure 1). We then, second, adopted a focussed framework for examining the linkages between food governance , renewed and more intensive financialisation, and the development of a range of interconnected vulnerabilities since the 2007-87 crisis (sections 3 and 4). This examines the diversity and effects of the interconnected vulnerabilities in one specific empirical context (the EU/ UK). Third, in the final parts of the paper, (sections 4 and 5) we have focussed upon what were categorised as the more economic/financial dimensions emerging from this empirical analysis, and then begun to unpack some of the impacts of 'financialisation', which was seen as a major source of vulnerability in the system by many of our respondents.

As we have shown, and following Isakson (2015) and Ouma et al (2016), the adoption of a more grounded, embedded and, indeed, relational approach to financialisation uncovers far more fine-grained relationships. Financialisation is not one act or game in the agri-food system. It covers many games, and we can conclude that it does not fit easily into any single conceptual box. It is a multi-plex process, feeding off the crisis in neo-liberal governance, and affecting the wider economic and social dynamics of the overall food system. As we have learnt by exploring it's combinational effects upon, first, the farm sector in the UK and, second, in its role now in defining new (de)valuations of carbon based resources and their renewable alternatives, financialisation is now embedded into a wider state-corporate-market nexus and regime that is reproducing ecological, social and economic vulnerabilities. In this sense, financialisation is in itself also a relational outcome of embedded existing and future power relations in this hybrid-socio-technical system.

An implication of this analysis is that we need to continue to build and refine our conceptual frameworks of food system vulnerabilities, so as to target where collective actions and perhaps more publically generated 'global and (trans-local) local commons' can be created to make transitions towards more effective and *functional resiliences* between food security and food sustainability. The global SDGs and the COP21 processes are the start of creating major and more reflexive state- based actions towards re-shaping investment strategies in the food-energy nexus. At the local and regional scales new translocal networks and assemblages associated with shorter-food supply chains and interfaces are becoming more widespread (Constance et al 2015). They are potential 'game changers', as we are beginning to see, not least in re-directing financial investment futures and, more specifically agri-food markets of commodities and land resources. They are indeed, in themselves, collective 'public common' reactions to the many interconnected vulnerabilities we have identified in this paper.

They are not only, of course, associated with the agri-food system. Finance flows, as we have seen, often quickly occur both within and between different resource-based systems. A key implication

here is that we will need to build more effective multi-sector frameworks that integrate the nexus of energy, water, and food, ecologies into our understandings of food vulnerabilities, if we are to tease out more resilient pathways that really engage in progressing a more sustainable post-carbon transition. Theoretically as well as practically, it will be necessary for both researchers and (multi-level) state authorities to reflexively recognise and adapt to these interconnected and complex systems, rather than relying on either outdated notions of 'the market' or on individualised conceptions of resilience that, as we have seen here, tend to allocate far more of the risks and vulnerabilities to their victims, be they consumers, producers or their local natures.

References:

Adger, W. N. (2006). *Vulnerability. Global Environmental Change*, 16(3), 268–281. doi:10.1016/j.gloenvcha.2006.02.006

Aschemann-Witzel, J et al (2012) Transferability of private food marketing success factors to public food and health policy: an expert Delphi survey. *Food Policy*, 37 (6): 650-660.

BIS, 2012 *Business Population estimates for the UK and regions 2012* https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/16402/bpe_2012_data.xls

Brotherton, A., Simmonds, N., & Stroud, M. (2010). Malnutrition Matters Meeting Quality Standards in Nutritional Care. British Association for Parenteral and Enteral Nutrition (BAPEN). Retrieved August 19, 2014, from http://www.bapen.org.uk/pdfs/toolkit-for-commissioners.pdf

Brunori, G, et al (2013) Assessment of the impact of global drivers of change on Europe's food and nutrition security (FNS). TRANMANGO. D2.1 Conceptual framework. KBBE. 2013.2.5.01.

Burch, D and G. Lawrence, 2009. 'Towards a Third Food Regime: Behind the Transformation'. *Agriculture and Human Values,* 26 (4): 267-79

Business Green (2013)' Are we facing a mulit-trillion dollar agri-bubble?' 9th August 2013, Ben Caldecott article.

Caldecott, B, Howarth, N and McSharry, P (2013) Stranded assets in agriculture:protecting value from environmental related risks. Smith School of Enterprise and theEnvironment, University of Oxford, UK.

Carney, M (2015) Breaking the Tragedy of the Horizons-climate change and financial stability. Speech to the global Financial Stability Board, Lloyds of London, 29th September, 2015.

Castree, N (2009) The spatio-temporality of capitalism. *Time and society*, 18 (1): 26-61.

Chayanov, A (1966) (1925) *The Theory of Peasant economy: American Economic Association.* Homewood. USA.

Clapp, J., 2014 'Financialization, Distance, and Global Food Politics'. *Journal of Peasant Studies,* 41 (5): 797-817

Constance, D *et al* (2015) Alternative agri-food movements: patterns of convergence and divergence. Research in Rural Sociology and Development. Vol 21. UK

Cronin, W (1992) *Nature's Metropolis: Chicago and the Great West*. W.W. Norton, New York.

Davoudi, S (2016) *Exploring Resilience. Chapter in Governmentality after Neo-Liberalism*. Bevir, M (ed) Routledge, London.

DEFRA, 2013 Family Food 2012 https://www.gov.uk/government/statistics/family-food-2012

DEFRA, 2014 Agriculture in United Kingdom 2013 Report https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/315103/auk-2013-29may14.pdf

DEFRA, 2014b Overseas trade in food, feed and drink datasethttps://www.gov.uk/government/statistical-data-sets/overseas-trade-in-food-feed-and-drink

DEFRA, 2014c Food Statistics Pocketbook 2014 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/361759/foodpocketbook-2014report-08oct14.pdf

Department for Work and Pensions. (2014). Households below average income (HBAI): 1994/95 to 2012/13. Retrieved from https://www.gov.uk/government/statistics/households-below-average-income-hbai-199495-to-201213.

Doria, M et al (2009) Using expert elicitation to define successful adaptation to climate change. *Environmental Science and Policy*, 12 (7): 810-819.

Erikson, P.J (2008) Conceptualising food systems for global environmental change research. *Global Environmental Change*, 18 (1): 234-245.

Fairbairn, M (2014) 'Like gold with yield': evolving intersections between farmland and finance. *Journal of Peasant Studies*, 41 (5): 777-795.

Farmers Weekly (2016) Volatility and how to manage it? Farm Business, February, 2016, 26.

Feeding Britain (2014) *Report of the Commission on Food Poverty*. Houses of Parliament. Westminster, UK.

Folke, K (2006) Resilience: the emergence of a perspective for socio-ecological systems analysis. *Global Environmental Change*, (16): 253-267.

Friedmann, H and McMichael, P (1989) Agriculture and the state system: the rise and decline of national agricultures. *Sociologia Ruralis*, 29, (2): 93-117.

Fussel, H, M (2007) Vulnerability: a generally applicable conceptual framework for climate change research. *Global Environmental Change*, 17 (2): 155-167.

Geels, F (2004) From sectoral systems of innovation to socio-technical systems. *Research policy*, 33 (6-7): 897-920.

Geels, F and Schot, J (2007) Typology of socio-technical transition pathways. Research policy, 36 (3): 399-417.

Geels, F (2011) The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environmental Innovation and Societal transitions*. 1 (1): 24-40.

Gordon, D., Levitas, R., Pantazis, C., Patsios, D., Payne, S., Townsend, P., Williams, J. (2000). Poverty and social exclusion in Britain. Joseph Rowntree Foundation. Retrieved from http://www.bris.ac.uk/poverty/pse/Poverty and Social Exclusion in Britain JRF Report.pdf

Grocery Code Adjudicator (GCA) (2016) Investigation into Tesco plc. 26th January, 2016. Crown Copyright. UK.

Harvey, D (1982) *The Limits of Capital*. Blackwell, Oxford.

House of Commons (2016) Farmgate Prices: third report of session 2015-16. Environment, Food and Rural Affairs. House of Commons, HC 474. Westminster, London.

House of Lords European Union Committee (2016) Responding to Price Volatility: creating a more resilient agricultural sector. HL paper 146. 15th Report of Session 2015-6. House of Lords, Westminster, London.

HSE. (2013). Health Survey for England - 2012. (mr) Web Master, United Kingdom. Retrieved from http://www.hscic.gov.uk/catalogue/PUB13219

Isakson, S.R., 2014 'Food and Finance: The Financial Transformation of Agro-Food Supply Chains'. *Journal of Peasant Studies*, 41 (5): 749-75

Isakson, S.R., (2015) Derivatives for development? Small farmer vulnerabilities and the Finacialization of climate risk management. *Journal of Agrarian Change,* 15 (4): 580-599

Kautsky, K (1988) The Agrarian Question . London; Zwan. First published 1899.

Lambie-Mumford, H. ., Crossley, D., Jensen, E., Verbeke, M., & Dowler, E. (2014). Household Food Security in the UK: A Review of Food Aid. Department for the Environment, Food and Rural Affairs (Defra). Retrieved December 16, 2014, from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/283071/household-food-security-uk-140219.pdf

Marsden, T.K and Sonnino, R (2012) Human health and wellbeing and the sustainability of urban-rural food systems. *Current Opinion in Environmental Sustainability*, 4 (4): 427- 430.

Marsden, T.K et al (2010) *The new regulation and governance of food: beyond the food crisis?* Routledge.

Marsden, T.K and Morley, A (eds) (2014) *Sustainable food systems: towards a new paradigm.* Earthscan Routledge, UK.

Marsden, T.K and Farioli, F (2015) Natural Powers: from the bioeconomy to the eco-economy and sustainable place-making. *Journal of Sustainability Science.* 10 (2): 331-344

Marsh, J (2016) Report on evidence given to House of Lords enquiry, (2016) p13 para 48; op cit.

McMichael, P (2012) The land grab and corporate food regime restructuring. Journal of Peasant Studies, 39 (3-4): 681-701.

McMichael, P (2013) Value-chain agriculture and debt relations: contradictory outcomes. *Third World Quarterly*, 34 (4): 671-690.

Mooney, P .H and Hunt, S.A (2009) Food security: the elaboration of contested claims to a consensus frame. *Rural Sociology*, 74 (4): 469-497.

Moore, J (2016) *Capitalism and the web of life: ecology and the accumulation of capital*. Verso: USA.

Moragues_Faus, A, Sonnino, R and Marsden, T.K (in press) Exploring European food system vulnerabilities: towards integrated food security governance.

Ostry, J, Loungani, P and Furceri, D (2016) Neo-liberalism: Undersold. International Monetary Fund (IMF): finance and development paper, June 2016, IMF.Paris

Ouma, S (2014) Situating global finance in the land rush debate: a critical review. *Geoforum*, (57): 162-166.

Ouma S , (2016) From financialisation to operations of capital: historicising and disentangling the finance-farmland-nexus. *Geoforum*, 2016.

Rayens, M.K and Hahn, E.J (2000) Building consensus using the policy Delphi method. *Policy, politics and nursing practice*. 1 (4): 308-315.

Tansey, G (1994) Food policy in a changing food system. *British Food journal*, 96 (8): 4-12.

Taylor, M (2015) *The Political Ecology of Climate Change Adaptation: Livelihoods, agrarian change and the conflicts of development*. New York. Routledge

The Economist (2009) Green Shoots (March). http://www.economist.com/node/.

Sobal, J, Khan, L.K, and Bisogni, C (1998) A conceptual model of the food and nutrition system. *Social Science and Medicine*, 47 (7): 853-63.

PMSU, 2008 *Food Matters: Towards a Strategy for the 21st Century*. London: Cabinet Office.

UK National Report, Transmango project. Assessment of the impact of global drivers of change on Europe's food and nutrition security (FNS) European Commission.

Visser, O, Clapp, J and Isakson, S.R (2015) Introduction to a symposium on global finance and the agri-foodsector: risk and regulation, *Journal of Agrarian Change* 15 (4): 541-548

Wolf, S and Bonnano, A (eds) (2014) *Agri-food systems and Neo-liberalism*. Earthscan/Routledge.

Table 1. Vulnerability drivers identified in the UK media analysis

Ecological	Social	Economic	Political	Technological
Bad weather and climate change ++	Unsustainable purchasing & eating practices ++	Dependency on food imports and international trade++	Cuts on public expenditure ++	GMs ++
Agro-chemical use +	Food fraud and crime ++	Economic crisis++	Tax avoidance +	Food contamination +
Pollution+	Population growth +	Price volatility and surges ++		Intensive livestock/production +
Spread of animal & plant diseases	Increasing social inequalities +	Land competition +		
	Food industry lobbying & advertisement	Food chain complexity & inefficiencies		
	Violence and riots	Financial speculation		

Table 2. UK Vulnerability drivers with input from stakeholders

Ecological	Social	Economic	Political	Technological
Bad weather and climate change	Unsustainable purchasing & eating practices	Dependency on food imports and international trade	Cuts on public expenditure	GMs
Agro-chemical use and antibiotics	Food fraud and crime	Economic crisis: decrease of household incomes	Tax avoidance	Food contamination
Pollution	Population growth	Price volatility and surges ++	Ownership of resources	Intensive livestock/production
Spread of animal & plant diseases (pandemics and inter-species spread)	Increasing social inequalities	Land competition, management and concentration	International conflicts	Perceptions about technology
Depletion of soils, biodiversity, water and other natural resources	Food industry lobbying & advertisement	Food chain complexity, concentration& inefficiencies	De-regulatory agenda	Packaging
Energy dependency/Fossil fuels	Violence and riots	Financial speculation	Low priority of food in policy agenda	Antibiotic resistance
Nutrient flow	Loss of skills and competence	Capital circulation	Tensions between political objectives	
Challenges of adaptation of crops	Erosion of food culture	Labour abuses		
	Food culture			

DELPHI results: What are the key drivers of change of the global system at the moment?

- "*Seen through a food regime analysis lens, the food price spikes in 2007-2008 and the resulting riots can be seen as an externalization of the crisis of the corporate-led food regime that took control of the global food system in the 1980s, buttressed up by intellectual property protection that stimulated corporate concentration and by structural adjustment policies and WTO regulations that limit states' policy space to pursue national food security objectives. Today the ability of the corporate regime to organize global relations of food production and circulation of food, and the WTO's capacity to manage global markets, in doubt. Additionally, there are legitimate suspicions that the expansion of a productivist and market-based solution to global food provision may be reaching its absolute limits in ecological and climate terms".*

- *"absence of coordination in different levels, between authorities (EU, national, regional) or within the agri-food chain value, poor knowledge transfer and exchange due to low connectivity between knowledge development (e.g. companies, universities) and practical implementation (e.g. farmers)"*
- *Increasing pest and disease pressure, which is created by new species favoure by increasing trade flows and climate change, as well as resistance development, which can be tackled properly due to the regulatory system*

- *Financial crisis, impending sector's capability to invest.*
  - *Peak oil (and subsequent effects on the extraction of raw materials, national economies and consumer practices)*
  - *Globalisation*
  - *Financial decisions*
  - *Political decisions (regarding property, State and legislation)**
  - *Financial decisions*
  - *History of low-priced fossil fuels, which have led to the destruction of oil-independent structures from government and the lack of financial sources.*

- *"Lack of financial resources, lobbying in Brussels, lack of integration of states at UE level, lack of comprehensive and holistic perspective gathering the different issues (environmental, social, nutritional), lack of knowledge.*

- *I think the primary drivers of change are economic and political, including:*
  - *Financial capital (speculation and commoditization)*
  - *Neoliberal globalization (growth by decreasing barriers to trade, eliminating subsidies, etc.)*
  - *Competition between producers (which causes consolidation on greater scales, and the reduction of the number of full-time farmers*

- *In fact, the EU is in the driver seat of neoliberal globalization, especially since the financial crisis and the rise of austerity politics within the EU.*

- *"the export-oriented "free trade" agenda of capital and multinational companies*
- *The privatization of resources (land, water, seeds….)*

The attempts to further "modernize" farming by biotechnology companies (GMO, precision farming…)
  - the attraction of land and commodity markets for financial capital

- financialization of nature (REDD, climate smart agriculture…)

- the growing food sovereignty movement (Nyeleni movement), which unifies peasant farmers, land workers, urban initiatives, scientists, indigenous communities and which struggles to re-localize and re-democratize food systems"

- The sector of small-scale food producers around the world, gather several hundreds of millions of producers that face economic, ecological, political, social and cultural challenges: their ability to create new spaces for participation in markets and political decision processes on the local, national, regional and global level

- The corporate sector, which gathers the interest of the major national, regional and transnational corporations involved directly or indirectly into food systems, their influence in design abd implementation of public policies, and with impacts on the spaces of small-scale food producers' participation in markets and political processes"
-
- The governmental and intergovernmental institutions with direct or indirect interventions of food and nutrition, such as through trade, energy, investment, finance, agricultural, mining, nutrition or development policies

- The consumer organizations, consumer patterns and their relation with the dominant national and transnational players, including through promotion and marketing practices
- Changes in global environment, including climate change, energy crisis, energy crisis, regional and global geopolitical developments. Economic policies dominated by the old group of OECD countries, plus China

- Technological developments in different models, including the two most opposite approaches: the input-intensive industrial production and consumptions model, and the agro-ecology based approaches on sustainable, human rights compliant and democratized food systems.

No. In fact, the EU is in the driver seat of neoliberal globalization, especially since the financial crisis and the rise of austerity politics within the EU.

"the export-oriented "free trade" agenda of capital and multinational companies

the privatization of resources (land, water, seeds, ….)

the attempts to further "modernize" farming by biotechnology companies (GMO, precision farming…)

→the attraction of land and commodity markets for financial capital

the change of consumption habits (more meat and dairy in some countries, trend to veganism in other countries)

financialisation of nature (REDD, climate smart agriculture…)

the growing food sovereignty movement (Nyéléni movement), which unifies peasant farmers, land workers, urban initiatives, scientists, indigenous communities and which struggles to re-localize and re-democratize food systems"

all of the above mentioned drivers but additionally the influence of farmer organisations like COPA-COGECA and their close relations to biotechnology industry and financial capital

The sector of small-scale food producers around the world, gather several hundreds of millions of producers that face economic, ecological, political, social and cultural challenges: their ability to create new spaces for participation in markets and political decision processes on the local, national, regional and global level

The corporate sector, which gathers the interests of the major national, regional and transnational corporations involved direct or indirectly into food system, their influence in design and implementation of public policies, and with impacts on the spaces of small-scale food producers' participation in markets and political processes"

The governmental and intergovernmental institutions with direct or indirect interventions on food and nutrition, such as through trade, energy, investment, finance, agricultural, mining, nutrition or development policies

The consumer organizations, consumer patterns and their relation with the dominant national and transnational players, including through promotion and marketing practices

Changes in the global environment, including climate change, energy crisis, financial crisis, regional and global geopolitical development. Economic policies dominated by the old group of OECD countries, plus China.

Technological developments in different models, including the two most opposite approach: the input-intensive industrial production and consumptions model, and the agro-ecology based approaches on sustainable, human rights compliant and democratized food systems

- competition between producers (which causes consolidation on greater scales, and the reduction of the number of full-time farmers)