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Food Security – background, issues and challenges

1. Context and Introduction

The issue of food security is one that the general public are becoming increasingly aware of. In recent years, media coverage of circumstances such as the growing world population, the rising costs of food, the potential impacts of climate change on agriculture and the rising costs of energy have all been increasingly presented in terms of the challenges that they pose to 'food security'.

This paper seeks to provide an overview of some of the main issues and challenges pertaining to the issue of food security at present and in the future. The paper is not meant to be definitive, but is rather an attempt to raise awareness and stimulate debate around what is an increasingly significant and complex issue.

2. Origins and Definition of Food Security

The origins of the ‘food security’ terminology are hard to pin down but the focus for individuals, communities and nations to be able to feed themselves is as old as civilisation itself. In European terms, the 20th century, and in particular the period during and post the Second World War, witnessed a growing understanding and emphasis on securing and producing food. Indeed the need to ensure that food was widely available and affordable was one of the founding principles behind the creation of the Common Agricultural Policy within post war Europe.

With regard what constitutes food security the definition developed by the United Nations Food and Agriculture Organisation (FAO) is the most widely referenced and commonly used in today’s literature. In this definition food security exists when,

“All people, at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”¹

The FAO also identify the conditions that are critical to food security to being achieved as follows:

- **Adequacy of food supply and availability;**
- **Stability of supply, without fluctuations or shortages from season to season or from year to year;**
- **Accessibility to food or affordability; and**
- **Quality and safety of food.**

Building upon this definition and conditions, and as illustrated in figure 1, the FAO estimated that in **2010 there were a total of 925 million people worldwide² who were undernourished** and for whom food security was a very real issue.

To add further complexity to the issue there is increasing recognition that **food security may well mean different things and exhibit differently depending on the level it is being looked at**. In this regard and by way of example, national food security issues may differ markedly from those experienced at either a regional or individual household level.

It is also increasingly accepted that **food security at whatever level it is being discussed is neither a fixed position or in a steady state, but is rather subject to conditions that can change rapidly and conclusively**.

¹ [Rome Declaration on World Food Security and World Food Summit Plan of Action, Food and Agriculture Organization of the United Nations 1996.](#)

² [The state of food insecurity in the world, addressing food security in protracted crisis, Food and Agriculture Organization of the United Nations, Rome 2010](#)

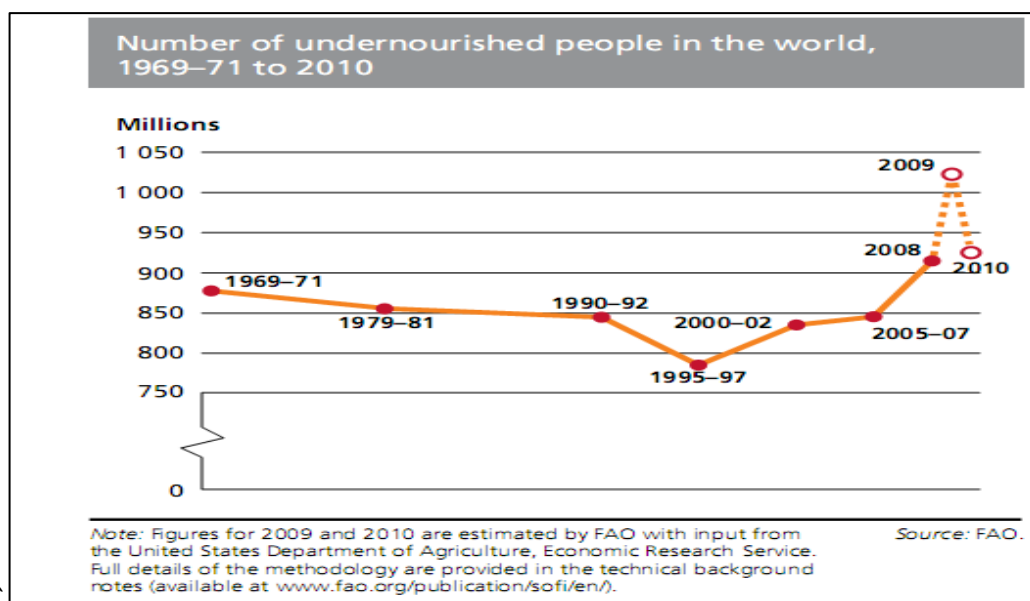


Figure 1: Number of undernourished people in the world - 1969-2010³

3. Food self-sufficiency – a distinct issue.

Despite the increasing interchangeable use of the terms food security and self-sufficiency, the two terms are best seen as distinct but undoubtedly related issues. By way of clarification, **food self-sufficiency is generally viewed as being reached when a nation is able to meet consumption needs from its own production capacity, thereby negating the need to import food.**

Based upon this definition, it would be **hard to find any country in the world which could be defined as being self-sufficient in food and it could be argued as the market for food has become more global the levels of national self-sufficiency in food have dropped markedly.** Figure 2 below highlights this reality as it shows UK's food self-sufficiency ratio for selected years over the period of 1956-2010 and reveals that the **UK has never reached self-sufficiency in that time period for either indigenous type foods or all food, and that the closest the UK came to this basis was in the 1980's and the figure has reduced since then.**

³ [The state of food insecurity in the world, addressing food security in protracted crisis, Food and Agriculture Organization of the United Nations, Rome 2010, page 9.](#)

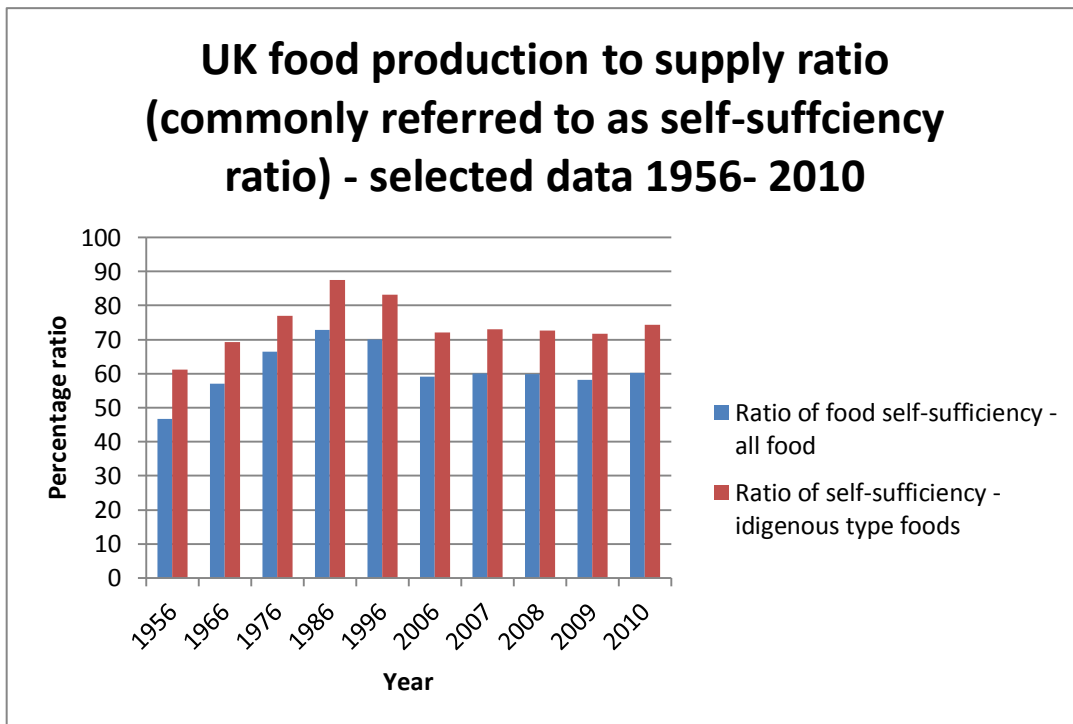


Figure 2 : UK food production to supply ratio - selected years 1956-2010⁴

Whilst national self-sufficiency in particular foods may well address some issues associated with food security such as stable supply, this situation can be subject to rapid change due to factors such as natural disasters (e.g. flooding, drought) and market changes to name but a few. In effect, and similarly to securing food security, **self-sufficiency may very much be a status that will not be fixed but may rather vary depending on circumstances.**

In addition it would have to be recognised **that full self-sufficiency in terms of food may be both unachievable and undesirable due to factors such as what can be grown within a particular state, and the fact that it may often be cheaper or politically expedient to buy certain produce from other states/locations.**

4. Issues and challenges impacting on food security – what these could potentially mean for Northern Ireland.

Whilst the concept of food security is becoming increasingly complex there are nonetheless certain issues which appear across the associated literature and which are generally recognised as being key issues that need to be adequately addressed if food security is to be achieved. How these issues might impact on Northern Ireland, in both positive and negative terms also provides some food for thought.

⁴ [UK food production to supply ratio data - 1956-2010, Defra website](#)

4.1 Rising demand for food

The world’s population is projected to rise from its current level of around 6 billion to over 9 billion people by 2050, which will require a 70% increase in food production⁵. The types of food that people eat are also projected to change on a global level and this is likely to have implications for the nature and type of food that will be produced. Looking at how changing diets are affecting demand for certain foods over the last few decades, and may change over the coming decades (as illustrated in figure 3) it seems clear that demand for foods such as meat and dairy is set to increase whilst demand for cereals and roots and tubers is projected to decline.

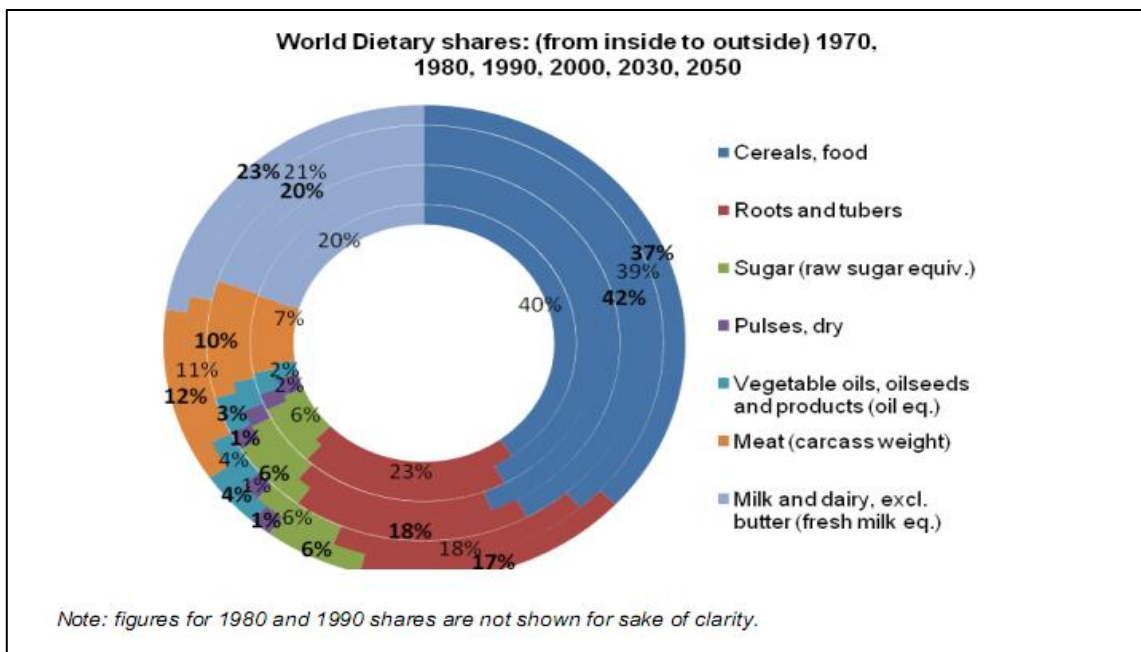


Figure 3 : World dietary shares - 1970 - 2050⁶

Potential impacts for Northern Ireland

A surge in demand for food has a potential economic spin off for Northern Ireland. The projected rise in dietary share for dairy and meat products could present real opportunities for local agriculture, given that these are two areas in which our agricultural industry has both a good reputation and strong exports. On a more cautious note however, other parts of the world may well look to maximise their production in these product areas so the competition for raw products to enable production and the scale of production needed to meet demand may well pose challenges to our local industry and environment.

⁵ [How to feed the world in 2050, FAO website](#)

⁶ [UK Food Security Assessment: Detailed Analysis, defra, January 2010, page 19](#)

4.2 Degradation of soil and water resources – added impact of Climate Change

Soil and water resources, so essential to the production of food are coming under increasing pressure. The so called Green Revolution of the 1940's and 1950's which led to the intensification and scaling up of agricultural production worldwide has undoubtedly increased yields but this has come at a cost.

The farming of **many marginal areas and repeated cropping without fallow periods has meant that in some areas of the world soil degradation and erosion are growing problems. Each year 10 million hectares of productive arable land are abandoned due to soil degradation**⁷. These figures are all the more challenging given the estimates that **it takes 500 years for nature to replace 1 inch of topsoil**⁸, **and approximately 3,000 years for natural reformation of topsoil to the depth needed for satisfactory crop production**⁹.

Turning to water resources agriculture is very dependent this key input for production of crops and feeding of livestock. Whilst **water usage rates will vary by agricultural sector the fact remains that the levels of water consumed by many modern methods are high**. In world terms it is also estimated that in relation to the **production of grain, it takes 1000 tons of water to grow 1 ton**. In terms of the **dairy industry, globally it requires on average 1000 litres of water to produce 1 litre of milk**¹⁰ when all of the production process is taken into account.

Climate change also has a real potential to further degrade the soil and water resources of regions and nations in coming years with climate models highlighting potential changes to rainfall levels, temperatures and drought risk.

Potential impacts for Northern Ireland

Whilst soil and water resources within Northern Ireland are not generally recognised as being under the same pressures at present as they are in other parts of the world, the fact remains that this situation could be subject to change. The critical challenge here for local agriculture is to develop methods and practices which make sustainable use of our local soil and water resources and enable local agriculture to continue to be productive. The impacts of climate change on Northern Ireland are far from clear but any potential changes will also need to be factored in if our soil and water resources are to be maintained.

⁷ R.A. Houghton, The Worldwide extent of Land Use Change, Bioscience 44(5), pages 305-313

⁸ Pimentel and Giampietro, Food, Land, Population and the US Economy

⁹ Ibid

¹⁰ [Facts and figures about water footprints and virtual water, UNESCO Water e-Newsletter No. 212: Water Footprints and Virtual Water, UNESCO website, 28th January 2009](#)

4.3 The rising cost of energy – “Peak oil”?

The twentieth century saw many radical changes to how we live and work but it could be argued that many of these changes were driven by the availability of cheap reliable and highly portable energy and other commodities derived from oil. This situation is perhaps nowhere more apparent than in relation to the modern agri-food industry.

Without oil and the products derived from it, the production, availability and variety levels of food that we currently enjoy would be far harder to achieve. It is estimated for example that 400 gallons of oil had be used annually to feed one US citizen¹¹. In addition between 1945 and 1994 energy input to agriculture was estimated to have increased fourfold but that crop yields had only increased threefold¹².

Whilst oil has been both cheap and readily available in large volumes for most of the last 100 years there is a growing recognition that this era may well be coming to an end. **The growing demand from emerging economies such as China and India has seen both world oil consumption and prices soar, at a time when the yield from many of the easiest to exploit oil reserves has at best levelled off or in some areas showed signs of decline.** This situation has led some experts to speculate that the world may now have reached or be about to reach the much vaunted **point of “peak oil” – when world oil production reaches its maximum and then begins a rapid and terminal decline. In such conditions the price of oil is likely to rise rapidly over the coming years as demand exceeds supply.** The impacts of this situation on the production, storage and distribution of food worldwide are not fully established but it seems reasonable to assume that these will be considerable if our agricultural production continues to rely heavily on oil. On a related point the growing of biofuel crops to meet energy needs, seen by many as a panacea to the question of energy provision, can be detrimental to addressing food security as these crops are increasingly being grown on land that was used for food production.

Potential impacts for Northern Ireland

As things currently stand 99% of Northern Ireland’s energy needs are met by the importation of fossil fuels (Green New Deal for Northern Ireland, 2009), a situation which leaves us very vulnerable to increasingly volatile prices for fossil fuels and in particular oil. Any rise in commodity prices has a knock on impact on the costs of production and with this in mind more needs to be done to both reduce and stabilise the costs of energy for agriculture in Northern Ireland. The potential of renewables could also be better utilised along with efforts to identify ways to reduce energy consumption and make production more efficient – areas that require more research and support.

¹¹ D Pimentel and M Giampietro, Food, Land, Population and the U.S. Economy, Carrying capacity Network Publications, 1994

¹² Ibid

4.4 Genetically Modified Organisms (GMOs) – a way of increasing production?

Genetically Modified Organisms (GMOs) play an increasingly significant role within the production of food and feed stuffs across the world. The rising demand for food is increasingly becoming one of the main motivations for the development and use within agriculture of genetically modified organisms (GMOs), with these foods being presented by some as the way to meet the need for increased yields

Public and indeed scientific opinion has been split on the potential benefits and risks from the production of these so called 'Frankenstein Foods' since their gradual introduction in the 1990's. Whilst countries such as the USA, Argentina and Brazil have wholeheartedly embraced GM technology, the EU has only approved 2 GM varieties for cultivation (BT maize and Amflora potato) within its boundaries over the last 12 years, compared to more than 150 worldwide. In addition whilst GM crops account for over 134 million hectares of cultivated land across the world, within the EU during 2009 there were only 100,000 hectares cultivated with GM crops¹³.

Potential Benefits	Potential risks
Pest resistance – crops can eliminate the need for chemical pesticides, decreasing costs and increasing yields	Unintended harm to other organisms – pollen from some GM plants can be fatal to some beneficial insects in agriculture – non-discriminatory in nature
Herbicide tolerance – enables the spraying of herbicides to kill weeds which cannot be physically removed cost effectively.	Reduced effectiveness of pesticides – harmful insect pests may become resistant to GM crops and as such be resistant to known pesticides.
Disease resistance – increases yields	Gene transfer to non-target species – GM crop plants which are herbicide tolerant may cross breed with weeds resulting in the creation of 'superweeds'.
Cold tolerance – reduces the risk to crop yields from frost and potentially extends growing season and locations	New allergies – introducing a gene into a plant may lead to the creation of a new allergy or cause an allergic reaction in susceptible individuals
Drought tolerance/salinity tolerance – potentially extends the growing season and areas suitable for planting in many parts of the world	Unknown effects on human health – no long term empirical evidence to determine positive or negative impacts
Nutrition – GM crops can be created to contain additional levels of existing or new nutrients.	Economic concerns – GM crops are costly to develop and as such the cost to farmers to purchase them will be higher – particular impact on small farmers and 3 rd world
Pharmaceuticals – GM plants can produce cost effective and edible vaccines, improving 3 rd world health in particular	
Phytoremediation – GM plants such as trees can clean up soil or groundwater pollution, bringing previously unusable land back into use.	

Table 1: Potential benefits and risks from Genetically Modified Organisms (GMOs)¹⁴

¹³ [International Service for the Acquisition of Agri-Biotech Applications - Brief 41, 2009](#)

¹⁴ Genetically Modified Organisms - background and latest EU developments, NI assembly Research Paper, 9th July 2010

Potential impacts for Northern Ireland

As things currently stand there are no GM crops being grown within Northern Ireland (or the ROI). In line with most other parts of the EU however, food and animal feed using GM material is freely available subject to meeting EU regulations. It is however not hard to see that challenges such as Climate Change and the increasing of yields may make the cultivation GMOs increasingly attractive to farmers in Northern Ireland.

The coalition Secretary of State for the Environment, Food and Rural Affairs, Caroline Spelman MP, appears to be in favour of GMOs and their application. In her first interview after being appointed she publicly stated that she was in favour of GM foods in the “the right circumstances” and that “the principle of GM technology is (OK) if used well. The technology can be beneficial.”

Questions remain however around whether the Northern Ireland Executive is pro or anti the cultivation of GM crops within Northern Ireland and whether this is likely to change in coming years? No doubt any decision in this area will need to balance the advantages for local agriculture having a GMO free status against some of the potential benefits from GMO cultivation.