Ireland’s Agricultural Sector’s Role in Food Security in the Wake of Climate Change

A report by Lisa Ashton
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1. Introduction

Throughout the evolution of humanity ensuring every individual obtains a diet that will enable him or her to lead a healthy life has been a defining task within every generation. This is exemplified in the Millennium Development Goals, as eradicating poverty and hunger are the top priorities. Recent achievements in the efforts to eradicate poverty and hunger are substantial, as the proportion of undernourished people in developing regions has declined by almost half in the past 25 years (UN, 2015). However, advancing these achievements is becoming increasingly difficult in the face of climate change. Thomas Malthus’ prediction that the population’s demand for food will one day outstrip the Earth’s capacity to provide a sufficient supply of food, is put into question, as the effects of climate change deteriorates global food production. The growing human population is putting pressure on the Earth’s arable land to produce more food, while this land, and other natural resources are deteriorating in quality and abundance as the human-enhanced greenhouse effect strengthens the negative impacts of climate change. This phenomenon is described by Kanayo F. Nwanze, the President of the UN International Fund for Agricultural Development (IFAD) in the sense that, "It is clear that food security and climate change, humanity’s two greatest challenges in the 21st century, are inextricably linked" (UN, 2011). To meet the demands of the ever-increasing human population and the a rising trend of overconsumption has led to an unsustainable use of natural resources, which has driven biodiversity loss, nitrogen and phosphorus saturation, ocean acidification, depletion of global freshwater, stratospheric ozone depletion, chemical pollution, atmospheric aerosol overloading, and change in land use (Rockstorm, 2009). These examples of environmental degradation underline the link between climate change and food security. In pursuit of ensuring food security, the global population increase has amplified the forces determining climate change and in turn climate change has limited the population’s capacity to ensure food security.

In the newly developed strategic plans, Food Harvest 2020 and Food Wise 2025, the Department of Agriculture, Food and Marine (DAFM), claims that Ireland will play a key role in meeting global demands for food, while overcoming the challenges of food security and climate change. Ireland’s agricultural sector seeks to meet global demands largely through increasing trade in dairy, beef and fish to EU markets and increasingly so to international markets. Ultimately, Ireland’s strategic agricultural economic plans outline Ireland’s place in the global food system and therefore determines Ireland’s role in global food security. This paper examines the influence that Ireland’s agricultural sector has on global food production, consumption,
human health and environmental sustainability. Further, it assesses whether Ireland's actions, will or will not make a significant contribution to overcoming the challenges of food security and climate change.

In light of Ireland’s agricultural sector’s existing activities and future projections, this assessment finds that instead of contributing to food security, the dairy, beef and fishing industries destabilize sustainable development in food security. This is realized by, Irish agri-food products contributing to a global disconnect between supply and demand, and feeding into a food system that fosters disparity in nutrition consumption. Increasing dairy and meat production and consumption in developed and emerging economy countries encourages overconsumption in middle-income and high-income household’s consequential increasing health issues such as obesity. In addition, environmental degradation is magnified through further total GHG (Green House Gas) emissions, from increasing Irish dairy and beef for export to high-end markets. Thus resulting in, potentially pushing adequate nutrition and the ability to sustain local production, out of reach for those facing food insecurity.

2. Practices and Projections of Ireland’s Agricultural Sector

Ireland’s Department of Agriculture emphasizes, that by the year 2050 the world population is estimated to climb to 9.1 billion people. To meet the demands of the world population in 2050, the Department of Agriculture stresses in Food Wise 2025 that there will need to be an increase of 70% in overall food production based on 2005 levels (DAFM, 2015). Food Wise 2025, similar to Food Harvest 2020 are strategies to map the direction of the agri-food, fisheries and forestry sector of Ireland (DAFM, 2015). The objectives of these strategic plans may vary in their specifics, but overall they seek to increase the value of agri-food exports, increase jobs, increase the value of primary production and increase the value added in the agri-food, fisheries and wood product industries (DAFM, 2016). Food Harvest 2020 and Food Wise 2025 underline that these objectives are achievable because of the growing world population’s food demands and the increase in middle-income class consumers that acquire the means to consume high-end commodities.

In addressing population increases and international food security, the DAFM (2016) underscores that, “Europe has to consider the role of its own agri-food sector in ensuring international food security, so that it can play its part in ensuring a high standard of quality food for future global food security”. Ireland’s agricultural projections largely influence international food security through its production and
exports to targeted markets. Food Wise 2025 highlights that a large component of the demand for agricultural and seafood products will come from the rapidly growing Asian economies and some African economies as well, due to the growth in their middle income classes. It is also noted that consumption in North America and Europe is slowing down, but consumer trends towards food that have specific requirements (e.g. gluten free, sugar free, etc.) creates opportunities in new product development (DAFM, 2015). To meet these growing and changing demands, DAFM (2010) in Food Harvest 2020 suggests, “Irish companies must seek new markets, develop new product streams that meet changing consumer demand, as well as finding new ways to assert Ireland’s environmentally friendly credentials to target the premium end of the market with high-value products”. Thus, the main goal for Ireland’s agricultural sector is to expand in existing markets and access new markets with products that are of high-value in premium markets. The projection of Food Harvest 2020 and Food Wise 2025 are based on economic terms and volume of production as measures of success and determinates of the future direction of the sector. This emphasis does not seem entirely aligned with the asserted aim of contributing to global food security.

3. Food Security

Ireland’s agricultural sector’s alignment with efforts to advance food security is determined by its role in upholding the four key elements of food security, both domestically and internationally. Food Security is having adequate availability, access, utilization and stability in food sources that provide the necessary amount of nutrients to lead a healthy life. Availability in the context of food security is the physical supply of food available for one to consume. The FAO (2015) considers “the levels of food production, stocks and net trade” to determine food availability. Access in food security is determined by income and again physical access to food. Key indicators of access to food security are frequency of food inadequacy, degree of food deficit and domestic food price index, etc. (FAO, 2015). Utilization is how one is able to use the nutrients in the food that is available and that one has access to. The utilization of food is determined by the capacity that one has in preparation of food, the variety in their diet and the distribution of food within the household, region or nation. These factors determine the energy and nutrient intake a person has and can be indicated through weight, prevalence of deficiencies in macronutrients, micronutrients and vitamins and access to clean water and sanitation facilities (FAO, 2015). Lastly, stability of food supply refers to the consistent access to nutritious foods. States and people have better food security when they are more resilient to the effects of adverse weather conditions, political instability and economic
influences. Examples of strengthening resilience to food insecurity could be through domestic production and efficient food storage strategies (FAO, 2015).

The four elements of food security determine the health of a population within a region, and as a result affecting the overall productivity, economic wellbeing and development as seen in Figure 1. If a region, country or individual’s degree of food security increases, their nutritional wellbeing will increase, because of the improvements in variety and consistency of food substances that food security brings. As a result economic development can be achieved because of increased energy levels and overall health. In turn, a stronger economic state allows for better access, availability, stability and utilization of food and therefore a higher degree of food security. However, this cycle can also be used to demonstrate the negative impacts of a low degree of food security, when food systems, international trade and climate change, impact food security negatively.

Figure 1: Cyclical diagram displaying the relationship between food security and developmental success.

The increase in the global population is projected to mainly come from developing countries, with more than half of them being African, which is where the largest percentage of undernourished people reside (UN, 2015). To have the population rise in regions where food security is already an issue and a crisis in some parts, is concerning (negative cycle in Figure 1). To amplify these concerns, current agricultural methods and practices of intensification and high input production, are destabilizing food security in developing regions. Agri-food, fisheries and forestry are driving forces in land degradation, water exhaustion, natural resource depletion.
and GHG emissions (Khan and Hanjra, 2009). These externalities like land degradation from flooding, limit the agricultural sector’s ability to provide for food insecure regions. The UN stresses that, *“poor people’s livelihoods are more directly tied to natural resources, and as they often live in the most vulnerable areas, they suffer the most from environmental degradation”* (UN, 2015). In addition, agricultural strategies like Ireland’s are directed towards the emerging economies’ middle income classes’ consumption patterns that resemble westernized diets of high meat and dairy intake, and more processed foods and snacks (Bailey, Froggatt, & Wellesley, 2014). This development of growing consumption highly affects food security and puts pressure on global food systems to ensure consistent adequate nutrition for every person. Therefore, intensified and globally exported agricultural goods, like Ireland’s, mainly livestock-derived foods, raises concerns of further marginalizing the people facing food insecurity in a bid to meet the demands of growing consumption in wealthier and already food-secure middle and upper income classes.

In the wake of growing concerns of food security, climate change threatens to exacerbate these concerns. The Intergovernmental Panel on Climate Change (IPCC), finds overall that, *“Global temperature increases of ~4°C or more above late 20th century levels, combined with increasing food demand, would pose large risks to food security globally”* (IPCC, 2014). Increasing meat and dairy production in Ireland, as forecasted in Food Wise 2025, is strongly correlated to global food insecurities. Ruminant-derived products are financially and physically out of reach from those facing food insecurity and, amplify the negative effects of climate change on their land. Dr. Tommy Boland (2011), suggests that this consumption comes at a high cost as, *“Decisions made in the short and mid-term in relation to management of our natural resources to feed the burgeoning population have the potential to exert disproportionate influence on the future of the planet, presenting major challenges and opportunities for all sections of our global society”* (O’Neill et al. 2011). The IPCC findings supports this claim, recognizing that producing resource intensive products like dairy and meat that are tailored for affluent markets increases the impacts on climate change by direct and indirect emissions from fossil fuel use and land use change. In turn, production and consumption by affluent markets negatively influences global food inequalities, as climate change effects heighten (IPCC, 2014).

### 3.1 Food Security and Food Production

According to the Department of Agriculture, food production must rise to feed everyone. This however, is a common misconception of food security that suggests a need to produce more, to feed the global population and the future increase in population. This misconception is made possible because global food systems do not
efficiently distribute the supply where the demand is, and instead distributes the supply where it’s the most economically profitable. Oxfam Canada (2015) states, “The world produces 17% more food per person today than 30 years ago.” This is a great achievement in agriculture production but it also suggests that more production is feeding into overconsumption and/or waste as many people are still undernourished. At a European Environmental Bureau conference, Ursula Hudson (2015) proclaimed, “We currently produce food for 12 billion people, yet malnutrition and obesity levels have gone up. Furthermore, about 1.3 billion tonnes of food are wasted every year worldwide which means that about a third of all food produced does not end up feeding the world” (Karlsson et al, 2015). This underlines the need to re-evaluate the effectiveness of global food systems in providing appropriate nutritional food to all regions and income classes, before suggesting increasing production. Therefore, food security is not a question of whether or not the supply exists. Food security is about local access to food, which is determined by barriers created through global prices, geopolitics and trade policies, complicating the economics of the food supply and demand equilibrium (WB, 2013). According to the World Bank Report, Trade Policy and Food Security, there is no global food shortage (Gillson and Fouad, 2015). Therefore, an increase in the volume of production is not the answer to food security. Achieving food security is accomplished through moving nutritional food from regions where there is a food surplus to regions where there is a food deficit. In addition, locality of production is also an issue raised in food security. To address this issue it requires enhancing local capacity in production on a small farm scale to meet the demands of local markets while also conserving the regions biodiversity, resource depletion and improving economic development (Irish Aid, 2009).

3.2 Ireland’s Role in Food Security

Ireland provides for a large portion of its own food consumption through domestic production, in addition to importation. According to the Global Food Security Index, Ireland ranks third, globally in being food secure (Global Food Security Index, 2016). Thus, food stability, access, availability, and utilization are very high for those living in Ireland. However, Ireland’s contribution to global food security beyond its borders is debateable, as the main agri-food exports are meat and dairy: foods embodying high GHG emissions per unit energy, per hectare. These products are limiting global food security because they use up nutrition and land that could be used directly for human consumption. Reducing the presence of cattle in this food chain would create more available energy (i.e. calories) from that same area of land to run a human’s metabolic processes directly instead of losing energy to feed the cattle that will later feed a human. A Chatham House report entitled Livestock – Climate Change’s Forgotten Sector states, “Animal feed constitutes a major and
growing share of crop consumption, contributing to higher international food prices with detrimental impacts on the poorest people, who tend to eat diets low in animal products and high in cereals” (Bailey, Froggatt, & Wellesley, 2014). This statement is particularly pertaining to Ireland’s contribution to food security because beef and dairy accounted for 60% of total agricultural outputs in 2013 and is projected to rise, along with the importation of animal feed. (Priority Area 1: Sustainable Food Production and Action Plan, 2013).

Dairy and beef production plays a significant role in emitting GHGs and furthering climate change. The Irish Farmers Association (IFA) views reductions in GHG emissions as an obstacle to profitability and to meeting global demands of food. The IFA (2015) states that, “The international community must accept that it is not realistic to implement a crude cut in emissions from food production at a time of increasing global demand for food. It must also consider the many parts of the world that suffer from resource stress and are therefore not in a position to increase food production.” In contrast to the IFA’s view, it would in fact be detrimental to promote resource intensive products, like Irish beef and dairy, as resource scarcity is becoming a global crisis. Continuing down the unsustainable path that Irish beef and dairy production are on, would limit food security, as these products are resource intensive and have high total GHG emissions. If Ireland’s agricultural sector does not participate in reducing GHG emissions, opposed by the IFA, it is likely going to contribute to weakening food production in areas stricken by food insecurity. Due to climate change intensified events like desertification, seasonal drought, flooding, and rising seal levels that cause reduced yields, which primarily are a consequence of production and consumption in developed countries, like Ireland, who are failing to reduce their agricultural GHG emissions. In alignment with this argument the IPCC states, “Climate change is projected to undermine food security”. This will materialize, if not already a reality, in marine ecosystems where redistribution and biodiversity will be reduced, challenging the continuous provision of fisheries productivity. In the context of crop yields the IPCC projects a negative impact on production in tropical and temperate regions (IPCC, 2014). Therefore, Ireland’s provision to develop the agricultural sector towards increased beef and dairy production will further the progression of resource depletion and climate change resulting in a negative cyclical effect on global food security.

4. Agriculture Exports

Ireland’s agricultural sector is believed to be meeting global food demands by exporting 85% of its agricultural products with beef and dairy holding the largest
portion of those exports as seen in Figure 3 (DAFM, 2010). Ireland’s agri-food and fisheries, to date are Ireland’s largest indigenous industries and contributes around 7.6% to the national GVA (Gross Value Added) (Bord Bia, 2015). In 2014 the agriculture, food and drink sector accounted for 12.3% of Ireland’s overall exports (DAFM, 2014). The agricultural sector is not only an indigenous aspect of Ireland’s economy, but it is also a growing aspect of the economy, with a 3% increase in exports in 2015 adding up in total to approximately €10.8 billion (Bord Bia, 2016). The driver of this growth in the agricultural sector of Ireland is the increased consumption in both mature markets (e.g. UK) and emerging market economies (e.g. China). The ten main countries Ireland exports to in descending order are Great Britain, France, Germany and Netherlands, China, United States, Italy, Belgium, Spain and Nigeria as seen in Figure 2 (DAFM, 2015).

The lucrative trade, of dairy, beef, seafood and consumer food and drink production has driven Ireland’s expansion in these global markets (DAFM, 2010). In 2014 Gross Agricultural Output (GAO) was valued at €7.06 billion with dairy accounting for 35.2% and beef accounting for 33.9% of the value. Other industries within the agricultural sector like sheep, pigs, seafood and cereals are also a part of the total GAO (DAFM, 2015).
4.1 Dairy and Beef
The Department of Agriculture asserts that the dairy and beef industries are at the forefront of the agri-food economic growth and claim to be taking the reins to ensure global food security by increasing supply to meet the pressuring global demand for food (DAFM, 2015). Dairy export value was approximately €3.24 billion in 2015, which was a 4% increase from 2014 (Bord Bia, 2015). This rise in the value of dairy is a recent trend as the dairy industry has increased its volume to produce products such as, infant formula, milk powder and cheeses. This has been made possible by increased production on dairy farms from 1984 to 2014. There are recorded national increases of 48% per cow output, 470% increase in output per farm based on litres of milk, and 350% increase in dairy herd size, while the number of dairy farms has dropped from 80,000 to 17,500 during the same time period (Donnellan, Hennessy & Thorne, 2015). To achieve this transformation in the industry, dairy farming in Ireland has immensely expanded its production through intensification, the end of the milk quota and increased global economic activity to make dairy the largest Irish export in agri-food goods. The land devoted to dairy production for exports occupies a large portion of Ireland’s land and natural resources. Agriculture overall requires 4.5 million hectares of the 6.9 million hectares of Ireland’s total land area (or 65% of total land mass)(Bord Bia, 2015). This agricultural land is divided up with 81% devoted to pasture, grass silage and hay, 11% to rough grazing and only 8% to crops, fruit and horticulture production (Bord Bia, 2015).
Food Harvest 2020 and Food Wise 2025 outline the success of agri-food, specifically dairy and beef, in monetary terms and through volume measured in tonnes to indicate the industries’ progress. However, revenue and volume should not be the only indicators when determining the success of the industry. Net available calories per hectare (with minimal GHGs) from the product are equally as important to consider as they exemplify the capacity of the industry to feed a population sustainably and the amount of energy it took to do so. In the context of measuring the agricultural sector’s success in trade, in calories, Ireland is a net importer. Ireland along with the rest of the EU, imports more calories than they export (Doyle, 2014). Thus, when calorie production is examined, it becomes apparent that global food security is undermined by the entirety of the EU trends in trading agri-food products in the context of calories. Since a large percentage of Ireland’s land is used for agricultural purposes that produce sources of calories it is questionable as to why Ireland is a net importer of calories. Analysis of FAO food balance sheets show that this is mainly due to net importation of cereals, vegetable oils and sugar, which have resulted in a net importation of food energy into the state from 2005 onward. Ireland has also become a growing importer of feed and fertilizer to fuel to facilitate the ongoing growth in dairy and beef exports. Ireland imported €779 million in animal feed (excluding unmilled cereal) from January 2015 to December 2015 (CSO, 2016). In addition, Ireland’s imports of dairy products rose by nearly 50% in 2010 to 2013 and increased by a further 25% in 2014 (Meikle, 2015). Therefore, measuring the agricultural industries’ success by only value in exports and volume terms do not encapsulate the entirety of the industry’s development. As the dairy industry develops further to meet the projections of Food Harvest 2020 and Food Wise 2025, imports of food energy and production inputs will continue to rise as well. Consequently, the intensification and expansion of the dairy industry will continue to limit Ireland’s capacity in contributing to food security through agriculture production as Ireland continues to import more calories than it exports.

In 2010, the DAFM purported that Ireland’s beef industry would decrease in volume to offset the increase in dairy volume, to balance total agricultural GHG emissions (DAFM, Food Harvest 2020). Since Food Harvest 2020 there has been some alterations in the forecast for Ireland’s beef industry. According to Bord Bia there was 6.9 million cattle in Ireland in June 2015, this was an increase of 0.5% from June 2014 (Bord Bia, 2015). Ireland’s beef exports amounted to €2.4 billion in 2015 in addition to €135 million worth of live cattle that were exported. These numbers are only projected to increase as Ireland targets China’s growing market of beef consumers and enters into the USA beef market as the first EU state to export beef to the USA (DAFM, 2015). As seen in Food Wise 2025, the projections for the beef industry are described as a need to meet global demands for protein in emerging
markets, creating opportunities for increased production (DAFM, Food Wise 2025, 2015). Therefore, suggesting a need to expand the beef industry, on the basis of global demand for protein that comes from mature markets or international emerging middle classes. This increase in exported beef is not being targeted to meet the global deficits in food, as noted above Ireland is a global importer of calories. Instead, the increase in beef is to target consumers that are part of a ‘high value market’ in attempt to rise the value of Irish beef products, as mentioned in the Food Wise 2025.

The DAFM outlines the projected monetary incentive for beef production in Ireland by bringing attention to the high beef prices that can be capitalized on by Ireland in the USA. In 2014 beef prices in the USA were 24% higher than they were in Ireland (DAFM, 2015). Similar to the USA, China proves to have growing economic opportunities, as there is an estimated 50% increase in the value of food consumption from 2013 to 2018 (Bord Bia, 2015). Increases in beef exports are expected rise in Germany as well, considering Bord Bia’s (2016) announcement that they are, “set to launch a new three year promotional campaign, starting in 2016, to increase beef exports by a further 50% to reach 30,000 tonnes per year by 2018. Germany represents Ireland’s fourth largest export market for food and drink, valued at €565 million in 2014.” With the intended increase in volume and value of beef being exported to primarily rich countries like Germany and the UK the unavoidable question is: how does this meet global food and protein needs when consumers in these markets already exceed, if not double the recommended meat consumption per annum? It also raises questions of how the increase in beef can tackle global food security issues, when beef is one of the most resource intensive foods on the global market. From a greenhouse gas perspective Ireland cannot claim to be an efficient producer of dairy and milk products. Currently, Ireland’s emissions of GHG per unit of bovine food energy are the second highest in Europe (direct emissions, excluding pasture sequestration which is still being researched and debated) (Doyle, 2014). As Ireland’s agricultural system entails a net import of food energy, and exports of bovine products are targeted predominately at high value markets, it fails to contribute to global food security. Moreover, high total GHG emissions contribute to climate change and resultant global food insecurity.

4.2 Seafood
Ireland’s seafood exports had an estimated value of 540 million in 2014. Bord Bia projects that by the year 2020 it will increase to 650 million (Bord Bia, 2015). To materialize this projection Irish seafood companies like Ocean Jade, have based their production out of Shanghai to make the Chinese market more accessible by
Irish fish exporters, with the aim of being viewed as a premium brand. DAFM (2014) highlights that to do so, Ocean Jade, “has developed strong long term relationships with importers in Shanghai and Beijing and has participated in the China Fisheries and Seafood Expo. As a result, it now supplies Spar-Beijing and has achieved a 74% value increase in exports to the Chinese market”. To amount to this growth Food Harvest 2020 seeks to accomplish a 78% increase in aquaculture volume (DAFM, 2014). This growth is due to global growing demands for seafood, particularly in Asia.

In Ireland, fishing is important both economically and socially and has a strong cultural significance. Therefore, it is important to keep this industry community led and sustainable. However, current fishing and aquaculture practices do not embody these attributes. This is noted in a statement by the European Commission (2015) discussing Irish fishing, “the sailing boats, spears and makeshift nets our ancestors fished with didn’t pose any threat to jobs, the coastal environment or fish stocks, but modern fishing vessels and methods do”. In addition the European Commission recognizes that over the past few decades overfishing has caused a collapse in many fish stocks in the North, Irish and Celtic seas (European Commission, 2015). The FAO research on fisheries finds that global fish stocks predominately range from moderately exploited to depleted (FAO, 2002).

Ireland’s plan to meet the fish demand through aquaculture as an alternative to catching wild fish is envisioned in Food Wise 2025. Aquaculture practices are also resulting in detrimental effects on Ireland’s natural resources and coastal communities. FAO warns that the pursuit of high output requires higher inputs, thus creating an intensive system. Intensive aquaculture systems have been found to create discharge that results in a build-up of anoxic sediments, eutrophication of lakes and degradation of coastal habitats (FAO, 2016). Thus, meeting the rising global fish demand is not a sustainable avenue to generate wealth, because 70% of wild fish stocks are defined as fully used, over-used or in crisis (WWF, 2016), while aquaculture practices are deemed harmful and create irreversible ecological damage. In Food Wise 2025, the SWOT analysis recognizes depleting fish stocks as a threat to the strategic plan’s success (DAFM, 2015). Therefore, it is questionable as to why increases in volume, export and value are on the radar for the Department of Agriculture as resources continue to be depleted. Ireland is contributing to overconsumption by expanding to markets like China with fish products. Through the expansion of companies like Ocean Jade, Ireland is encouraging consumption patterns that go beyond the planetary boundary, by exploiting a resource that is globally limited.
The Global Ocean Committee (2014) comments on overfishing as a, “widespread and systemic, primarily affecting the poorest, for many of whom fish is an irreplaceable food source. The loss of reliable sources of fish would deprive 500 million people of their primary source of protein and cause severe health problems”. Ireland is a large contributor to overfishing and thus food insecurity, as it exceeds the scientifically proven maximum Total Allowable Catches (TACs) by 25%, due to Minister Coveney’s negotiations to increase the allowance at fisheries (NEF, 2015). It has been confirmed that staying below the TAC proves to have better outcomes in both environmental and economic terms. Ireland’s commitment to continue over exploiting depleted fish stocks in the pursuit of short term economic gain, comes at the cost of sustainable job creation and supporting indigenous inshore fishing (NEF, 2015). As overfishing depletes fish stocks it undermines the ability for the marine environment to sustainably produce food it impacts negatively on global food security.

5. Case Study: The Prospects in China’s Emerging Middle Class

China has captured the DAFM’s attention due to its increasing per capita incomes and consumption that make for a potentially large and profitable market for Irish exported agri-food and fish. This makes exports to China a driving force in the incentives to increase dairy, beef and fish production in Ireland. In Food Harvest 2020 it was noted that China is Ireland’s second largest market in dairy and pork exports (DAFM, 2010). To understand the Chinese consumer trends the DAFM has ventured on trade missions to China to understand what the demands are and how Ireland can best respond. In a statement on Irish and Chinese trade relations, Minister Simon Coveney (2011) said, “Ireland views China as a key strategic trade partner not alone from a trading perspective but in terms of sharing expertise and experience in sustainable food production. China has a strong demand for imports of quality food, given the size of its population and concerns over food security and safety” (Minister’s Online News Letter, 2011). This is because China’s lack of trust in local production and the population experiencing a substantial shift to higher incomes within the existing middle class, as seen in Figure 4.
As more people in China enter into higher income classes, their consumption rises in alignment with their income or even faster. This explains why Irish food and drink exports to China over the past 10 years have increased by tenfold (Bord Bia, 2015). This increase in exports is not due to growing population, but rather higher consumption. The FAO (2011) describes China’s consumption increase as, “the per capita consumption of meat quadruple, consumption of milk increase tenfold, and egg consumption increase eightfold between 1980 and 2005”. This income and consumption increase in China is necessary to uplift individuals out of the negative food security cycle. However, this increasing rate of consumption must be addressed, so that patterns of overconsumption do not have the negative impacts in Asia that are ongoing in North America and Europe. In addition, China lacks the natural resources to provide for its rising overconsumption as Jennifer McBeath. et al (2010), suggests that the disproportion between population and agricultural land poses a threat to global food systems, because China only accounts for 7% of the world’s arable land, but acquires 22% of the global population. Therefore, if China were to continue down the path of overconsumption that is promoted and in part being met by Irish exports of meat and dairy, the pressure on global food systems for more imports to China is likely to be exacerbated.

China is globally considered a success story in terms of economic growth. However, institutions like the International Monetary Fund (IMF) highlight that the economic growth is not necessarily evenly spread throughout the country. The IMF finds that even though the middle class’s wealth is growing, income inequality is still very prevalent in China. The IMF (2015) measured inequality using, “the Gini coefficient for pre-tax market income”, which, “has exhibited an increasing trend from 0.28 in
1980 to 0.44 in 2000 and 0.52 by 2013" (Cevik and Correa-Caro, 2015). The closer the Gini coefficient is to 1, the more inequality is present. Therefore, the economic growth has not been equally distributed between regions and individuals. In addition, the IMF (2015) states, “This widening in the gap between rich and poor shows China’s transition from a relatively egalitarian society to one of the most unequal countries in the world” (Cevik and Correa-Caro, 2015). In the 2015 FAO report, The State of Food Insecurity in the World, it is suggested that the economic growth China is experiencing, is essential to improve poverty and hunger reduction rates, but it is not enough to ensure sustainable food security. FAO (2015) recommends that, “it is inclusive growth that matters growth that promotes equitable access to food, assets and resources, particularly for poor people and women, so that individuals can develop their potential”. Thus, exporting goods that are designed to predominately be accessed by high-end consumers contributes to the widening gap of inequality within China and other countries experiencing similar economic development. Especially when one considers the scope of population that is still not receiving enough nutrients, as global undernourishment is around 1 in 9 people globally (WFP, 2016). Ireland is part of the problem of widening the consumption gap. Irish agri-food producers like Kerrygold capitalise on the Chinese consumers’ adoption of western food, the tendency towards hypochondria relating to their child’s health (a product of the one child policy) and their concerns of domestic production through marketing strategies. Kerrygold marketing, promotes their products as beneficial for child development, pure, and internationally imported from a small Green Island that is magical and mystical (VARD Brand Design, 2015). Marketing such as this contributes to overconsumption and undermines local production. This is unfortunate because improving local production is a key component of inclusive economic growth, as a large portion of poverty in China is rural based. Thus, capitalizing on and marketing for overconsumption and westernized diets in emerging markets, contributes to food security disparity and diminishes local food production where it is needed the most.

5.1 Mixed Messages in Infant Formula and Milk Powder
The consumption of infant formula is sounding alarms for The World Health Organization (WHO) around the world but especially in China where consumption is growing as dairy exporters like Ireland strive to expand and dominate the Chinese infant formula market. Regardless of the health, economic and environmental recommendations, Irish dairy producers are marketing their infant formula in China and in other EU and international markets as sustainable, healthy and premium products. However, it is globally recognized and encouraged by international organizations and governments that breastfeeding is the best option for mother and child. Breastfeeding should be the exclusive source of nutrition for a child within the
first six months of life. Beyond the six months it is recommended by health experts to continue breastfeeding until the age of 2-3 in addition to feeding the child solid foods (WHO, 2015). Breastfeeding does not require additional health infrastructure or costs to the mother. The WHO recommends breastfeeding because of the protection it provides against diarrhoeal disease, respiratory infections and other life-threatening ailments. It also provides protection against obesity and non-communicable diseases such as asthma and diabetes. (WHO, 2015) Further research has found, with the increasing health benefits of breastfeeding, it can, “contribute to the reduction of child mortality and inequalities in developing countries.” Active promotion of breastfeeding can prevent a large proportion of child deaths and disease burden (Thomas Roberts et al, 2013). Due to the substantial benefits of breastfeeding the WHO advocates reducing the advertising and consumption of baby formula to increase the chances of mothers choosing to breastfeed (WHO, 2015). Ireland’s Department of Health also advocates for mothers to choose breastfeeding. This is demonstrated in their mission statement for the five-year strategic plan for breastfeeding, stating, “To improve the nation’s health by ensuring that breastfeeding is the norm for infants and young children in Ireland” (Ireland Department of Health, 2005). The message that is portrayed by the Department of Health to Ireland’s public is aligned with the WHO’s goal of increasing the percentage of infants exclusively breastfed in the first six months by at least 50% by the year 2025 (WHO, 2015).

Ireland’s Department of Agriculture has an entirely contrary vision for the global projections of how infants are fed by the year 2025. The Department of Agriculture’s targets by the year 2025 are outlined in, Food Wise 2025. Food Wise 2025 places a high value on the importance of the dairy sector and its increasing export capacity, valued at over €3.2 billion in 2015 (Bord Bia, 2015). In 2015 Irish infant formula value accounted for €1.5 billion in exports and is now 35% of all dairy exports (Allen, 2016). Ireland accounts for 10% of the global infant formula supply with major importers being China, and the UK. According to Bord Bia’s website, Ireland accounts for 17% of the infant formula market in China, making it the second largest exporter to China, right behind New Zealand (Bord Bia, 2015). The increasing demand for infant formula in Chinese markets is seen as an economic opportunity to Ireland’s agricultural sector, one that is believed to drive growth and improve Ireland’s GDP. To counter this projected growth, in alignment with the WHO recommendations, the Chinese government has released a statement that they are seeking to ban baby formula advertisements within their borders (Guo, S., et al., 2010). This exemplifies the global understanding of the benefits of breastfeeding for both the child’s and the mother’s health. Why is Ireland promoting the exact opposite through its increasing production and entry into international markets?
Ireland’s infant formula producing companies, with the support of the DAFM seek to push domestic sales and exports of infant formula, and they are succeeding as seen with the revenue-generated statistics stated above. Irish companies have been known to target mothers to use their products before even leaving the hospital, by giving out free samples on the birthing floor both domestically and aboard. This occurrence was noted in a study on marketing, advertising and distributing of formula in Ireland, “breast milk substitute is nearly always provided for free during the stay in the maternity ward (96%)” (Food Safety Authority of Ireland, 2007). The WHO has publicly stated that these practices are not promoting best health practices. The WHO designed a code for the international marketing of breastfeeding milk substitutes outlining rules for the promotion of infant formula. No free samples of these products to expectant mothers or families with young children are a top priority in this code (WHO, 1981). In conclusion these practices evidently harm a nation’s breastfeeding rate considering the prevalence of free samples in Irish hospitals and the low rate of 15% of exclusively breastfed infants in the first six months of life in Ireland (WHO, 2015). Therefore, Ireland has a much to do in improving breastfeeding rates both domestically and aboard.

Irish dairy companies are consciously engaged with unethical practices by domestically and globally acting contrary to the WHO recommendations, and against the efforts of governments like the Chinese’s ban on advertisements for infant formula. This is concerning, considering there are very few serious health issues that prevent a mother from breastfeeding. The global percentage of mothers that cannot produce enough milk is estimated to be between 1 to 5%, while the number of mothers who are physically incapable of producing any milk is even lower (Breastfeeding Basics, 2015). It is important to ensure that mothers have options, but flooding the market with breastfeeding alternatives is not beneficial to a society in any sense. Economically, a nation that has low rates of breastfeeding may benefit from infant formula sales, but suffers in healthcare costs, as preventable diseases and child mortality would be consequently raised, according to the WHO. In addition, the argument concerning mothers that need to use infant formula because they have to work is not substantial. Companies are encouraged to give mothers breastfeeding breaks and there is breastfeeding technology like breast pumps that allow the child to be breastfed without the mother present (Health Service Executive, 2007). Thus, there is a very small credible need for infant formula.

The increase in infant formula production and distribution also opposes the Department of Agriculture’s claim to being environmentally sustainable and contributing to food security. It is hard to deny the short-term economic profit
motives resulting in the increase in trade of infant formula. Considering, it costs €43 per kilo in China for Kerry Groups ‘Green Love+’ products, which is four times as much as infant formula sold in Ireland (Becto, 2015). However, this economic profit comes at very high social and environmental costs as the dairy industry’s resources go towards creating a product that is to a large degree unnecessary. The process of creating and distributing infant formula adds to pressure on climate change and takes resources away from contributing to global food security efforts. The FAO (2013) states overall that, “GHG emissions from cattle represent about 65 percent of the livestock sector emissions (4.6 gigatonnes CO2-eq), making cattle the largest contributor to total sector emissions”. Therefore, the source of infant formula is a pressuring force, adding to climate change. Infant formula also requires a lot of resources for production and packaging including: paper, aluminum, plastic, cardboard, tin, plastic and steel. In addition to the input resources, Irish infant formula also has a lot of food miles, considering the industry’s target markets are in Asia and emerging in Africa (Eco Friendly Food, 2010). For a product that has been proven and promoted by the WHO as unwarranted for the vast majority of mothers, it consumes a lot of resources and exerts a lot of negative externalities that limit global food security efforts and heightens climate change.

Ireland’s dairy industry is not addressing the issues that it is sparking in the context of global food security and climate change. Attention is instead, focused on increasing value and expanding production, as noted in Food Wise 2025 (DAFM, 2015). This is demonstrated as Ornua, an Irish dairy organization, announced that it has established a manufacturing plant in Shanghai to enable better access to, “high end retail market and will provide an entry point into supplying dairy ingredients to the rapidly growing Chinese Food Service industry” (Moran, 2016). Ornua has also established a dairy powdered milk-packaging factory in Nigeria. In discussing this new development, The Minister of DAFM (2015) Minister Coveney praises the global expansion of the dairy industry, announcing that, “Expanding economies in West Africa provide fertile ground for Irish companies in the agri-food sector wishing to expand their global footprint” (DAFM, 2015). The expansion of the dairy industry into global manufacturing to further its reach to global markets does not embody the sustainability with which the Irish dairy companies are branding themselves as. An Economist report suggests that Ireland’s expansion into Nigeria is damaging local suppliers’ businesses and Nigeria’s self-sufficiency in food supply. In the report Uncowed by the Economist (2015) it was noted that when local milk product, “finally arrives on supermarket shelves, it costs around three times what it would in Europe. Cheap long-life imports [i.e. Irish milk powder] sell for less than half the price of local milk. Nigeria spends roughly $1m a day on imported milk powder”. This poses a serious threat to global food security, as it spreads the promotion of intensified
Agricultural production to globalize western overconsumption patterns, instead of promoting local production.

In addition, imported dairy products contribute to marginalizing a large portion of the population in places like Nigeria where the number of people living in poverty, is staggeringly high and has increased to 61% in 2010 from 52% in 2004 (National Bureau of Statistics, 2012). Increasing the supply of products that are expensive and imported like Irish dairy, adds to the divide of the ‘haves and have not’ in developing countries, like Nigeria and Ghana, where Ireland is expanding exports to. This expansion is detrimental to food security as it undercuts local production by increasing competition where it is already nearly impossible for local farmers to make a profit. In addition, the promotion of dairy products like infant formula in developing and emerging economy countries, negatively affects environmental sustainability and human health, and as seen can also negatively affect incomes and national economies. To counter the increase in consumption inequality and poverty, breastfeeding is proven to contribute to raising household incomes, as seen “In Brazil, a study found that when infants are breastfed for more than 12 months income increases by 33%”, because breastfed children have higher IQs, which largely affects their income as adults (Victora et al, 2015). Overall, dairy exports to developing and emerging economy countries should not be directed to target lucrative markets to gain the best short-term economical advantage, alone. Rather exports should be supplied to meet the nutritional, economical and environmental demands of both the exporting and importing country.

6. Ruminants and Climate Change

Agriculture has evolved into a sector that both contributes to and undermines food security at the same time. Livestock emissions are one of the greatest drivers of climate change. The global livestock sector contributes to some of the most potent GHGs at very high rates. Overall livestock accounts for 9% of global anthropogenic carbon dioxide (CO₂) emissions, 35-40% of global anthropogenic emissions of methane (CH₄) and 65% of global anthropogenic emissions of nitrous oxide (NO₂)(FAO, 2006). These emissions are made up of various GHG emitting activities within the sector. For example some of the means that contribute to the release of carbon within the livestock sector are the respiration and digestive processes of livestock, using fossil fuels during feed and animal production, land-use change for feed production and for grazing, CH₄ and NO₂ release from the breakdown of fertilizers and from animal manure and fossil fuel use for transportation and refrigeration of animal products (FAO, 2006). Within the livestock sector ruminants
are the biggest contributors to total emissions, especially CH₄, through enteric fermentation and manure spreading. Ireland plays a large role in contributing to global emissions through its large herd size and transporting and refrigerating high volumes of ruminant-derived products to distant markets.

Ireland’s agriculture emission targets are estimated to fall short of the commitment to reduce emissions by 2020 set by the EU. In the non-ETS sectors category of emissions, agriculture accounts for 45.6% of total emissions in 2014 and 33% of total emissions out of all sectors, in 2013 (EPA, 2014). In addition to the agricultural sector’s already high emissions, the EU Commission outlines, “Emissions from agriculture are also expected to increase by 2% during this period of time [2013-2020]. That means Ireland’s total emissions are projected to fall short of the 2020 target by 10 percentage points” (EU Commission, 2015). The EU Commission sets these targets, not the national government. The EPA notes that this increase is due to the increase in the dairy herd since the lifting of the milk quota. The dairy herd is projected to increase by 21% compared to current levels by 2020 (May 2015), while the beef herd is only projected to decrease by 7% by 2020 (EPA, 2015). The organization, Chatham House highlights that beyond the fact that the majority of developed countries are not doing their part in reducing GHG they also do not have any binding targets/goals in place. “Very few targets consider either livestock or agriculture. Of the 40 developed countries listed under Annex I of the UNFCCC, only Bulgaria and France have established a quantitative reduction target for livestock-related emissions (Costa Rica is also said to be developing one)” (Bailey, R., Froggatt, A., & Wellesley, L. 2014). Consequently, this suggests a side lining of livestock emissions in Ireland’s national emission targets and plans, allowing for further development of the dairy and beef industry with little to no regulation on GHG emissions.

The impacts from agricultural growth have been felt globally through increasing pressure on climate change. In sequence, the pressure that the agricultural sector, particularly bovine-based systems, has put on increasing climate change impacts has undermined food security efforts by contributing to extreme weather, poor soil quality and increased animal diseases. In a presentation on Climate Change Impacts on Food Security, Tom Wheeler and Joachim von Braun, (2013) noted that, “Extreme weather events are likely to become more frequent in the future and will increase risks and uncertainties within the global food systems”. In addition, to degraded environmental conditions for crops, animal diseases like the blue-tongue virus are projected to continue to spread throughout Europe due to warmer climates, posing as a threat to cattle herds (IPCC, 2014). In the latest IPCC (2014) report, AR5, it was suggested, “Climate change impacts on livestock will include effects on forage and
feed, direct impacts of changes in temperature and water availability on animals, and indirect effects via livestock diseases”. The projected crop yield losses and livestock losses from climate change, in part are a direct result of the agriculture practices and emissions of today. These losses come at a high cost, which consequently will affect Ireland as well as the rest of the world, but to different degrees. The projected increase of primary output in the agriculture, fisheries and forestry sector by €1.5 billion to €6.1 billion by 2020, will be over shadowed by the costs of climate change that will be inflicted on Ireland (Flood, 2013). A Stop Climate Chaos report highlights that, “The most significant climate change impacts on Irish agriculture relate to pests and diseases, crop yields, flooding, plant and animal stress factors, drought effects and the ability to provide sufficient resources for animals during extreme events” (Flood, 2013). These climate change induced environmental challenges are estimated to cost between €1 and €2 billion (Flood, 2013).

6.1 Environmental Creditability in the Agricultural Sector
Ireland are currently marketing their food and drink industry as environmentally sustainable through Bord Bia’s Origin Green programme. The main environmental initiative within Origin Green are the on farm carbon foot printing assessments. The Carbon Trust (UK) conducts a part of the sustainability measurements for this project (Carbon Trust, 2016). To measure the sector’s success in environmental sustainability, there must be a holistic assessment and approach through using indicators like GHG emissions, biodiversity loss, amount of natural resources used for inputs compared to outputs and energy efficiency. Leaving indicators like GHG emissions out of the calculations of measuring the agricultural sector, can lead to results that misrepresent the environmental impacts the sector has and therefore overestimating its capacity to contribute to environmental sustainability.
Unfortunately, this is exactly the case with the results that Origin Green has produced to measure the carbon footprint of Ireland’s agricultural sector. In the Origin Green programme, agri-food manufacturers must pick at least two target areas to be measured and assessed upon. Those target areas include energy, emissions, waste, and water and biodiversity (Origin Green, 2015). To properly assess a manufacturer’s role in environmental sustainability, all of these targets collectively need to be assessed, with respect to standardized criteria to produce a proper report on how well agri-food and fishery manufacturers preform within each target and where they need to improve. Unfortunately this is not the case, companies can choose which parameters they want to include (at least two) and they can choose their own baselines and criteria. This might be a useful beginning but it is hard to see how its current poor methodology can in any way justify the claims of sustainability being made in the massive international marketing campaign being undertaken by Origin Green.

On the supply side of agri-food production, farmers that are participating in Origin Green are using a tool called The Carbon Navigator. The Carbon Navigator uses five
indicators that are to trace the carbon efficiency of a farm (Origin Green, 2016). These indicators are: length of grazing season, improving genetics and breeding (increased EBI), improved nitrogen efficiency, improved manure management and energy efficiency. Measuring all of these indicators and improving on them are necessary in combating climate change. Yet, none of these indicators measure total GHG emissions from farms, which is the key measure of a farm’s addition to the global warming effect causing climate change. Adding up the total emissions from all farms gives the total national emissions, which is what needs to be reduced. In Carbon Trust’s case review on Bord Bia as a client, they emphasize their success in efficiency and cost reduction but do not present any success in annual reductions in total GHG emissions, decrease in biodiversity loss and/or reduced use of water (Carbon Trust, 2015). Therefore, it is arguable that Origin Green does not produce results that demonstrate Ireland as a leader in environmental sustainability. This argument is supported by an EU statistical analysis that shows Ireland’s national agriculture GHG emissions are the highest in the EU as of 2012 as seen in Figure 5 (Eurostat, 2012). Ireland has also reduced its CH$_4$ and N$_2$O emissions amongst the least in the EU from 1990-2011 as seen in Figure 6 (Eurostat, 2012). These high emissions in Ireland are predominately emanate from dairy and beef production.

![Green House Gas Emissions from Agriculture 2012](image)

Figure 5: Total agriculture GHG emissions measured in %. Source: European Environment Agency, 2012.
By measuring the agriculture sector’s success in environmental sustainability based on energy efficiency, without consideration to GHG emissions, can create rebound effects. Improved efficiency incentivizes more production or use of energy which can result in increase in the net environmental footprint. In the case of farms with cattle herds, greater efficiency incentivizes herd size increases, which results in an increase in net GHG emissions. Efforts to achieve GHG emission targets needs to be a prioritized goal, along with reducing the overall environmental footprint of farming.

Bord Bia (2015) depicts Origin Green as a marketing scheme in the Branding Work Book, Billion Dollar Baby, where China’s infant milk formula (IMF) market is described as, “on the way to being the Billion Dollar Baby. Crucially, branding IMF ‘Origin Green’ or Irish origin now allows producers to command the ‘super premium’ prices the likes of Illuma enjoy”. Bord Bia is supporting the message “Ireland Believes in Origin Green” in China because it translates to Mandarin nicely to motivate consumers and to create further opportunities for other food sectors (Bord Bia, 2015). To date Origin Green’s agenda largely reflects an act of green washing, in the sense that the claims that have been made about the sustainability of Ireland’s food and drink industry are highly selective and ignore the fact that Irish agriculture is the greatest environmental pressure/threat at present. Origin Green creates the impression that Irish produce is currently sustainable and as such is starting from a origin which is green rather than the reality which is that the industry needs to work towards ‘destination green’. The success or failure of Origin Green in “reducing environmental impact, serving local communities more effectively and protecting the extraordinarily rich natural resources that our country enjoys” (Origin Green, 2016) must be based on improvements in key areas where the industry is currently a major pressure such as climate change, biodiversity loss and water quality.
7. The Link Between Agriculture and Nutrition

Globally there are roughly 1 billion people suffering and dying from hunger (WHO, 2015), there are 1.9 billion adults overweight, and there are 1.3 billion tonnes of food wasted each year (Karlsson et al, 2015). Evidently, within one world, there are large percentages of people at each extreme end of the spectrum of human nutritional problems. These statistics make it apparent that food systems are flawed and are creating problems that influence economic growth, environmental sustainability and human health. Economically, the disproportionality within the global food system creates extra costs to governments and to individuals. The Policy Symposium: Feeding the World 2050 states, “Malnutrition reduces people’s productivity and an estimated 2-3 percent of a country’s national income can be lost to malnutrition. In addition, malnutrition can reduce an individual’s life time earnings by as much as 12 percent” (O’Neil et al, 2013). On the opposite end of the spectrum, The National Obesity Organization (2010) articultates that the, “Estimates of the direct NHS costs of treating overweight and obesity, and related morbidity in England have ranged from £479.3 million in 1998 to £4.2 billion in 2007”. Thus, both malnutrition and obesity hinder economic development within a household and/or a nation.

Environmentally, 40% of the world’s land surface is used for agriculture (WB, 2013) and this is expected to increase to further expand agriculture production; as a result, further degrading land diversity and quality and increasing GHG emissions. Minister Coveney (2014) proclaims the increase in agriculture production is necessary so that, “the industry is well positioned to exploit the relentless growth in the global demand for food”. In particular Bord Bia (2014) states, to meet, “with increasing demand from more affluent consumers in key world markets, there is little doubt that the €12 billion export target set out in the industry-led strategy for the agri sector Food Harvest 2020 is well in sight”. This dialogue highlights the misrepresentation of the agricultural sector’s success, by demonstrating that success is indicated by euros in the billions rather than by the percentage of people reaching nutritional requirements to lead a healthy life. Food Harvest 2020 and Food Wise 2025 are concrete examples of how agricultural success is misrepresented, which hugely affects the development of industries within the sector. In Ireland, high valued industries like dairy and beef are dominating the agri-food sector, resulting in more readily available products that are linked to obesity. In a study examining meat consumption and its relationship with obesity Y Wang and MA Beydoun proclaim that high meat consumers are 27% more likely to be obese in comparison to low meat consumers (Wang and Beydoun, 2009). Yet, Ireland exports large volumes of
meat to countries that already have high rates of obesity as seen in Figure 7, while other countries continue to struggle with under nutrition because of a lack of access and availability to a variety of foods.

Figure 7: This bar graph demonstrates the obesity rates in the top ten importing countries of Irish Agri-food in 2008. Data source: CIA, 2008.

The food system's current trends demonstrate that it's functioning is purely based on economics through international trade. At the same time neglecting serious costs in externalities due to impacts on the environment, loss of biodiversity and global warming, as well as impacts on poverty and food security through a loss of employment and local production. The mainstream trends that contribute to defining the structure of global food systems include farms getting bigger with fewer employees, high energy waste on farms, fertilizer and other artificial chemical use at an all-time high, food transported far distances, agrobiodiversity declining 75% since 1990, limited transparency in the food chain and limited food literacy. This makes people more susceptible to allowing the market to make their consumption decisions. Food is also cheaper to purchase than it is to make, and unhealthy consumer choices often outweighing the healthy choices in terms of price (Hudson, 2013). These attributes underline the notion that food production is moving further away from locally sourced healthy food, grown for human nutrition, to instead, move towards mass production and marketing schemes designed to encourage consumption that benefits the manufacturer.

If the global food system continues to enable overconsumption and undernourishment at the same time through increased production and consumption
of resource intensive goods, the capacity to achieve food security goals will be further weakened. In light of this argument, Jane Wilde describes Food Harvest 2020 as a branding issue, not as a real attempt to improve environmental and sustainable goals (Wilde, 2009). This is also demonstrated in the Origin Green Charter, as the purpose of the programme is to, “1. Demonstrate the sustainability credentials of individual Irish food and drink manufacturers. 2. Enhance the reputation of Ireland as a source of sustainably produced food and drink products” (Origin Green Sustainability Charter, 2015). Hence, the purpose is to increase credentials and improve reputations. Wilde furthers her critique of Food Harvest 2020, by drawing attention to the fact that there is no mention of public health or of the value to human and environmental health that dietary change can bring. She also notes that no one with a public health background or expertise seems to be involved with Food Harvest 2020 (Wilde, 2011). This is understandably concerning, as Food Harvest 2020 highly influences nutrition choices for the public by publicizing important industries to the Irish economy, like dairy. Agricultural policy strongly influences the state of human health and to neglect this link has created nutritionally based global epidemics like malnutrition and obesity. To improve food systems and food security this link needs to be strengthened and at the forefront of policy formation in both agriculture and population health.

7.1 Dietary Shift
The global population continues to grow substantially and shows increasing patterns of urbanization. This transition has created a tremendous amount of pressure on the Earth’s natural resources, creating more demand for food that is nutritious, affordable and produced by someone else. By 2050 more than 70% of the global population will reside in urban settings compared to the 49% today (FAO, 2015). Thus, more people will be dependent on markets for foodstuffs instead of through their own production. In alignment with urbanization, household incomes are rising as well, as seen in section 5. This is resulting in emerging and developing countries to adopt westernized dietary consumption, which one can see from the path of more developed countries, leads to problems of overconsumption. To sustain a healthy diet the maximum recommendation of meat is 70g per day or 30kg per person yearly. European and North American consumption averages at more than 83kg per person yearly. East Asian consumption is currently at 28kg per person yearly and is projected to jump to 52kg by the year 2050 (IFPRI, 2012). In response to these consumption patterns global organizations like FAO and Oxfam are advising industrialized nations to reduce their consumption of meat and dairy by shifting their diets to more plant-based proteins. At the same time governments are beginning to feel the pressure to implement policies to reduce meat and dairy
consumption like carbon taxing resource intensive foods to assist in reaching GHG emission targets. The dietary shift that is being proposed, is focused on mature markets and emerging markets that exceed the recommended intake of calories and volume in animal products to alter their diets to contribute to the twinning goals of climate change and food security.

The FAO (2003) emphasizes that there is a global issue in meat and dairy consumption as it “...is heavily and disproportionately concentrated in the industrial countries. They account for 15 percent of world population but for 37 percent of world meat consumption and 40 percent of that of milk”. This is a global issue because this over consumption limits the consumption of meat and dairy in regions where malnutrition is rampant, as the production of these goods are exhausting natural resources. S. Khan and Hanjra (2009), finds that natural resources like water, are used at excessive rates, considering, “meat production requires several multiples of water (4000–15,000 l/kg) than grain production (1000–2000 l/kg) to meet daily nutritional energy needs. An estimated 2.5–10 times more energy is required to produce the same amount of calorie energy and protein from livestock than grain (Molden et al., 2007)”. In addition to water and energy use, Mark Sutton (2011) underlines how the large inputs for livestock production like land can be devoted to direct human consumption and reduce the amount of land exploited for livestock. “If Europeans obtained all their protein from plants, only 30% of the crops grown currently would be needed, reducing nitrogen fertilizer inputs and the associated pollution by 70%”(Sutton, 2011). Evidently, if meat and dairy production and consumption were to be reduced, arable land use could transition away from livestock use to feed more people.

Furthermore, beef and dairy production and consumption are aggressively overusing natural resources, and also largely contributing to climate change. In an FAO report this was shown through the comparison of carbon footprints based on diet. The FAO (2006) report, Livestock’s Long Shadow, it was calculated that, “A 2,000 kcal high meat diet produces 2.5 times as many greenhouse gas emissions as a vegan diet, and twice as many as a vegetarian diet. Moving from a high meat to a low meat diet would reduce a person’s carbon footprint by 920kg CO₂e every year”. Thus, diets that contain high quantities of meat are damaging the global capacity to reduce the increasing impacts of climate change. In addition, shifting one’s diet away from beef and dairy can hugely contribute to global food security. Dairy products like baby formula and beef products are not efficient nor effective products to ensure food security and meet global demands for daily nutritional satisfactory. In support of this argument Mintel highlights that, “Nearly 60% of the world’s agricultural land is used for beef production, yet beef accounts for less than 2% of the calories that are
consumed throughout the world” (UCSUSA, 2012). Therefore, the resource intensity and GHG emissions that comes with meat and dairy production are not worth the calories they produce, as more people can be fed on a mainly plant-based diet with less harm to the environment.

The increasing demand for protein-based foods referred to by the IFA is based on overconsumption, not necessity. The argument put forth, regarding Ireland as a necessary leader in increasing the supply of meat and dairy for consumption is misinforming citizens regarding the reality of global meat and dairy consumption with respect to food security. It is apparent that increasing beef and dairy production does not target feeding the world, but rather supports living beyond the planetary boundaries by making short-term economic gains at the cost of environmental degradation. In addition, there is an assumption that the feed for livestock and the land dedicated to livestock is too low in quality to be fed directly to humans. This assumption is very misleading as FCRN finds that this, “...wheat [among other cereals] is perfectly edible – the constraints here are consumer and industry perceptions of ‘quality’” (Garnett, 2010). By selling this feed as human food on the market and devoting some of the land that is used for grazing to the production of grain, would allow for more food with a wider variety in price and quality on the market to be accessible to people who are affected by food security.

The demand for food security is coming predominately coming from developing countries. Food Wise 2025 partially recognizes this, instating, “Globally, that demand continues to grow, bringing with it an increasing requirement for more sophisticated food solutions, particularly among the emerging middle classes of Asia and Africa” (DAFM, 2015). However, it is not these emerging middle classes that are at risk for malnutrition and/or under-nutrition. It is the poor people living in these countries that are experiencing food and water shortages creating a definite demand for access and availability to foodstuffs. For example there is approximately 800 million extremely poor people (€1.11 or less a day) globally, with a large portion living in middle-income countries like India, Nigeria and China (UN, 2015). The populace of 800 million living in extreme poverty are not able to afford products that Ireland is boasting as meeting the global food demands, as exports to these regions like baby formula brands ‘Green Love +’ cost €43 (Betco, 2015), far exceed the spending capacity of someone living on €1.11 a day. Yet, Ireland’s Department of Agriculture continues to promote this trade, saying that Ireland is assisting countries in meeting their needs through trade. Minister Coveney comments here on increasing trade to Africa, “This trade mission is about helping Irish companies to optimize on the opportunity that exists, as the continent transitions from the need for assistance, to a continent of opportunity; the so-called ‘aid to trade’ journey” (DAFM, 2015). The ‘aid
to trade’ transition has the potential to benefit the hundreds of millions of people living in poverty as it stimulates economic growth, job development and widens the variety of commodities available. However, the commodities that are being traded must be accessible to all, nutritionally beneficial and not resource intensive, to ensure no further inequality in access to food within a country.

Reduction in meat and dairy also aids in the efficiency of ensuring food security as, “Direct consumption of cereals by humans can boost energy efficiency of the global food system, because one third of the world’s cereal supply is used for feed resulting in lower energy efficiency (de Fraiture et al., 2007; Renault and Wallender, 2000)” (S. Khan, M.A. Hanjra, 2009). Consequently, reducing meat and dairy consumption can increase food and food-protein access for people of all regions and incomes. To support these potential improvements in global food systems, William J. Ripple et al (2014) urges a need for policymakers to include the livestock sector in climate change policy, as meat production is growing rapidly worldwide. Ripple et al (2014) states that without policy changes meat, “is projected to more than double from 229 million tonnes in 2000 to 465 million tonnes in 2050. The greenhouse gas footprint of consuming ruminant meat is, on average, 19–48 times higher than that of high-protein foods obtained from plants”. If the livestock sector continues to grow the repercussions are going to be negatively felt global through climate change and natural resource depletion, furthering the crisis of food insecurity. Thus, a dietary shift away from high meat and dairy consumption in developed and emerging economy countries is a key solution in reaching food security and climate change goals.

This information is not to instruct individuals to change their lifestyle habits but rather to inform individuals of the scientific evidence that supports moderating meat and dairy consumption. Conveying the message of reducing consumption to the general public is a difficult task. Advising and intervening in the publics’ consumption of meat and dairy can raise concerns of encroaching on cultural values, personal health and individual priorities in commodity purchasing. However, awareness to the reality of the impacts caused by meat and dairy over consumptions harm to environmental and human health, needs to be raised to create an open dialogue about the issues surrounding the topic. Extracting and burning fossil fuels are often centre stage in policy formation and in public attention for reducing GHG emissions, even though the livestock sector accounts for 14.5% of total anthropogenic emissions (Ripple et al, 2014) and 33% of Ireland’s total emissions (EPA, 2015). If the public were to be better informed on the relationship between beef and dairy production and consumption, climate change and food security, than achieving GHG emission targets would be far more achievable. When informed that
reducing global GHG emissions is achievable by making conscience choices in purchasing less livestock products and livestock by-products, consumers are in fact remarkably receptive to considering the making dietary changes (Wellesley and Froggett, 2015).

8. Mitigation and Alternatives

To alleviate food insecurity, a multi-disciplinary approach is needed, where policy implementation seeks multiple objectives and is supported across departments to ensure positive outcomes. This entails all departments in government and across the EU to support policies that enhance food security and climate change efforts, rather than positioning them to be in opposition of each other. Overall, Ireland has the capacity to contribute to food security, but based on its current agricultural economic plans, alterations are needed. To achieve genuine sustainability where the needs of today and tomorrow are met effectively, it is necessary for both the private and public sector to commit to meaningful GHG emission reductions and to target markets where consumption increases are necessary, while also promoting local production in food insecure regions.

To mitigate the negative side effects of agriculture, Smith et al (2015) argues that total GHG emission and environmental impact reductions by farms, positively impacts climate change and therefore food security. To foster sustainability in Irish agriculture it is vitally important for GHG emissions to be properly measured and acted upon accordingly. To incentives GHG emission reductions there is a dire need for binding reduction targets in the agricultural sector with short timeframes to stimulate immediate action. In addition to reducing GHG emissions, food security goals can be better achieved through local production. This requires partnerships and knowledge sharing between developed and developing countries that embodies the transition of ‘aid to trade’. The European Environmental Bureau emphasizes, “The EU must support developing countries to produce their own food sustainably” (EEB, 2015). This can be done by decreasing the pressure on land by actually consuming what is already produced by, “reducing and limiting how much food we throw away; every tonne of food waste is responsible for 4.5 tonnes of CO2 equivalent emissions” (EEB, 2015). Action to mitigate the global problem of food waste is already being carried out through government policy. Food Cloud an organization in Ireland committed to reducing food waste and feeding those in need highlights the French government’s recent achievement in reducing food waste. In France, “after the Senate unanimously voted through a bill forcing supermarkets to take action to stop food waste. The law which forces supermarkets to donate their surplus food to
charity and any food no longer fit for human consumption must be processed into animal feed or compost" (Food Cloud, 2016). To ensure this bill is effective grocery stores face substantial fines in cases of noncompliance. If countries around the world were to follow suit it would drastically improve global food security.

Another avenue to achieve food security are the modernization of production, reduced waste by producers and consumers, promotion of smallholder family farms and reduced meat and dairy production and consumption by developed and emerging economy countries. However, Bakker et al (2012) underline that while, “shifting to technologies and stabilizing population will be essential in creating sustainable societies, neither will succeed without considerable changing in consumption patterns as their needs to be a decrease in resource intensive production overall”. Therefore to achieve food security there needs to be a shift in global food supply and demand to stimulate changes in agricultural methods like intensification. Peter Smith et al (2015) suggests that if I consumers were to adopt more sustainable practices like reducing food waste throughout the supply chain and shift diets to less resource intensive products the ecological and human health feedbacks would be positive. This can be initiated by consumers demanding producers to provide evidence of reduction in food wastage along the supply chain. The positive feedbacks that would be stimulated would be less competitive demand for land and water use and generally healthier diets for people.

Scientific evidence points towards the dietary shift away from meat and dairy as an inevitable step towards sustaining food security in the future. This is recommended in a report by Compassion in World Farming as, “A reduction in the volume of meat production and consumption in rich countries over the next 10 to 20 years would enable farmers to move to more extensive, low input animal farming and would make a significant contribution to reducing agrichemical and energy use in agriculture”(Compassion in World Farming, 2009). Ireland’s Department of Foreign Affairs suggests there are negative impacts that come from agricultural intensification, both environmentally and socially. Irish Aid highlights in a report entitled Environment and Agriculture, that intensification is a threat to food security. It causes loss in diversity, increased competition for water and increasing use of energy and pressure on climate (Irish Aid, 2009). Comparatively, developed countries’ agriculture intensity in production far exceeds that of developing countries. When developed countries export their subsidised agricultural goods to developing countries it not only negatively affects the environment through their intensive production, but it also negatively affects the local economy in the developing country (Irish Aid, 2009). Creating greater competition for the local small farmers obscures the price of their products and making them more
susceptible to food insecurity as they attempt to sell more expensive produce and consume the most inexpensive produce to stay afloat. Ireland has demonstrated this kind of behaviour in markets in China and Nigeria where Irish agri-food products are beginning to flood the market, as noted in the section 5.1. To increase food security locality of production is essential along with developed countries reducing resource intensive production and reducing their GHG emissions to reduce climate change impacts on developing regions as depicted in Figure 8.

Figure 8: This relationship graphic depicts the connection between the supply-side and the demand-side of agriculture products to contribute to sustainable food security.

9. Conclusion

It is evident that the challenges of food security and climate change are intensifying and will continue to do so without concerted international effort to cut greenhouse gases. Temperatures are continuing to rise and negatively impact the hundreds of millions of people struggling with chronic hunger. These negative impacts such as, reduced yields due to extreme weather are likely to be aggravated unless strong action is taken by responsible nations with the capacity to act. This has to include Ireland. Industries that seek to capitalize on overconsumption will only exacerbate these issues, while also fueling obesity. This is demonstrated through Ireland’s activities in agri-food exports that promote the increase in production of resource intensive goods such as dairy and beef without considering the ramifications on food security and climate change. The increases in beef and dairy volume and exports are undercutting food security and promoting overconsumption both in the EU and in international markets, where
increased overconsumption has and will continue to intensify climate change. Unless, the agricultural sector makes significant strides to change the direction of their actions, the agri-food industries of Ireland will continue down a path of unsustainability to meet short-term economic gains at the cost of long-term issues like environmental degradation, climate change and the continuation of the negative cycle of poor food security.

To make meaningful progress towards sustainable development, all of Ireland’s governmental departments, including Agriculture, Health, Foreign Affairs, Environment and Arts Heritage and the Gaeltacht should be in alignment with each other on their policy strategies, and pool their efforts to achieve common goals related to food security and climate change. The general public can also make a large contribution in improving global food security and climate change and other environmental issues by being conscious of the consequences of their consumer choices and becoming further aware of the signals their actions send to global food systems. In addition, the public has the ability to stress the need for evidence from producers of their commitment to climate change mitigation and food security to limit the risk of more sectors developing programs like Origin Green that, to date, have fallen short on their promises of sustainability. There is potential for mitigation and alternatives to tackle the overarching challenges of food security and climate change, and all are needed. Making them happen will require governments, producers and the public to collectively take action in feeding people sustainably within planetary limits.

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