



Doubling food production to feed the 9 billion: A critical perspective on a key discourse of food security in the UK

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A B S T R A C T

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Within the emergent international policy arena of 'food security', the imperative to double global food production by 2050 has become ubiquitous. This statistic, as well as a revised figure of a 70% increase by 2050, have been widely used by key individuals in the food policy arena and have come to play a significant role in framing current UK and international policy debates about food security and the future direction of global agriculture. This paper provides a critique of the specific claim that we *need* to increase global food production by 70–100% in order to feed the world in 2050 and challenges the dominant framing of the problem of food security in the UK, and its resolution. This critique is based on two main observations: firstly, increasing production on such a scale was never intended as a normative goal of policy and, secondly, to do so would exacerbate many of the existing problems with the current global food system. This clearly raises questions about why these statistics have risen to such prominence. Drawing on framing and discourse as conceptual tools, this paper shows how these statistics are a key discursive device used by dominant institutions and individuals with prior ideological commitments to a particular framing of the food security issue. This paper discusses the social movement activities and institutional scientific and political challenges to this, that are beginning to coalesce and articulate an alternative set of discourses around concepts of ecological food provision, food sovereignty, and agroecology.

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1. Introduction

Within the emergent international policy arena of 'food security', the imperative to double global food production by 2050 has become ubiquitous. This statistic and an interim target to increase production by 50% by 2030, have become, as Hilary Benn, former Labour Secretary of State for Environment, Food and Rural Affairs declared, the accepted figures that everybody repeats (Benn, 2009). Indeed, they have been used by prominent Government scientists such as John Beddington (2009, 2009a, 2009b), Bob Watson (2009) and David King (2010), Government ministers and members of the opposition (for example Hilary Benn, 2008, 2009a and David Cameron, 2008), the agricultural industry (Kendall, 2008, 2009) and the agricultural biotech industry (see Barkhouse, 2010). They are contained within several Government policy documents (for example, Defra, 2008) and Conservative Party policy (2010). The need to double food production has also been repeated in academic

contributions to the food security debate (for example Godfray et al., 2010, p. 2; Lawrence et al., 2009, p. 1).

When doubt was subsequently thrown on the basis and accuracy of the 'doubling' figure (HCEFRACS, 2009), some actors including the UK Government (for example Dfid/Defra, 2010; Defra, 2010), following the lead of the FAO (2009) shifted to stating that a 70% increase is needed with an assumed starting year of 2006. Both statistics continue to be used in parallel, or combined to offer a range of the scale of production increases needed: Pretty et al. (2010, p. 220) declare '...it has been estimated that we need to produce 70–100% more food' (see also Conway, 2011).

The magnitude of these increases in production are, of course, attention-grabbing. In particular, the need to 'double' production is clearly a powerful statistic that has captured the imagination of policy-makers, politicians, scientists and industry alike. Its use has enabled an air of scientific precision and certainty to be given to a specific line of a somewhat neo-Malthusian reasoning: the need to vastly increase food production to feed the world of 9 billion by 2050. This imperative forms part of what has been described by many authors as a 'new productivism' policy period (Winter and Loble, 2009; Marsden, 2010) triggered by rising global commodity prices, estimated at an 83% increase between 2006 and

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2008 (Lawrence et al., 2009). This 'food crisis', that left many of the poorest people in the Global South unable to afford basic foodstuffs was one of the contributory factors to the emergence of 'food security' as an issue once again at the forefront of international and national policy.

The main purpose of this paper is to provide a critique of the specific claim that we *need* to increase global food production by 70–100% in order to feed the world in 2050, and thus challenge the dominant framing of the problem of food security in the UK, and its resolution. This critique is based on two main observations as will be outlined in detail in the discussion that follows: firstly, that increasing production by 70–100% was never intended as a normative goal of policy and, secondly, to do so would exacerbate many of the existing problems with the current global food system. This clearly raises questions about why these statistics have risen to such prominence. Drawing on framing and discourse as conceptual tools (Hajer and Laws, 2006), this paper aims to show how these statistics are a key discursive device being used by institutions and individuals with prior ideological commitment to a particular framing of the food security issue. Drawing on Mooney and Hunt's (2009) work on 'keying', this paper discusses the challenge to this 'flat' keying of the food security frame, in the form of a 'sharp' key that is coalescing through the articulation of an alternative set of discourses around concepts of ecological food provision, food sovereignty, and agroecology.

2. The imperative of doubling food production by 2050

In the UK, the 'food crisis' has been evocatively linked to the other global challenges of climate change, population growth, and increasing demand for energy and water, to create fear over what John Beddington, the Government Chief Scientist, infamously described as a 'perfect storm' of global events by 2030: 'If we don't address this, we can expect major destabilisation, an increase in rioting and potentially significant problems with international migration, as people move out to avoid food and water shortages' (Beddington, 2009c). The Foresight Report on the future of food and farming (2011, p. 9) reproduces such concerns, seeing this convergence of crises as a threat to food security: 'together they constitute a major threat that requires a strategic reappraisal of how the world is fed'. The rehearsal of this 'threatening global dystopia' is as Nally (2010, p. 45) articulates, 'complemented by a suite of prescriptive norms that invariably conclude that agricultural production must be increased if we are to deliver more calories to the poor of today and the hungry of tomorrow.'

Formally, food security is commonly defined with reference to the 1996 World Food Summit definition, as existing when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life (see WHO, 2011). In everyday use, however, it has been likened by Mooney and Hunt (2009, p. 470) to 'sustainability' for its multiple meanings, and its success as a concept put down 'to a resonance that does not immediately engender oppositional claims, making it difficult to mobilise opinion in favour of alternatives'. Yet it is clear that one particular understanding of the food security 'problem' has come to dominate: how 'we' will 'feed the world' of 9 billion, increasingly affluent and urban, people by 2050 in a way, given recognition of environmental problems such as climate change, water and land scarcity, that is 'environmentally sustainable' (for example see Marsden, 2010; The Royal Society, 2009; Beddington, 2010; Godfrey, 2010; Brown, 2010; Foresight, 2011).

The key solution within the politics of 'new productivism' has been the promotion of the 'oxymoron' (Marsden, 2010) of *sustainable intensification*, first espoused by The Royal Society (2009). It has become something of a truism that '...the most

likely scenario is that more food will need to be produced from the same or less land' (Godfray et al., 2010, p. 2). This understanding of the food security 'problem' can now be found in scientific advice to Government (e.g. Committee on Climate Change, 2010), as well as prominent scientific publications (e.g. Nature, 2010) and scientific meetings (e.g. The Royal Society, 2011) and lends itself to seeking technological solutions contributing to the further intensification of agriculture. In parallel, this emerging discourse of food security has a presumption that the problems of hunger, starvation and malnutrition are a problem of 'global food security' and solving them needs a *better* global food system (see for example Foresight, 2011). Thus, it is clear that the 'doubling/70%' statistic has played a key role in the construction of a *global food security challenge* that is to be resolved through increasing agricultural production of a limited range of food commodities through further intensification, a liberalising of the global food system and the use of the latest (bio) technologies.

In its report 'Securing food supplies up to 2050: the challenges faced by the UK', the UK House of Commons Environment, Food and Rural Affairs Committee (HCEFRACS, 2009) looked into the sources of the statistics. They found they were used at the UN's High Level Conference on World Food Security. Jacques Diouf, Director-General of the FAO, stated that 'global food production must be doubled to feed a world population currently standing at 6 billion and expected to rise to 9 billion by 2050' (Diouf, 2008). At the same meeting Ban Ki-moon, Secretary-General of the UN, stated that food production needed to rise by 50% by 2030 (Ban Ki-moon, 2008). Two reports were cited as the principal sources in e-mail correspondence between the Committee and the UK Department for International Development (DfID) (HCEFRACS, 2009). The 50% by 2030 figure was taken from Rosegrant et al. (2006) whilst the source of the doubling by 2050 figure was an FAO (2006) report 'World Agriculture: Towards 2030/2050'. Whilst the latter appears to be no longer publicly available, updates of the modelling work are (Rosegrant et al., 2008, 2008a). The FAO (2006) report is an updated version of two of the key chapters of the study 'World Agriculture: Towards 2015/2030' published in 2003 (Brunisma, 2003).

FAO (2006) and Brunisma (2003) are based on computable general equilibrium modelling (CGE) that uses actual economic data to estimate the economy-wide impacts of a policy, project or other external factor. (See Appendix 1, Brunisma, 2003 for a full description of the methodology used). CGE models rest on the theory of general equilibrium that draws on the key concepts of market clearing and neoclassical micro-economic optimization behaviour of rational economic agents. (For a critique, see Scricru, 2007). The FAO (2006) report states that economic growth assumptions together with the growth of population, are the major determinants of projected food consumption, although by no means are they the only ones used. The projected increases in demand for food are driven by the 'normal evolutionary path' of increased per capita food consumption in countries in the Global South.

In HCFRA (2009) the modelling work is re-examined and it is calculated, that, according to 'the most likely future', demand for food between 2005 and 7 and 2050 would increase by 70%, not double. In their response to the HCFRA (2009) report, the Government acknowledged that 'the difference between 100% and 70% is not trivial: it is more than the food production of the whole American continent. So claims around food production needing to increase 50/100% need to be treated with care' (HCFRA, 2009a). This figure is now being used in order to justify the need for a 70% increase in production to meet this demand (Defra, 2009; FAO, 2009).

There are some easily apparent limitations with this work: firstly, this 70% figure does not correspond to an increase in actual

tonnes of production, or yield, as might be assumed, but the *aggregate volume of demand and production* of the crop and livestock sectors. This is calculated by multiplying the physical quantities of demand or production by the price for each commodity. This is an important distinction because with the shift in commodity types away from staple foods towards more meat and animal products that are of a higher value, this price-based index of the volume of production/consumption grows faster than the aggregate in physical units (such as tonnes) (FAO, 2006, p. 2). If weight of the actual production was used, it is estimated that the figure would be reduced by 6% (Defra, 2010). Secondly, fruit and vegetables are excluded from these projects, a significant omission given their prominence in recommendations for healthy diets (e.g. FSA, 2010). This is at least partly because fruit and vegetables are not treated as commodity crops and do not feature significantly in the FAOSTATS database (Wright, 2010). Thirdly, the measure used in the report (standard for FAO) is based on per capita food consumption in calories to calculate undernourishment and is based on the availability criterion (supply-side) only.¹ Crude food availability measures (like the FAO's) enable frequent and geographically broad estimates, but at the expense of neglecting waste, and the inevitably unequal distribution and uses of food within a population, that should be taken into account (Barrett, 2010).

However, the most important point to note is that the FAO report does not state, explicitly or implicitly that we *need* to double global food (or increase it by 70%) production by 2050. In fact, what becomes immediately clear is that this report, and the modelling work on which it is based, does not have a normative agenda: in fact expressedly not. Rather, what it does provide is an assessment of the author's views of what the 'most likely' future will be:

'Another important feature of this report is that its approach is "positive" rather than "normative". This means that its assumptions and projections reflect the most likely future but not necessarily the most desirable one'

It continues:

'For example, the report finds that the goal of the 1996 World Food Summit – to halve the number of chronically undernourished people by no later than 2015 – is unlikely to be accomplished, even though this would be highly desirable. Similarly, the report finds that agriculture will probably continue to expand into wetlands and rainforests, even though this is undoubtedly undesirable... Therefore, the prospective developments presented here are not goals of an FAO strategy but they can provide a basis for action, to cope both with existing problems that are likely to persist and with new ones that emerge' (Brunisma, 2003, p. 2).

Thus, it is very interesting to note the slide from a positive to normative interpretation of this work. In the original Foreword to the report, Jacques Diouf stated 'the findings of the study aim to describe the future as it is likely to be, not as it ought to be' (Brunisma, 2003, p. iii), a statement that is in direct contradiction to more recent statements within the FAO (see FAO, 2009). Whilst the

report does not present an agenda for what we need to do to 'feed the world', and is clearly not intended to be interpreted as doing so, it continues to be used in this way. Whilst not intended as 'goals of an FAO strategy' they have come to be the goal of international food security policy.

3. Conceptual tools: framing, discourse and ideological process

In seeking to understand why these statistics have risen to such prominence given the problematic nature of their use, this paper draws on conceptual tools around framing and discourse. Framing is one of the 'ordering devices' identified by Hajer and Laws (2006, p. 252) as a conceptual tool that can be used 'to capture how policy actors deal with ambiguity and allocate particular significance to specific social or physical events' that 'explain how policy-makers structure reality to gain a handle on practical questions.' Snow and Benford (1992, p. 137) define a frame as 'an interpretative schema that signifies and condenses the 'world out there' by selectively punctuating and encoding objects, situations, events, experiences, and sequences of actions within one's present or past environment'. Hajer and Laws, (2006, p. 256) argue that 'frame analysis highlights the communicative character of ordering devices that connects particular utterances (a speech, a policy text) to individual consciousness and social action'.

In a recent analysis of the frames surrounding the current food security debates centred on the USA, Mooney and Hunt (2009) define food security as a master frame with three 'collective action frames' that are distinct claims to ownership of this social problem. These are defined as; 'food security as hunger'; as 'a component of a community's development whole'; and as 'minimising risk'. They identify 'flat' and 'sharp' keys of each of these frames; a 'sharp keying' is critical, suggestive of crisis and a challenge to dominant institutionalised social and discursive contentions, whilst the 'flat keying' of the frame tends to reinforce dominant institutionalised practices. Food security framed as a concern with 'hunger' is derived from Malthusian assumptions. In the flat key, it is in a form that focuses on less-developed nations and is premised on a 'global food supply', facilitating 'the articulation of a 'free trade' prognostic framing with a role for biotechnology to bring about the 'second green revolution' (Mooney and Hunt, 2009, p. 475). By contrast, the sharp key challenges the neo-Malthusian association of population growth and starvation and emphasises the importance of access, as Sen (1981) infamously articulated: 'starvation is the characteristic of some people not *having* enough food to eat. It is not the characteristic of there *being* not enough food to eat. While the latter can be a cause of the former, it is but one of many *possible* causes.' Mooney and Hunt (2009, p. 477) argue that the 'sharp' key 'amplifies beliefs that the productivist model of agriculture is unsustainable and violates environmental values as well as norms of social justice... focused not only on the transformation of social structures toward more democratic and egalitarian forms but also on prioritising national food self-sufficiency with low-cost, low-technology, labour-intensive forms of production'.

According to Hajer and Laws (2006) all frame analysis takes, to different degrees, language and its use as the organising framework for understanding society. However, Steinberg (1998) argues that despite the fact that framing occurs through language there has been surprisingly little examination of its discursive foundations. Thus there emerges a question as to how framing should be understood in relation to discourse, the second ordering device that Hajer and Laws (2006) identify. They define discourse as 'an ensemble of concepts and categorisations through which meaning is given to phenomena'. A policy analyst can get analytical leverage

¹ These figures are adjusted so that it is not assumed that each person had access to food exactly according to his/her respective requirements. An inequality measure is used in these estimates – the co-efficient of variation – measures 'the average difference of the food intake of individuals from the national average' (FAO, 2006, p. 15) but clearly this average value does not allow for any detailed analysis about access for individuals within the population, nor does it consider utilisation. Data obtained from individual and household surveys on a national scale provides disaggregated data that allows more accurate prediction of who is most likely to be affected adversely by potentially harmful shocks such as food price increases, drought, or slumping demand for wage labour (Barrett, 2010).

'on how a particular discourse orders the way in which policy actors perceive reality, define problems, and choose to pursue solutions in a particular direction' (Hajer and Laws, 2006, p. 261).

Steinberg (1998) is also concerned with the way in which the discourse used in framing is taken to be a generally straightforward bearer of meanings. He argues that this referential perspective on discourse poses problems for both the analysis of frames and ignores important semiotic dynamics of the framing process. The framing perspective is deficient because it lacks a critical perspective on the stuff of framing itself: advocating a 'discursive turn', he argues that understanding the framing process should involve investigation of the discursive fields within which it should take place. He argues that these fields 'contain the genres that collective actors can draw upon to construct discursively diagnosis, prognosis, and motivation. They are historically and contextually dependent, partially structured through hegemony, and the vocabularies, symbols and meanings within them are dialogic' (Steinberg, 1998, p. 856). Framing is unanimously considered an ideological process, but according to Steinberg (1998) the rhetorical and discursive processes that tie frames to these larger ideological structures remain largely unspecified. Steinberg (1998, p. 853) argues that 'we should focus on discourse as a process of joint ideological labour... discourse is therefore a terrain of conflict and not simply the meaning the medium or messenger through which it is expressed.' Conceptually, then, this paper seeks to understand the use of the 'doubling' (and latterly 70%) statistic as an important discursive device that is being used in the creation in the UK context of what Mooney and Hunt (2009) define as a 'flat' key of the 'hunger' frame described here as the *global food security challenge*. This leads to questions as to what this means for the identification and existence of a 'sharp' key of the hunger frame.

4. The global food security challenge: problems and limitations

Reflecting on Steinberg's (1998) first observation that in order to understand the framing process we should focus our analysis on the discursive fields within which the framing process takes place, it is clear that the rehearsal of the 'doubling/70%' statistic is a key discursive device being used to frame the food security problem in a particular way. As previously discussed this framing is problematic because of its inappropriate use of a 'positive' statistic in a normative way. Further, though, this framing is problematic because of what it excludes from our understanding of the food security problem, and its solution. These 'missing' issues are outlined here, and given these limitations, a discussion as to why this framing has come to dominate UK food policy is included.

4.1. The nutrition transition

The FAO model predicts a continuation of the 'substitution effect' (Kearney, 2010) that is the structural change in the diets of people in developing countries from carbohydrate-rich staples (cereals, roots, tubers) to vegetable oils, animal products (meat and dairy foods) and sugar. These three food groups now provide 29% of total food consumption of the developing countries (in terms of calories) and their share is projected to rise further to 35% in 2030 and 37% in 2050. The continuation of dietary transition in the Global South, as predicted by FAO (2006), is likely to cause worsening health problems. The report admits that: '...the diet transitions experienced by many countries imply changes in diets towards energy-dense ones high in fat, particularly saturated fat, sugar and salt and low in unrefined carbohydrates. In combination with lifestyle changes, largely associated with rapid urbanisation,

such transitions, while beneficent in many countries with still inadequate diets, are often accompanied by a corresponding increase in diet-related chronic non-communicable diseases (NCDs)' (FAO, 2006, p. 20). (For example cardiovascular disease, some cancers and Type 2 diabetes). Diet-related heart disease and stroke have already taken over as the two leading causes of death in low and middle-income countries (Lopez et al., 2006).

There are widespread concerns about the health impacts that the availability of calories and structural changes in diet have already had in the Global North. In the UK, the issue of obesity has been the subject of a Foresight project (Foresight, 2007). The UK Cabinet Office (2008, p. 16) acknowledged that 'existing patterns of food consumption will result in our society being loaded with a heavy burden of obesity and diet-related ill health.' The FAO (2006) trajectory does nothing to solve this problem in the Global North with, not just increased calories available per capita, but 'Industrial' world consumption of meat is projected to increase further from 90.2 in 1999/01 to 103 (kg/person/year) in 2050, and consumption of milk and dairy from 214 to 227 (kg/person/year) (FAO, 2006, p. 25). Questioning the level of meat consumption is a direct challenge to the current food system given that, as FAO (2006, p. 45) states, 'the world food economy is being increasingly driven by the shift of diets and food consumption patterns towards livestock products.'

In understanding why the statistics have arisen to such prominence, it is useful to reflect on Steinberg's (1998) second observation that we should see framing and the use of discourse as an ideological process. It is possible to see three prior ideological commitments by key UK institutions and individuals driving forward this frame; that is actors committed to the future that the FAO (2006) work models. The first is relevant here, in the context of dietary change, and is a prior ideological commitment to progress and wealth creation through economic growth. This is seen in the UK food policy through the failure to challenge the expansion of a Western diet, and focus instead on the benefits of global 'dietary convergence'. For example, Gordon Brown declared in the Food Strategy 2030 (HM Government, 2010, p. 3) that 'we need to feed more people globally, many of whom want or need a better diet' whilst the Foresight report (2011, p. 9) declared that over the next 40 years 'many people are likely to be wealthier, creating demand for a more varied, high-quality diet requiring additional resources to produce...' There is a tension here, though, between a presumption not to interfere with the growing demand for high meat/dairy/fat diets in the Global South, and an acknowledgement of the need to 're-balance' diets in the Global North, most clearly seen in the Foresight report with a priority for policy-makers to 'work to change consumption patterns (Foresight, 2011, p. 34) and 'contain demand for the most resource-intensive types of food' (Foresight, 2011, p. 6).

Indeed, the enormity of the *global food security challenge* has been discursively constructed on the basis that the imperative to meet the projections of increasing demand, based on the dietary choices of an increasing, wealthier, population in the Global South is taken as a given. As Gordon Conway acknowledged in a recent Royal Society meeting (The Royal Society, 2011), just feeding a growing population wouldn't be too bad a task but argued that it becomes a much larger task with the increase in per capita income and a shift towards a more Western diet. In fact the scale of the increased demand is based not solely on increases in the Global South, but also on the maintenance (and small increase) of very high levels of consumption (of calories and meat and dairy) in the Global North: The FAO (2006) projected figures for 2050 see meat consumption in the 'developing' world as being still less than half of that of 'Industrial' countries, whilst milk and dairy consumption is still only a third.

4.2. Reducing the prevalence of hunger

Meeting the projected increases in demand for food as modelled by FAO (2006) would not result in 'food security' for all. Whilst the projections would reduce significantly the proportion of the population in the Global South who are undernourished, because of population growth the reduction in absolute numbers 'is likely to be a slow process', with just over 290 million people still undernourished in 2050 (FAO, 2006, p. 4).

FAO (2006, p. 36) acknowledges that 'the interaction between food security and food production potential is very much a local problem in poor and agriculture-dependent societies'. It continues that 'unless local agriculture is developed and/or other income earning opportunities open up, the food insecurity determined by limited local production potential will persist, even in the middle of potential plenty at the world level. The need to develop local agriculture in such situations as the condition *sine qua non* [essential condition] for improved food security cannot be over-emphasised'. In his forward to Brunisma (2003, p. iii), Jacques Diouf also emphasises that 'of the many issues reviewed, the report concludes that the development of local food production in the low-income countries with high dependence of agriculture for employment and income is the one factor that dominates all others in determining progress or failure in improving the food security of these countries'. However, support for local agriculture is in contradiction with the overall direction of agricultural trade in countries in the Global South which has increasingly seen them become importers of basic food stuffs, with the drop in the self-sufficiency of Africa being particularly marked (Anderson, 2010). The projections contained with the FAO report assume a continuing pattern of countries in the Global South being net importers of cereals and livestock products (as well as vegetable oils and sugar). It is argued that 'Not all countries will be able to increase cereals production *pari passu* [in line] with their consumption. Therefore, past trends of ever growing net cereal imports of the developing countries should continue and grow to some 300 million tonnes by 2050, a 2.7-fold increase over the 112 million tonnes of 1999/01' (FAO, 2006, p. 5).

This results from international economic policies promoting the liberalisation of the agricultural sector in countries in the Global South (Nally, 2010) with the WTO-endorsed system of world agricultural trade re-orientating production to global rather than local markets (Rosset, 2006). Similarly agricultural advice to countries in the Global South has tended to focus on promoting opportunities for increased exports to international markets and not improving the competitiveness of import substitutes or market opportunities in domestic and regional markets, as the recent International Assessment of Agricultural Knowledge Science and Technology for Development (IAASTD) report recognised (McIntyre et al., 2008). With the opening up of markets, cash crops for exports have been promoted, and the most productive land is then used to grow these crops, squeezing out domestic food producers. Small-scale and subsistence farming is being replaced by larger and more globally focused farms. This process impacts on the type of farming system, engendering a shift away from traditional crops suited to local ecological conditions and the knowledge and resources of farmers, towards cash crops that rely on purchased inputs (Ghosh, 2010). It is argued that a more export-orientated agriculture could provide an effective means to fight rural poverty and become a catalyst for overall growth, but this is dependent on the ongoing negotiation of favourable multilateral trade agreements (Brunisma, 2003). Whilst the intention has been to raise the incomes of marginal producers, Christian Aid (2008) amongst others reports how it has reduced agricultural diversity with countries increasingly importing staples from abroad. This focus on export-led agriculture makes these

countries vulnerable to price shocks on international markets as well as to currency exchange volatility. Alongside the FAO (2006), the IAASTD report (McIntyre et al., 2008) also argues that for many countries in the Global South sustainable food security depends on local food production, although, for some arid and semi-arid countries with limited natural resources bases increased food security will require increased trade. The IAASTD report identifies trade policies designed to ensure sufficient levels of domestic production of food (not just sufficient currency reserves to import food) as an important component of food security and sovereignty strategies for many countries, and thus a greater balance between policies promoting export, and improving local and regional agricultural production is needed.

In this context, a second prior ideological commitment to a global food system and liberalised agricultural trade is readily identifiable (following on from the first defined as progress and wealth creation through economic growth) and is also useful in explaining the dominance of this framing of the food security issue. The previous Labour Government saw the UK as a 'modern trading economy' whose food security was dependent on global food security (Defra, 2009a) and both this and the Food Strategy 2030 (HM Government, 2010) set out a clear political commitment to a liberalised global trade regime that is seen to spread risks, encourage growth, keep prices competitive, increase the diversity of supply and incentivise production where comparative advantage exists. The new Coalition Government has indicated a similar commitment: Caroline Spelman (2010), Secretary of State for Environment, Food and Rural Affairs declared 'our food security and variety of diet are dependent upon global supply and international patterns of production and consumption' and in her Oxford Farming Conference speech (Spelman, 2011) made a clear commitment to reducing protectionism and improving the functioning of world agricultural markets.

Most strikingly, the dominant framing sees food security as a problem of inadequate agricultural production (availability), sidelining the other two pillars of access and utilisation and the perspective that sees food security as a distributional issue and of ensuring regular, appropriate, affordable access to food (Barrett, 2002). Certainly, this is not to say that the question of access, and particularly affordability, has passed the UK Government by, who indeed acknowledge that '...simply increasing food production will not end hunger...There are huge problems in terms of access to food, distribution, and affordability' (Defra, 2009a). It is also an acknowledgement made by exponents of sustainable intensification – for example an editorial in *Nature* (2010, p. 532) acknowledged that 'Nor are science and technology by themselves a panacea for world hunger. Poverty, not lack of food production, is the root cause.' Perhaps, of most significance, is that this broader understanding of solutions to hunger is to be found in recent FAO statements (FAO, 2009, p. 14): 'for almost 400 million people even the projected 70% growth in output of food and feed will not guarantee that they have access to adequate food. Their access to food will require a proper socio-economic framework to address imbalances and inequalities.' Yet such sentiments are excluded from the dominant framing of food security.

4.3. Climate change

The other issue that makes such trajectories problematic is their implications for mitigating climate change. FAO (2006) projects large increases in world production of cereals and a good part of this increase would be for animal feed, with most used to support the expansion of livestock production in the developing world (FAO, 2006, p. 9). There remains uncertainty and controversy over the scale of emissions from the agricultural sector. The

Intergovernmental Panel on Climate Change (IPCC) estimates agriculture contributes 14% of total global emissions with methane from ruminants and nitrous oxide emissions from the application of nitrogen fertilisers and manure to soils (Popp et al., 2010) contributing the majority of emissions. However the IPCC figures do not include emissions from agricultural soils due to land use change. These further contribute significantly to the GHG emissions burden from livestock, particularly through deforestation for pasture for grazing and feed crops – a problem recognised by the FAO in its report ‘Livestock’s Long Shadow’ (FAO, 2006a). Therefore, serious questions are being raised about a future further increase in farmed animals because of the likely increase in GHG emissions (Deckers, 2010; FAO, 2006a; McMichael et al., 2007; Carlsson-Kanyma and Gonzalez, 2009; Garnett, 2009).

In terms of UK policy, Marginal Abatement Cost Curves (MACC) produced by the Scottish Agricultural College (Moran et al., 2008) are being used to prioritise the most economically efficient options in the agricultural sector to reduce GHG emissions. The focus is on efficiency gains, in feeding and nitrogen fertilisers use, for example, and anaerobic digestion. GHG reductions in the UK agricultural sector are currently being made through voluntary industry-led initiatives, specifically the ‘Agriculture Industry (2011) GHG Action Plan’ that focuses on such measures. The implication of a commitment to the dominant framing of food security is that solutions to mitigating climate change lies in technical developments that do not challenge the overall trajectory of the food system. Here the identification of a third prior ideological commitment is useful: the ideological commitments of some key actors in the food security debate may be more to do with a belief in technological or ‘scientific’ solutions, rather than social or economic policy solutions, and in particular, the role of specific technological developments that proponents believe will help overcome some of the ecological and resource-constraints that the current food system is facing. (For example, see The Royal Society, 2009, 2011). The genetic-modification of crops is an important example.

However, these measures are controversial. The further intensification of livestock and crop production using such technological solutions will have severe consequences for the environment and animal welfare. Furthermore, it is now apparent that such measures may not be enough on their own to meet the UK 80% reduction by 2050 target. Indeed, in their Fourth Budget report, the Committee on Climate Change now acknowledge that ‘re-balancing’ diets towards those that are low carbon intensity as one of the more ‘radical’ solutions that might be needed if the agricultural sector is going to continue to reduce its GHG emissions after 2030 (Climate Change Committee, 2010; see also Audsley et al., 2010, p. 18). Whilst there is some evidence that reducing meat consumption in order to reduce GHG emissions is a message which has got some recognition within public debate in the UK (for example, ‘meat-free Mondays’) and whilst it is now within the radar of policy-makers and scientists, it is seen as a very difficult strategy (Godfray et al., 2010). Perhaps of most interest is that scientists are now linking the potential health and climate benefits of reduced meat intake. A series of papers in *The Lancet* (Volume 374, 2009) examined the health implications of policies aimed at tackling climate change. Here, Friel et al. (2009) argued that a 30% reduction in livestock production, combined with technological improvement could meet the UK’s 80% reduction target, and would reduce the incidence of heart disease.

4.4. Waste

It is worth noting that Defra (2010) presented a more nuanced analysis of the basis of the 70% statistic, and although it seems to

have had little wider impact, there is some evidence of a shift in thinking around the use of the ‘doubling/70%’ statistic is with regard to waste. It is estimated that the current global edible crop harvest is about 4600 kcal per person per day, but harvest and distribution losses and post-consumer waste cause the loss of 1400 kcal (Smil, 2000 and Lundqvist et al., 2008). Reducing post harvest losses could be as important as increasing yields (Herren, 2011). The Foresight report considered that halving the total amount of food waste by 2050 to be a realistic target and could reduce the food required by 2050 by an amount approximately equal to 25% of today’s production (Foresight, 2011, p. 19). In the case of UK Government, there is some evidence of the acknowledgement of the waste issue: for example, Spelman (2010, p. 4) spoke of the UN estimates of 1400 kcal being lost through waste and that ‘ironically that’s broadly equivalent to the 70% increase in available food it’s estimated we will need by 2050’. However, this is a confused position as this statement compares two sets of figures that are not compatible: The FAO 70% increase in food is a measure of the increase in the value of aggregate production, whilst the ‘70%’ in relation to food waste is calculated on the basis that 1400 kcal is 70% of the 2000 kcal currently available to households (Defra, 2010, p. 15). Recognition of the waste issue has led to a slight change in the interpretation of the 70% statistic: Defra (2010:21) notes that ‘such projections primarily relate to demand and nutritional goals, and they do not account for any reductions in waste which are currently very substantial’. Spelman (2010, p.3) says ‘the UN estimates that by 2030 the world will need [...] a further 70% increase in available food’ and also Bob Watson, Defra Chief Scientific Adviser, has stated that ‘Food availability needs to double in the next 25–50 years to alleviate hunger and poverty’ (Watson, 2010). Whilst this is no more an accurate interpretation of the FAO (2006) modelling than the imperative to increase production by 70%, it is perhaps at least possible to see this slight change as a recognition of the waste issue and perhaps an acknowledgement of alternative ways to ‘feed the world’, even if this does not question the basis of the projections of future demand.

4.5. Discussion

It becomes clear from this analysis that there is an inherent contradiction with the use of these statistics: whilst many scientists and other commentators are correctly pointing out why a radical change to the current food system is needed because of the need to address obesity and diet-related ill health, reduce GHG emissions and the use of non-renewable resources, and eliminate hunger and malnutrition (for example Foresight, 2011), the same commentators are using these statistics to drive future food policy that does not address, and in some cases may even exacerbate, these issues. It is impossible to know for certain the extent to which this re-interpretation was a calculated manipulation, or whether it was just the consequence of a prior existing set of ideological commitments. However, there are strong reasons to support the latter view. Nevertheless, this should be seen as being combined with a failure of all those involved to identify the sources of the statistics and check their accuracy and the basis on which they were made. The statistics seem to have taken on a life of their own, reproduced without regard for the assumptions on which they were originally based.

This process can also be understood using the conceptual tools previously discussed: the FAO (2006) model has been ‘flattened’, or interpreted using a ‘flat keying’. However, given the problems with the ‘future’ as modelled by the FAO work, it is also possible to show how the FAO model could validly be interpreted in a ‘sharp keying’, although this has not been done by the actors discussed here. This reflects Mooney and Hunt’s (2009) observation that the ‘flat’ keying

reinforces extant dominant institutional interpretations and discursive practices. The role of those challenging the framing process from the outside is to be found in a 'sharp' key. In their work on identifying the 'sharp' key of the hunger frame, [Mooney and Hunt \(2009\)](#) focus on the role of social movements in the USA. In this paper, the role that international, European and UK institutional and social movements are playing in challenging the 'flat' key and building a 'sharp' key in the UK context, is discussed in the following section.

5. A different imperative? : identifying the 'sharp' key

At a technical level, preliminary work modelling alternative futures for the food system does now exist. The first, [Agrimonde \(2009\)](#) is a platform designed for facilitating collective scenario development and debate on the world's food and agriculture, and has produced two of its own scenarios. 'Agrimonde GO' reflects [FAO \(2006\)](#) with economic growth largely explaining consumption levels, whilst in 'Agrimonde 1' concerns for health, equity and environment by consumers, producers and policy-makers will have led to food availability for 2050 converging at 3000 kcal/capita/day for all regions. Commissioned by Friends of the Earth and Compassion in World Farming in the UK, [Erb et al. \(2009\)](#) modelled 72 different scenarios for 2050 that included four different diets, but also three different livestock systems, three crop yields (intensive, intermediate and organic) and two levels of land use and indicated the level of feasibility of each. They found that for a 'western high meat diet' to be 'probably feasible' 'would require a combination of massive land use change, intensive livestock production systems and intensive use of the arable land' ([Erb et al., 2009](#), p. 23). This would have negative impacts for animal welfare and lead to further destruction of natural habitats. The report provides evidence 'that organic agriculture can probably feed the world population of 9.2 billion in 2050, if relatively modest diets are adopted, where a low level of inequality in food distribution is required to avoid malnutrition' ([Erb et al., 2009](#), p. 29). Through such modelling, the authors are able to offer a range of alternative theoretical (quantitative) possibilities of different farming systems operating within certain ecological limits that are able to meet different dietary requirements. Whilst such modelling offers technical possibilities for the future of the food system, and provides useful 'visions' of what might be achieved, re-thinking our global food system necessitates considering the changes in political, social and economic processes needed to realise these alternatives for 2050.

Perhaps the most significant international scientific and political challenge to the framing of the food security problem outlined here, is the International Assessment of Agricultural Knowledge Science and Technology for Development (IAASTD) ([McIntyre et al., 2008](#)), initiated in 2002 by the World Bank and the FAO. As Hans Herren co-chair of the IAASTD report states, it offers a different viewpoint:

'the question we keep hearing today is how will the world increase food production by 70 percent to meet rising food demands and feed more than a billion hungry people. But a growing consensus is asking whether this is the right question. 400 of the world's top agricultural scientists asked a different question: How do we rethink our global food system so that it can feed people, create healthy communities and economies, and sustain the planet.' ([Herren, 2010](#)).

The IAASTD report was directed by the UK's Chief Scientific Adviser Professor Bob Watson. Its aims were to assess the impacts of past, present and future agricultural knowledge, science and technology (AKST) on the reduction of hunger and poverty, improvement of rural livelihoods and human health, and equitable,

socially, environmentally and economically sustainable development. It recommends the strengthening of AKST towards agro-ecological sciences, the greater and more effective involvement of women and use of their knowledge and skills, and the targeting of small-scale agricultural systems. [Herren \(2011\)](#) has described it as a prescription for ecological intensification. However, it seems to have had very little impact on UK food security policy, despite being directed by Professor Bob Watson.

More recently in 2011, the EU Standing Committee on Agriculture Research (SCAR) appointed an Expert Group to undertake a foresight study to analyse expected environmental and resource issues impacting on long-term food security and the implications for future agricultural research in Europe ([Freibauer et al., 2011](#)). Recognising that the average Western diet was a risk to individual health, social and environmental systems, the third foresight report concluded that 'drastic change is needed in regard to both food demand and supply... This transition cannot be met by following the common narrative of increasing productivity. The narrative of "sufficiency" opens opportunities for transition into sustainable and equitable food systems by a systemic approach that deals with the complex interactions of the challenges founded on a better understanding of socio-ecological systems...' ([Freibauer et al., 2011](#), p. 9). They observed that a radical change in food consumption and production in Europe was 'unavoidable'.

Within these documents, and more broadly, a political discourse around 'agroecology' is emerging. It is a term that describes both a science – 'the science of applying ecological concepts and principles to the design and management of sustainable food systems' ([Gliessman, 2007](#), p. 369), but also an approach 'to meeting people's need for food which gives equal attention to the goals of sustainability, resilience and equity and not only to production' ([UK Food Group, 2010](#)). At a global scale, high level political support for agroecology has also been given by the UN's Special Rapporteur on the right to food, Olivier De Schutter, who identified agroecology as 'a mode of agricultural development which not only shows strong conceptual connections with the right to food, but has proven results for fast progress in the concretization of this human right for many vulnerable groups in various countries and environments' ([De Schutter, 2010](#), p. 1). Agroecology is beginning to gain some political traction in the UK with the setting up of the All Party Parliamentary Group on Agroecology in February 2011.

Agroecology represents ideas around a specific practical approach to agriculture. The wider political and economic context of an alternative framing lies in the idea of 'food sovereignty'. In its historical context, it is seen as a policy framework 'directed at the perceived negative impact of the unbridled globalisation of the economy and particularly agriculture. It is a direct challenge to the policies of the institutions of globalisation – the IMF/WB and the WTO' ([Glijo and Pascual, 2005](#), p. 1). The international farmers' movement, La Via Campesina, has become a strong voice of radical opposition to the globalisation of an industrial and neoliberal model of agriculture ([Desmaris, 2008](#)). It officially launched the idea of 'food sovereignty' at the 1996 World Food summit as an opposing concept, and discursive challenge to food security in this context. It is defined as:

'Right of peoples, communities, and countries to define their own agricultural, labour, fishing, food and land policies, which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food producing resources and the ability to sustain themselves and their societies' ([Glijo and Pascual, 2005](#), p. 1).

As a concept perceived as having its roots in the peasant movements of the Global South, questions have been asked about

its relevance in the Global North. Mulvaney (2007, p. 19) articulates agreement over the position that the principles of food sovereignty apply in all regions, although the contexts are different, and summarises it as 'a common struggle against corporate, industrialized food systems and a common determination to achieve socially, ecologically and economically benign models of production, processing and distribution in all societies.' The creation of a European Platform for Food Sovereignty, an alliance of European civil society organizations, is calling principally for reform of the Common Agricultural Policy. The UK Platform for Food Sovereignty, the UK chapter of the European Platform for Food Sovereignty, was set up to promote understanding of food sovereignty among UK NGOs and build support with European campaigners (UKFG, 2010). There are attempts being made in the UK to get relevant NGOs and other organization to unite behind the idea of food sovereignty.

The UK Food Group (2010, p. 2) also introduces the idea of *ecological food provision* defining the term as 'a system that provides a healthy food and their products, whilst ensuring food sovereignty, securing livelihoods and sustaining the biosphere'. It involves small-scale food producers that conserve natural assets, and is to be achieved by valuing and rehabilitating local and traditional knowledge, using socially just and appropriate technologies, with equitable trade at all levels. These three concepts have been brought together to create an alternative discourse, as articulated by the UK Food Group (2010, p. 3) 'the systems that currently feed most people in the world – smaller-scale, locally-sourced – can be enhanced through support for *ecological food provision*, based on the principles and practices of *agroecology* in the context of the *food sovereignty* framework'. It is here we can identify the discursive basis of the 'sharp' frame of the food security problem and its policy solution as it exists in the UK.

6. Conclusions

This paper tells the story of how a 'wrong' statistic has played such an important role in the dominant discursive framing of the food security debate in the UK as one of a *global food security challenge*, as projections for the most-likely future morphed into a normative goal for policy. The longevity of the 'doubling/70%' figure can perhaps partially be explained by its convenience, the scientific precision it conveys, and the prior ideological commitments by key UK institutions and individuals driving forward this 'flat' keying of the hunger frame. It remains problematic given that it does not address problems of climate change, diet-related ill health and does not substantially reduce absolute levels of hunger. This discussion raises particular issues about the legitimacy of the new politics of productivism and food security, within the UK and internationally, which in itself legitimises particular economic and political food system structures, and technological solutions. Its impact is to marginalise alternative framings in a 'sharp' key. Nevertheless, social movement activities and significant institutional scientific and political challenges to the 'flat' keying are beginning to coalesce, and articulate an alternative set of discourses around concepts of ecological food provision, food sovereignty, and agroecology.

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