

**Czech University of Life Sciences Prague**  
**Faculty of Economics and Management**  
**Department of Humanities**

**PhD Thesis**

**Devising a rural food system based on the United Nations  
Sustainable Development Goals**

**Holly Barlow MSc, Mhort.**

## **Abstract**

With the ever-apparent effects of climate change affecting the world, Governments and societies must look to adopt sustainable and regenerative practices throughout many sectors and industries to reduce green-house gas emissions. One sector associated with high levels of carbon output is the farming and food production sector, with many areas relying on fossil fuels, heavy usage of chemical inputs and production practices which destroy native habitats and impact the fertility and water storage of land. The British Government have been presented the opportunity to rewrite policy, following the 2016 Brexit vote and the subsequent withdrawal of the United Kingdom from the European Union and alongside the Government's commitment to fulfil the United Nations Sustainable Development Goals by 2030, agricultural policy can be redeveloped to promote regenerative practices to improve the sustainability of English farming. This research generates an understanding of the effects of the Common Agricultural Policy on English farming and how those working within the sector would like to see future policy developed. The research uses interviews to gain a lived experience perspective from farmers, growers and food producers based in three key agricultural counties in England, a perspective which is often overlooked. With over 70 interviews completed in both agricultural and horticultural sectors, the research highlights the importance of a grassroots approach to policy and sustainable practice with many farmers, growers and food producers generating their own shortened more effective supply chains, adopting regenerative practices, and creating financial independency from Government based subsidies.

I want to thank all of those who have helped on route to writing this thesis my husband, Richard for his continued support, my parents. My colleague Bianca Minotti for your companionship throughout this process. Professor Lošťák for his continued support and guidance over the last five years.

## **Contents**

<b>1. Introduction</b>	<b>7</b>
<b>2. Literature Review</b>	<b>11</b>
2.1 The Common Agricultural Policy	11
2.2 Failures of the Current Agricultural System	13
2.2.1 Economic Issues	13
2.2.2 Environmental Issues	14
2.2.3 Social Issues	18
2.3 Rural Development	20
2.4 Alternative Agricultural Movement	23
2.5 Regenerative Agriculture	24
2.5.1 Principles of Regenerative Agriculture	25
2.5.2 Success of Regenerative Agriculture	26
2.5.3 Criticisms of Regenerative Agriculture	28
2.6 Principles of Organic Agriculture	29
2.6.1 Benefits of Organic Agriculture	20
2.7 The Challenges of the Sustainable Development Goals	33
2.8 Delivering the Sustainable Development Goals	36
2.7 Lived Experience of farmers, growers and food producers.	40
<b>3. Methodology</b>	<b>42</b>
<b>4. Results</b>	<b>46</b>
4.1 The Survey Results	47
4.2 Interviews	52
4.2.1 Subsidies	52
4.2.2 Future Policy	55
4.2.3 Crop Production	60
4.2.4 Future Farming Methods	64
4.2.5 Greenhouse Production	68
4.2.6 Food Standards and Imports	69
4.2.7 The Supply Chain Issues	74

4.2.8 Supply Chain Solutions	80
4.2.9 Consumer Issues	85
4.2.10 Consumer Solutions	90
4.2.11 The Labour Market	94
4.2.12 Labour Solutions	101
4.2.13 Covid 19 Pandemic	103
4.3 Barriers	105
4.3.1 Economic Barriers	105
4.3.2 Social Barriers	111
4.3.3 Environmental Barriers	113
<b>5. Discussion</b>	<b>117</b>
5.1 Conceptual Theory	117
5.2 Subsidies and Future Policy	118
5.3 Crop Production	121
5.4 Future Farming Methods	122
5.5 Greenhouse Production	124
5.6 Food Standards and Imports	125
5.7 The Supply Chain	126
5.8 Supply Chain Solutions	127
5.9 Consumers	127
5.10 Labour	128
5.11 Covid 19 Pandemic	129
5.12 Economic Barriers	129
5.13 Social Barriers	130
5.14 Environmental Barriers	131
<b>6. Conclusion</b>	<b>131</b>
6.1 Research Questions	133
6.1.1 What has been the long-term affect of the current British agricultural policy on the English agricultural sector?	133
6.1.2 Can future policy be developed to embrace sustainable development and work symbiotically with the farming sector?	133

6.1.3 With the Government committed to fulfilling the SDGS by 2030, can the targets be achieved when applied to English Agricultural sector?	134
6.2 Future Research Areas	136
<b>Reference List</b>	<b>138</b>
<b>Appendices</b>	
<b>Appendix 1</b>	<b>149</b>
Interview Questions	
<b>Appendix 2</b>	<b>151</b>
Survey Questions	
<b>Appendix 3</b>	<b>152</b>
Sample form for Participants Contacted	
<b>Appendix 4</b>	<b>153</b>
Interview Analysis	
<b>List of Figures</b>	
<b>Figure 1</b> The Sustainable Development Goals	
<b>Figure 2</b> Summary of Regenerative Agriculture system principles and components	
<b>Figure 3</b> Mission Based Approach to Policy Changes	
<b>Figure 4</b> A Map of the Countries of England	
<b>Figure 5</b> Results from Question 4 of the survey	
<b>Figure 6</b> A table showing the Sustainable Development Goals relevant to English farmers, growers and producers.	
<b>List of Tables</b>	
<b>Table 1</b> Table depicting contract rate of participants.	
<b>Table 2</b> A representation of the business types contracted for the research.	
<b>List of Abbreviations</b>	
<b>AD</b> Anaerobic Digestors	
<b>BPS</b> Basic Payment Scheme	

**BSE** Bovine Spongiform Encephalopathy  
**CAP** Common Agricultural Policy  
**DEFRA** Department for Environment, Food and Rural Affairs  
**ELMs** Environmental Land Management Scheme  
**EU** European Union  
**FAO** Food and Agricultural Organisation  
**FPGs** Farmers, Producers and Growers  
**GCA** Grocery Code Adjudicator  
**GE** Genetic Editing  
**GMO** Genetically Modified Organisms  
**GM** Genetically Modified  
**GHG** Greenhouse Gas Emissions  
**GPD** Gross Domestic Product  
**IPCC** Intergovernmental Panel for Climate Change  
**LDCs** Least Developed Countries  
**NBT** Novel Breeding Techniques  
**NCDs** Non-Communicable Diseases  
**NGOs** Non- Governmental Organisations  
**RA** Regenerative Agriculture  
**RABI** Royal Agricultural Benevolent Institute

**SDGs** Sustainable Development Goals  
**TIFF** Total Income from Farming  
**UK** United Kingdom

## 1. Introduction

Britain's food security was heavily affected by World War Two and as Lang and Heasman discuss in their 2013 publication, 'Food Wars' the consequence of food shortages during this period forced a change in food policy for British agriculture. Leading a new influential narrative for policy, entering the phase which became termed as the 'productionist paradigm' and ultimately lead to cheap food production at any cost. This change in policy led to the over production of food and the famous 'butter mountains and wine lakes' witnessed in the 1980s (Grant, 2010). The European Union's Common Agricultural Policy (CAP), introduced in the early 1960s, played into this paradigm, rewarding farmers and landowners for acres owned and quantity produced which eventually turning land into a commodity for investment and ultimately driving up the price of land and pushing production into the hands of yield-focused contractors. This incentive for quantity has reinforced the need for heavily industrialised production driving the use of larger machinery, more chemical inputs and further investment in mechanised production methods.

A large percentage of British arable crop production is grown for the commodity market where the United Kingdom (UK) struggles to compete with larger producers, regions such as Russia and the Americas which can produced crops on a much larger scale and using production chemicals which are banned in the UK, directly impacting farmers profits. Despite the production being aimed at the commodity market the UK's food system is heavily reliant on imports and currently the UK experiences a food trade gap of £46.8bn in 2018, with just 50% of food consumed within the UK produced domestically (Lang, 2020). Government's horticultural statistics from the Department of Food and Rural Affairs (DEFRA) showed that in 2020 that 44% of vegetables consumed in the UK and an astonishing 84% of fruit was imported (DEFRA, 2021).

In addition, the productionist paradigm has led to heavily processed foods and value-added goods being favoured by supermarket retailers and large food producers who dominate the food systems supply chain and the marketplace. The term 'highly processed food' and its origins are clearly defined in Monteiro's et al 2019 paper "they are formulations of food substances often modified by chemical processes and then assembled into ready-to consume hyper-palatable food and drink products using flavours, colours, emulsifiers and a myriad of other cosmetic additives" (Monteiro, et al 2019, p.939) and the association of these ultra-processed food groups to the food regimes theory is clearly defined in this statement "most are made and

promoted by transnational and other giant corporations. Their ultra processing makes them highly profitable, intensely appealing and intrinsically unhealthy” (Monteiro, et al 2019, p.939). Popkin’s (2001) in his paper drew attention to the ‘nutrition transition’ witnessed in many developed countries and the associated links with increasing levels of obesity due to increased meat and fat consumption. Paradoxically, global communities not only face rising levels of obesity but also malnutrition, defined by such communities which have greater access to highly processed foods. A direct result of this is an increase in non-communicable diseases (NCDs) such as heart disease, diabetes, cancer and dementia (Lang and Heasman, 2013).

The increased demand for processed and value-added products, combined with the productionist narrative of food policy has driven the typical mono-cropping style of modern agriculture. However, this all comes at an environmental cost, with a massive loss in biodiversity in recent decades. Hedgerows ripped out to accommodate larger machinery, the impact of chemicals which are either used incorrectly or have a toxic impact on nature’s food chain, affecting predators, waterways and even entering the human food chain. A decline in farmland birds has proven to be the biggest indicator in a loss of biodiversity with populations declining rapidly in the last 40 years and there is a direct correlation between this decline and intensive agricultural production (Donald et al 2001). UK farmland has seen in a 97% drop in wildflower meadows, which are a vital source of habitat for insects and pollinators (Goulson et al, 2015). Soil erosion is another devastating factor of our current food production system, a global issue, the Food and Agriculture Organisation of the United Nations (FAO) warned in 2014 that there are an estimated 60 harvests left on Earth, such is the damage of global soil erosion. With the focus on UK production, in recent years we have seen increased rainfall over winter and the massive impact of flooding on local communities. This is partly due to exposed soils over winter and the soil run-off collecting in our rivers and streams (Helm, 2019).

A report from the Intergovernmental Panel for Climate Change (IPCC), published in 2019 estimated that 8.5% of all greenhouse gas emissions were directly produced by agriculture and a further 14.5% is as a result of changing land use, for example deforestation (IPCC, 2019). Considering such statistics there is call for global agriculture to change its current practices to use more sustainable methods with a focus on regional production. It is, however, difficult to truly define sustainability, it is a fluid term which can be defined in so many ways. Constanza and Pattern (1995) discuss that sustainable systems must be forever changing as evolution itself is ever developing.

The Bruntland Report (1987) commissioned by the World Commission on Environment and Development offers a cornerstone definition for sustainable development “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (EUR-Lex, 2022 p.1). This definition has a multisectoral approach and offers a clear aim for the purpose of sustainable development in existing and future systems.

The United Nation’s Sustainable Development Goals (SDGs) developed in 2016, are an evolution from the UN’s successor, the Millennium Goals, which are aimed at building economic progression, environmental sustainability and include social inclusion (Sachs, 2012). The 17 sustainability goals and 167 targets are endorsed and supported by 170 countries in which the UN Development Programme is operating as well as many more multi-stake holder partnerships (UNDP, 2018). As can be seen in figure 1, many of the goals are linked to agricultural production and the food system and tackle issues such as hunger, poverty, sustainable production and consumption, decent working conditions, care of waterways and land-based ecosystems. The goal-based format of the SDGs supplies Governments and stakeholders a much-needed focus for policy progression towards more sustainable systems.



Figure 1: The Sustainable Development Goals (Global Education Magazine, 2019).

Despite this, the vast nature of the goals has left them open to some criticism and quite often considered, unachievable targets. Hák et al (2016, p. 567), argues that the major “weaknesses were the poor alignment of the targets and goals with existing international agreements and political processes; lack of effective implementation; conflicts between goals and targets, and

non-quantified targets”. Although there is valid criticism of the SDGs, they do still create a global agreement between governments and stakeholders and offer an emphasis towards more sustainable development.

The UK Government have committed to fulfilling the SDGs by 2030, but with little openly publicised about the SDGs and their goals what impact will that have on British farming and the associated Governmental policy? With the UK Government’s commitment to the SDGs coupled with Britain’s exit from the European Union, there is an exciting opportunity to redevelop agricultural policy with a more sustainable focus and remove the current siloed approach to policy, looking at a more inter-governmental approach to future policy development. The application of the SDGs supplies much needed goals for Government to base their policy development on. However, the future of policy is still unclear and the withdrawal of subsidies leaving farmers with an insecure future. Although the implementation of environmental schemes providing true sustainable development and with the offer of ‘public money for public goods’ should not come as a financial cost to the farming community (Helm, 2019). The goals set by the SDGs provide much needed clarity and accountability for sustainable development, but the farming sector faces many challenges if they are to be achieved in the strict timeframe set by the UK Government.

Some of the challenges faced by the farming sector include the rising cost of land and the tough working environment which has had a direct impact on new entrants in farming, as well as an aging sector which many find difficult to retire from. This therefore creates little opportunity for new or young farmers to enter into the farming sector (Zagata and Sutherland, 2015). Alongside the dominance of supermarket retailers creating a consolidated marketplace which has led to tactics including products sold as loss leaders, fixed pricing policies and tough contractual conditions resulting in a challenging environment for British farmers. The implementation of the SDGs will ultimately rely on UK farmers to play their part in the application of a sustainable agricultural policy but farmers themselves face a number of challenges that directly impacts their opportunity to innovate. The success of the SDGs to date has predominately shown that they have driven accountability and engagement amongst Governments and stakeholders at a global level.

Although existing research into British agriculture typically focuses on key events or specific agricultural practices, the lived experience of British farmers is rarely documented. This research conducted in this thesis looks fill that void by developing a broad understanding of

the lived experience of farmers and growers in the UK. Many of whom, on a daily basis deal with the complexities of the CAP, increased pressures with the supply chains, face the impact of climate change and the devastating effects of biodiversity loss. By creating the understanding of the lived experience and drawing in the structure of the SDGs, conclusions can be made for a food system which embraces sustainable development at its central core.

To further understand the lived experience of English farmers, growers and producers the research conducted in the thesis will look to answer three key research questions:

- What has been the long-term affect of the current British agricultural policy on the English agricultural sector?
- Can future policy be developed to embrace sustainable development and work symbiotically with the farming sector?
- With the Government committed to fulfilling the SDGS by 2030, can the targets be met when applied to English Agricultural sector?

The methodological approach for this research adopts a mixed methods approach consisting of three key phases. The first phase involves the completion of the interviews, three counties from England were chosen based on Government statistics for agricultural and horticultural output, these were the Southwest, East Anglia and the East Midlands. During this initial phase 591 farmers, growers and producers were contacted and this research presents a total of 72 exploring the lived experiences of the British Agricultural sector. The second phase asked interviewees to complete a brief survey focusing of the relevance of the SDGs to British farming and their own business operations. The final phase will be a discourse analysis of the most update agricultural policy published by the UK Government. This will look to understand the level of acceptance of the need for sustainable development within future policy and the level of commitment from the current Government.

## **2. Literature Review**

### **2.1 The Common Agricultural Policy**

The European Union's (EU) CAP has by far held the biggest influence over economic modern agricultural systems. Originally, introduced in 1962 to combat post-war food shortages, improve the standard of living in agricultural communities and stabilise European markets, laid out in Article 39 of the Treaty of Rome (Bailey *et al* 2016; EC, 2022). Despite many reforms

the impact and side effects of this policy has created great instability to the global farming sector (Helm, 2019).

Initially, the CAP instilled a market intervention by creating a single market thus guaranteeing a minimum price for farmers in an attempt to mitigate the volatility of the global marketplace through fixed prices and to ensure intervention in the event of low global rates. By doing so, this would effectively shelter the sector from the impact of worldwide events, for example, the 1930s 'Great Depression' (Bailey *et al*, 2016). The many positive outcomes have included increasing productivity, greater percentage of land mass under production, boosting yields and the stabilising of farm prices (Bailey, *et al* 2016). But the unforeseen side-effects of the CAP have included the financial burden of mass production surplus, the cost to the EU budget assigned for the CAP and the distortion caused to the world trade markets (Bailey *et al* 2016).

There have been many reforms introduced to combat the inefficiencies of the CAP and key historical reforms have included:

- **The Mansholt Plan (1968-1972)** – aimed at increasing efficiency and reducing the farmer population through retirement schemes and retraining farming communities to get other work (Stead, 1970).
- **The Macsharry Reform (1992)** – this reform focused on advancing the competitiveness of the agricultural sector (EC, 2022), “stabilising the agricultural markets, diversifying production, protection of the environment” and controlling the EU expenditure on CAP (Bailey *et al*, 2016 p.4).
- **Agenda 2000 (1999)** – the objectives of this reform looked to, again, increase competitiveness, improve food safety and quality, stabilise agricultural incomes, introduce environmental aspects to the CAP, support rural areas, simplify the policy and strengthen decentralisation (Bailey *et al*, 2016).

The Agenda 2000 saw the introduction of the Pillars I and II strategies, with Pillar I focussing on the direct payment schemes and market administration measures and Pillar II introduced to tackle rural development by providing support to help modernise farms but also drive diversification of rural businesses (EC, 2022). During this phase of the CAP reform the Basic Payment Scheme (BPS), a rural grant system which was introduced and limited payments to a per hectare basis. The Greening Payment, most probably the first significant measure reflecting the challenge of sustainability and establishing funding for some sustainable practices such as “maintaining permanent grassland, crop diversification – more commonly known as the three-

crop rule and maintaining an “ecological focus area” (Bailey *et al* 2016 p.6). This reform also built on the aims for the Macsharry Reform with a focus on food safety and quality, improving environmental commitments, animal welfare and establishing more equal global trading (Bailey *et al*, 2016).

## **2.2 Failures of the Current Agricultural System**

For a future of truly sustainable agricultural production, it is essential to view the issues created by the current food production system from an entire system perspective, addressing the interrelated factors which cause many of the problems faced by society but to also address the siloed approach from policymakers and Governments. We must no longer divide these factors into individual concepts, but to approach them as the cause and effect of food production allowing for the externalities of the food system to be challenged by Governments through future policy and by stakeholders. As well as industry/ private sector taking steps towards more sustainable production methods. This next chapter looks to provide an overview of the interrelated factors caused by the current mainstream agricultural sector.

### **2.2.1 Economic Issues**

It is estimated that the CAP absorbs 40% of the total EU budget (Bailey *et al* 2016; Webster, 1997), and certainly in the case of British Agriculture, the farming sector only contributes 0.7 per cent to the GDP (Gross Domestic Product), a turnover of £9 billion but receives subsidy of approximately £3 billion (Helm, 2019). This heavy reliance on subsidy has stifled innovation and suppressed the competitive nature of the farming sector. Furthermore, the Basic Payment Scheme (BPS) has led to the capitalisation of land prices, resulting in land becoming more of a hedge fund investment than a profitable investment for farmers (Helm, 2019). Additionally, because of the rising land prices due to the BPS, the effect of which has massively changed younger generations and new entrants gaining access into the farming sector (Helm, 2019).

The productionist paradigm has arguably achieved its goal of successfully accomplishing increased yields over the past 70 years but this increase in yields has had a significant impact on environmental and social factors (Pretty *et al*, 2000). Many farmers are suffering the cost of rising inputs for systems which are dependent on chemical intervention to support the profitability of their farming businesses. To achieve maximum profitability farmers will typically produce crops which supply the greatest economic return regardless of the environmental impact of the crop or the chosen production method and this concern has heavily influenced the popularity of certain crops in recent years (Boardman *et al*, 2003).

Additionally, the decline in farm income has deteriorated rapidly, Gregoire (2002) states that in 1995/1996 the average farm income for a 500-hectare farm fell from £80, 000 to £2500 in 2000/2001. The effect of various historical events has obviously contributed to the decline of farming incomes with outbreaks of devastating illnesses such as BSE (bovine spongiform encephalopathy) in the late 1980s and foot and mouth disease in 2001, but also the fluctuating global crop prices affecting farm profitability (Gregoire, 2002). Regardless of the farming sectors increased production efficiency as part of the improved industrialisation, these economic stresses surrounding the farming sector have emerged as “one of the important pre-indicators of psychiatric morbidity and even suicide” (Gregoire, 2002 p. 471). A survey of 500 farmers in England and Wales between 1995 and 1996 showed that 23% reported financial problems and a total of 79% reported that they worried about money (Simkin, *et al* 1998).

The rural economy in the UK is weak, facing challenges such agricultural decline, poor economic activity, low incomes, unpredictable and fluctuating consumer demand and confronted with continued peripherality from Government (Kitchen and Marsden, 2009). Kitchen and Marsden (2009, p. 274) express their concerns at the widely held view that rural areas of the UK should be “controlled and regulated on behalf of the wider public”. However, these authors argue that this opinion does little to support the regeneration of rural economies “or to reduce the salience of the eco-economy paradox” which epitomises many marginal rural areas despite the “potentially high ecological value” and the relatively poor economic activity and welfare (Kitchen and Marsden, 2009 p.274). The authors call for the de-carbonisation of production and consumption systems, such ecological progress would simultaneously combine “with rural social and economic development in innovative ways” and as a result the authors support the emergence of a new rural development paradigm (Kitchen and Marsden, 2009 p.274). The eco-economy model would readdress the balance through diverse and innovative businesses and rural development which would work in a unified way with social, environmental and economic aspects (Kitchen and Marsden, 2009).

### **2.2.2 Environmental Issues**

A review conducted by Skinner *et al* (1996) offers an in-depth overview of the environmental impact of agriculture in the UK. The primary practices which cause severe environmental impact are pesticide usage, “nitrogen compounds, farm livestock waste and soil erosion” (Skinner *et al* 1996 p. 111). The authors comment on the wide-reaching footprint of the emissions and pollutants from modern day intensified agricultural production and advise the utilisation of “management techniques and systems to reduce the detrimental impacts” linked

with modern agriculture (Skinner *et al*, 1996 p. 111). The researchers have acknowledged that further research is needed to investigate the impact of “non-animal wastes and socio-economic impacts and aesthetic effects, for example on the landscape” and the inter-related nature of many of the polluting practices of mainstream agricultural production (Skinner *et al* 1996 p. 124).

Boardman *et al*, (2003) discusses the effect of modern cultivation techniques which often leaves soils bare to the elements, some crop production methods worsen the soil run-off for example, potatoes, sugar beet and maize noted for the greater plant spacing and its shallow rooted growth habit. Soil erosion is problematic because it causes the loss of fertility, with soils becoming “progressively coarser-grained” (Davies *et al*, 1993), the transportation of phosphorus and pesticide compounds “from farmland to surface water are bound to eroded soil particles” and the decline of the soil structure (Skinner *et al* 1996 p.124).

It is documented that influences such as the loss of field boundaries to accommodate larger farm machinery, cultivation of steeper areas of land, the requirement for finer tilths and the “fashion for post-drill rolling”, are all modern practices synonymous with arable production which have a damaging influence on soil erosion (Boardman *et al*, 2003 p.3). Consistently these practices have been motivated by “perverse subsidies” and the consequences overlooked by those working within the sector, chasing increased productivity and they were often considered “external to the farm and borne by society (Boardman *et al*, 2003 p.1). Boardman *et al* (2003) observe the change from mixed farming systems to that of livestock and arable to predominately arable production, once again, for many, driven by a socio-economic decision (Boardman *et al*, 2003).

Boardman *et al* (2003) also emphasises that the impact of soil erosion does not only affect farm production but has huge societal and environmental consequences as a direct result of the loss of topsoil, typically flooding which takes place as a result of sedimentation build up in waterways. The researchers state that there are few ramifications for landowners who are responsible for soil run-off, mostly due to the impossibility of proving legal responsibility and also the effects may not be seen for years to come (Boardman *et al*, 2003). With local councils bearing the brunt of the removal of soil sediment from local waterways and the effects of soil burdened water flooding property (Boardman *et al*, 2013), the authors conclude that soils have become irrelevant in modern farming systems which aim to maximise profitability and high yields, this has been exacerbated by intense economic pressure and policy (Boardman *et al*,

2003). There has been little incentive for farmers to move away from these intensified techniques of crop production due to the economic pressures, worsened by the enlargement of the EU and competing in global markets.

Moss (2008) states that agriculture affects all freshwater systems from their natural states. The use of nitrate-based fertiliser, a product designed to be extremely soluble is readily leached into watercourses, rapidly accelerating the “process of eutrophication in coastal waters” (Stoate *et al*, 2009 p. 36; Matias and Boavida, 2005; Newton and Mudge, 2005). Research has also recorded aquifer contamination “downstream of intensive crops such as citrus orchards, horticulture and rice (Stoate *et al*, 2009, p.36; Silva *et al*, 2006; Stigter *et al*, 2008). The main causes of nitrate leaching are due to the lack of plant uptake of obtainable nitrogen, reduced evapo-transpiration and high rainfall level or irrigation, causing “greater hydrological connectivity facilitating the rapid transport of nitrogen to watercourses and groundwater” (Stoate *et al*, 2009 p.36). It is considered that British agriculture is responsible for approximately 70% of nitrate pollution levels in waterways (Stoate *et al*, 2009).

Livestock waste produces significant levels of nitrate, an estimated 90 million tonnes of livestock waste is applied to agricultural land each year in the Britain (DEFRA, 2007). Not only do the levels of nitrate in the waste cause pollution within waterways but also the mass of pathogenic micro-organisms found in livestock waste also poses a threat (Mawdsley *et al*, 1995). Once again, the circumstances surrounding the application of manure dictates the level of pollution witnessed in waterways (Skinner *et al*, 1996; Mawdsley *et al*, 1995). The use of pesticides is also a major contributor to pollution, massively affecting native flora and fauna, waterways and human health (Skinner *et al*, 1996).

Moss (2008) observes that some steps have been taken in recent decades, in regard to a more controlled use of pesticides and development of chemical compounds to improve the breakdown and greater legislative practice. These advancements have proved successful in developed countries but is sadly not the case in developing countries where chemical residue is persistent (Moss, 2008). It is recognised by the researcher that it is impractical to import food at the cost of preserving native waterways, however, current levels of agricultural production and the associated chemical usage in existing agricultural production would need to be reduced to 20% of its current land usage, again many would consider this to be unfeasible with growing populations (Moss, 2008). The author concludes the potential to adopt a mixed system of agricultural production and ‘rewilding’ techniques (Bechmann & Stalnacke 2005; Bengtsson

*et al* 2005; Boody *et al* 2005; Pimental *et al* 2005) but states that such systems, at the time of publication, were not widely accepted by Governments and planners (Moss, 2008).

The multi-layered factors affecting biodiversity loss are primarily influenced by the decline of natural habitats and the influence of chemical usage in intense farming production. The collapse of farmland bird populations is a stark indicator of the decline of rural wildlife (Krebs *et al*, 1999; Stoate, *et al* 2009). Firbank *et al* (2007) states that the loss of diversity of bird species is directly correlated with the loss of biodiverse rural habitats and that to minimise the affects of intense agricultural production several key factors could be utilised such as introducing and maintaining diverse habitats, reducing the loss of permanent agricultural land and minimising the pollution caused by pesticides and fertilisers. A 27-year study in Scotland proved the direct correlation between declining farmland bird populations is directly associated with declining insect populations (Benton *et al* 2002), factors which are directly associated with mainstream agricultural methods.

Urbanisation has played a significant role in the loss of habitats, particularly for bee species, but more importantly is the loss of rural “semi-natural flower-rich habitat” which has played an even bigger part in the decline of bee species (Goulson *et al*, 2015 p.2). With the intensity of arable production greatly impacting rural ecosystems, factors such as the removal of hedgerows and the propensity for arable crop production has massively affected native biodiversity. Although some floriferous crops are used in arable rotations such as oil seed rape borage, Goulson *et al* (2015) points out the diversity of nectar available is fundamental to bee health, something which can be corrected with the reintroduction of native wildflower meadows, most of which were lost in Britain post World War II (1939-1945). Many countries are in fact already dealing with the devastating effects of declining bee populations and as a result suffer low pollination rates of crops.

Goulson *et al* (2015) explains that not only is it the use of agricultural chemicals used affecting pollinator species but, also a factor which is rarely tested, the accumulative effect of a combination of agrochemicals which creates a toxic cocktail for bees and other pollinators. This coupled with the bee populations being persistently exposed to novel parasites unintentionally distributed by humans and climate change is likely to intensify both these issues (Goulson *et al* 2015). The researchers state that the exposure to toxic chemicals “can impair both detoxification mechanisms and immune responses, rendering bees more susceptible to parasites” (Goulson *et al* 2015 p. 1). This combination of stressors is driving the loss of

honeybee colonies and native pollinator populations. It is recognised by the researchers that these issues create major challenges to be resolved but steps can be taken to mitigate the rapid decline of native pollinators, for example, “incorporating flower-rich habitat into farmland, reducing pesticide use through adopting more sustainable farming methods and enforcing effective quarantine measures on bee movements (Goulson *et al* 2015 p.1).

The externalities of the current UK agricultural system are significant, Pretty’s *et al* (2000) cornerstone research provides an in-depth analysis of the outward environmental and health costs of agricultural production. Supplying data for such factors as pesticide usage, nitrates, biodiversity and habitat loss, greenhouse gas emissions and health implications for instance food poisoning and the BSE disaster, the authors have created a data set which aims to address the policy imbalance (Pretty *et al* 2000). The researchers call for more effective usage of public resources by the internalisation of the costings, which in turn would create more sustainable practices throughout agriculture (Pretty *et al* 2000).

### **2.2.3 Social Issues**

Farming is inherently a taxing occupation both physically and mentally with an accumulation of stressors, chronic stress can manifest itself in physical symptoms, for example, sleep loss and headaches, or mentally through anxiety or depression or cognitively through memory loss (Williams, 2001). A systematic review of farming mental health highlighted the most common stress factors of global farming communities as “commodity prices, debt, climate change, drought, overwork, government regulations, isolation, role conflict, time pressure and poor housing” (Daghagh Yazd *et al* 2019 p. 1). With many farmers working more than 10 hours a day, with little chance for annual leave or a holiday as well as the seasonal variations of the workload which is highly weather dependent for successful yields (Gregoire, 2002; Simkin *et al*, 1998). Also, many farmers often face the unique position that “as a group whose work is so intimately tied with every aspect of their lives and the lives of their families, often across several generations”, such situations can create great social tension within the family unit (Gregoire, 2002 p. 472).

Much of the literature describes farming as one of the fastest aging sectors (Dwyer *et al*, 2019; Zagata and Sutherland, 2015) with many farmers struggling either financially or for social reasons to retire completely from the sector. This coupled with the complexities that young entrants face trying to gain access to farmland has caused stagnation within the agricultural industry and low generational transfer of farmland (Dwyer *et al*, 2019, Conway *et al*, 2018).

One must also consider that farming is a way of life, not only a vocation and with that many social complex social factors are intertwined and for many this is identified by Pierre Bourdieu's (1930-2002) theory of habitus (1977). Giddens and Sutton define the theory of habitus as "the product of a long period spent inhabiting the social world from a specific position" (Giddens and Sutton, 2017 p.25). The theory is further allied to the farming community through the research of Yarwood and Evans, (2006), Shucksmith (1993) and Conway *et al* (2016) who all argue for wider use of this theoretical concept in both the aging farmer problem and intergenerational transfer of farms to fully understand the broader intricacies of age-related issues in farming. Research shows that older generations of farmers feel a sense of belonging and purpose whilst they are playing a daily role in the farming community and for many there is little cultural expectation to retire (Conway *et al* 2022; Conway *et al*, 2016), with many farmers choosing to remain involved but merely stepping back from main duties (Lobley *et al*, 2010). The literature acknowledges that inheriting farms is the primary route of access for many farmers (Kelly, 1982; Taylor *et al*, 1998; Hennessy and Rehman, 2007). Over the years there have been various policy schemes, such as the Early Farm Retirement Scheme (EFRS) to encourage earlier retirement and increase the numbers of young entrants (Leonard *et al*, 2017). But often these schemes were poorly executed leading to minimal uptake throughout Europe due to poor financial incentives (Leonard *et al* 2017). The inheritance and intergenerational transfer of farms is generally considered site specific and economically complex with very little option for an ideal scenario, however future agricultural policy holds a strong influence in encouraging retirement and access for young entrants (Leonard *et al* 2017).

Other tensions which add further stresses to the farming community include the burden of farm administration and for many smaller farms the complex administration required often has little support or assistance (Gregoire, 2002; Simkin *et al* 1998). Daghigh Yazd *et al*, (2019) concludes that the impact of mental health is far greater for those in rural settings because many of the stressors are not directly addressed. Primarily, this is directly associated with the lack of mental health professionals in rural areas but also the cultural attitudes of the farmers themselves (Daghigh Yazd *et al*, 2019).

Gregoire's 2002 paper offers a comprehensive overview of the social factors which affect British farmers, despite the age of the paper sadly these factors are all still relevant. The disadvantaged status of rural communities affects farmers and their workers, many of whom are on the lowest wages in the country, reduced healthcare services and poor transport

availability (Gregoire, 2002). Rural communities also have less access to social housing and for many farmers and farm workers, whose housing is commonly tied to their jobs, their availability is becoming progressively more precarious due to loss of labour within farming and declining incomes (Gregoire, 2002).

The accumulation of these stresses leads farmers to experience a volatile working environment and leads to some of the largest suicide statistics in any occupation in the UK (Gregoire, 2002). Daghagh Yazd *et al* (2019) discusses the prominent level of suicide that surrounds farm workers, with mental disorders identified as the primary factor for suicide attempts amongst farmers, with many farming communities seeing this as significant concern. Recent statistics from the Royal Agricultural Benevolent Institution's (RABI) 'The Big Farming Survey' offers an insight into the state of mental health within farming communities. The survey states that those working within the farming sector are 20 times more likely to have an accident within the workplace than any other industry and three times more likely to suffer with physical health issues (RABI, 2021). The survey also says that regrettably, more than one farmer a week commits suicide (RABI, 2021). Considerations such as the affects of Brexit, the COVID-19 pandemic and the phasing out of the BPS scheme are all concerns for farmers (RABI, 2021) in addition to the factors discussed previously by Gregoire.

### **2.3 Rural Development**

The current rural development paradigm has been formed through lengthy social and political discussion, replacing the modernisation paradigm of old, which prioritised economic growth over more integrated sustainability policies. Conversely, there are complications in providing a clear definition of the new rural development paradigm which, fuels the juxtaposed theories surrounding the future of rural agriculture (Van der Pleog *et al*, 2000). It is considered by some that this paradigm will lead to the usurpation of rural farmers, whilst others argue this is simply the next step in survival of rural economies (Van der Pleog *et al*, 2000). Van der Pleog *et al*, (2000) argues that the fundamental element of rural development is constituted as "the strength, scope and impact of current rural development practices become clear" and the role of scholars will be to generate an "empirically grounded theory" (p.391). In this evolution of the rural development paradigm the role of rural agriculture is changing to one of providing public goods and not the quantities of cheap food farmers have previously strived to supply, whilst generating social benefits such as creating more rural employment (Van der Pleog *et al*, 2000). Van der Pleog *et al*, (2000) outlines that there is a need for the public goods offered by rural

development and the agricultural systems within those areas must meet the requirements of the new paradigm. Rural development is a paradigm which is fully integrated with regard to sustainability, responding to the restructuring of economic modelling and adopting a flexible approach to economic strategy, the large-scale intensification of the farming sector which negatively impacted the industry through a loss of labour, reduced farm numbers and aided rural decline leading to regional inequalities and a sector division of quality over quantity (Van der Pleog *et al* 2000).

Van der Pleog *et al*, (2000) highlights the importance of creating a rural culture based around community and collaboration not only between farms but also with multi-actor involvement, including the operations between “local and regional ecosystems” the authors refer to this paradigm approach as a “synergy” (p.393). The conceptual framework generated by Van der Pleog *et al*, 2000, draws attention to the need for rural and urban areas to work together and form proactive relationships with the many actors in the private and public sectors. The authors recognise the multifaceted issues with a top-down approach to agricultural policy making, signifying the importance of policy which is reflective of those who manage and care for the land regardless of the size of the operation, their diverse needs and is culturally inclusive, such inclusivity would generate much needed resilience in rural communities (Van der Ploeg *et al*, 2000).

Research has shown that the British Government has failed to adopt the rural development paradigm in the previous agricultural policy, choosing to follow economic production methods and neglecting the environmental and social factors that are fundamental to thriving rural communities (Marsden and Sonnino (2008). Building on the rural development paradigm of Van der Pleog *et al*, (2000), Marsden and Sonnino (2008), reiterate the importance of recognising agriculture as a “multifunctional activity” stating that environmental management, indigenous culture and the products and benefits generated by farming activities are vital for rural development and fundamental to benefiting the wider society (p. 422). The CAP has stifled rural development in Britain and has greatly aided larger more intensive farming systems, whilst promoting the free movement of goods and driving export effectiveness (Marsden and Sonnino, 2008). This economic approach, adopting a neo-liberal perspective has marginalised small scale and diverse producers, who the authors argue, are better equipped to deliver rural development which has an integrated approach to sustainability (Marsden and Sonnino, 2008). Once again, the authors highlight the disconnect between a top-down approach to policy and the delivery of those policies at a local level and even though this has been

remarked upon in EU policy, the EU has failed to deliver a multi-functional approach to agriculture at either local or regional level (Marsden and Sonnino, 2008). The researchers state that the discourse surrounding agricultural policy in the UK is changing to a more multifunctional and holistic approach although the rate of change is likely to occur irregularly, this is likely to be based on the predominant paradigm in each region (Marsden and Sonnino, 2008). The acceptance of multifunctional agriculture is competing with the broader complication of a supply chain and food system led by the retail sector, which is heavily supported by the British Government and the productionist model (Marsden and Sonnino, 2008) There have been continued attempts to devolve and generate greater diversity throughout regional level agricultural systems (Marsden and Sonnino, 2008). A wider acceptance of this alternative movement in regional agriculture would provide a stronger connection to the rural development paradigm.

The changing discourse of British policy has an emerging narrative which incorporates the rural development paradigm moving away from economically focused agricultural policy and accepting the need to recognise the importance of rural culture and community (Shortall and Shucksmith, 2001). Again, building on previous research the authors discuss the impact of the agricultural policy which has clearly prioritised economic development, over the need for environmental and social factors in the context of Northern Ireland and Scotland (Shortall and Shucksmith, 2001). By exploring the historical policies for these regions and their legacies it has been possible to highlight the exclusion of key environmental interests and offer a more holistic perspective in future rural development (Shortall and Shucksmith, 2001). Rural communities have suffered as a result the economic drive-in agriculture and the this is partly due to the delivery of regional programmes stating that local councils should be made the central administrative organisation coordinating both local and regional development in partnership with stakeholders and the numerous actors involved (Shortall and Shucksmith, 2001). The authors draw attention to the importance of empowering local communities through decision making, resource distribution, encouraging ownership in delivering rural development and also the recognise the need of a grass-roots approach to rural development which aids the growth of regional polices which should be variable in their application to each locality (Shortall and Shucksmith, 2001).

## 2.4 Alternative Agriculture Movement

There is a significant drive from within the agricultural community to combat the production intensity and the external pressures faced by many farmers and food producers and this is represented in many different organisations at both a global level and domestic level. Global organisations such as ‘La Via Campesina’ creates a strong united voice for peasant and agrarian farmers. Whilst in British organisations such as the Soil Association, providing a union for organic farmers, the Land Workers Alliance and many more organisations offering support to those choosing alternative methods of food production. Previous chapters of this literature review have provided a brief outline discussing the integrated complexities of modern agriculture, its impacts on the environment, society and farming economics, and many farmers are choosing to adopt more sustainable production techniques allowing them to reduce costs, improve biodiversity and generate a strong and vibrant local economy.

The array of sustainable farming terminology and practices are widespread, and implementation is subjective to each farm and the objectives of the food producers. The term agroecology is often used as a vital alternative method to modern farming, which embraces an integrated sustainable approach to food production. A review completed by Wezel *et al* (2009) offers an extensive analysis of the history, principles, and success of agroecology as a production method and readers who wish to learn more about this principle. Agroforestry combines a range of farming production techniques which can be used with both arable or livestock systems, creating a combined cropping system and wildlife corridors to improve biodiversity (Nair *et al*, 2010). This method can be further specified, and this includes techniques such as silvopasture, an ancient practice of raising livestock symbiotically within a forestry setting (Jose and Dollinger, 2019).

There are many more alternative farming systems, but they all share similar principles. Organic farming has steadily grown in popularity throughout the UK and Europe, the building consumer awareness of the connection between chemical usage in agriculture has aided the increase of the organic movement. Regenerative agriculture focuses on methods which not only produce food sustainably but also, as the name suggests, regeneratively. This set of alternative principles is the focus of this thesis, as it is not possible to research all the available methods for alternative agricultural production and these methods are often adapted for a site-specific approach.

## 2.4 Regenerative Agriculture

With a growing global population, many argue the need to further intensify agricultural production, however Lal (2020) argues that the current system already produces enough food for 10 billion people and the epic food waste within the system, currently around 30%, needs to be addressed. Growing popularity for more sustainable agricultural production has led to the implementation of agroecological and regenerative agricultural (RA) methods, adopting principles which sustain and restore natural ecosystems and produce food in a way which no longer merely takes from the surrounding environment but also contributes to the local ecosystem. Robert Rodale (1983) of the Rodale Institute, Pennsylvania, United States, defined the goals of RA systems as improving soil quality and farmland biodiversity whilst producing farm products which are socially and environmentally nourishing and economically profitable. Critics question the efficiency of sustainable agricultural techniques in replacing modern intensified monocultural systems, but Lal (2020) argues that RA systems can yield enough food for global populations. He highlights the importance of breaking the destructive and depleting cycle of monocultural systems and with the implementation of RA, produce more food from less land and ensuring nature has a place to thrive (Lal, 2020).

It is difficult to provide a clear definition of RA systems due the numerous combinations of farming practices that are included (LaCanne and Lundgren, 2018) and Lal (2020) acknowledges that there is no “one-size fits all” but, fundamentally RA “encompasses a wide range of farming and grazing practices aimed at restoration and sustainable management of soil health through the sequestration of soil organic carbon”, this is conveniently summarised in figure two (Lal, 2020 p.1). Howard and Howard’s 1945 definition that the “soil-centric” approach is centred on the idea that “health of soil, plants, animals, and humans is one and indivisible (Lal, 2020 p. 1). From this soil centric approach, the focus is the longevity of optimum yields with little dependence on agro-chemicals as opposed to current systems which rely heavily on agro-chemicals and short-term cultivation approach to achieving high yields. (Lal, 2020).

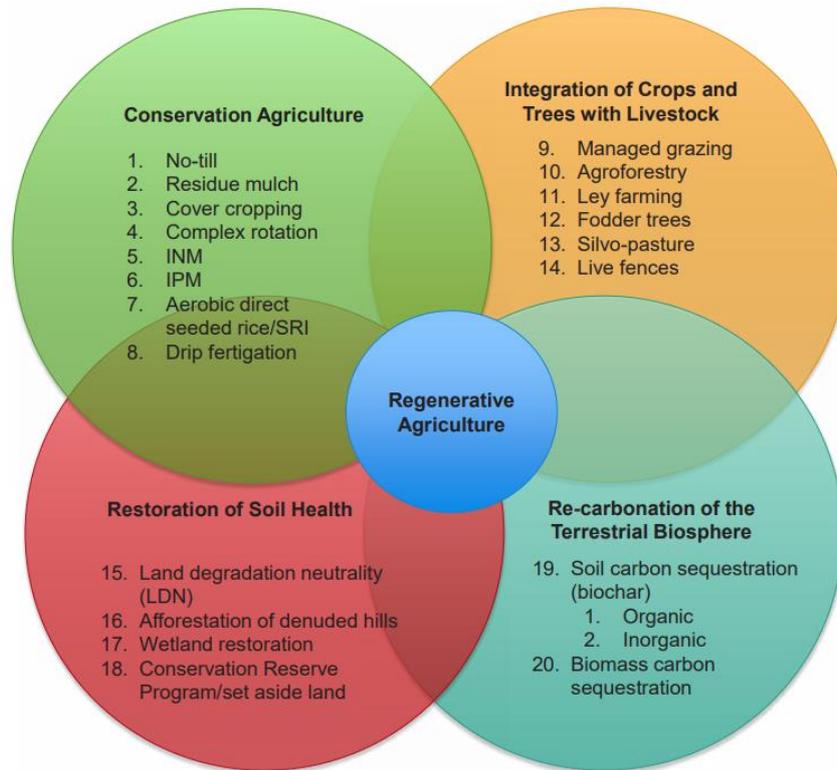


Figure two: Summary of RA system principles and components (Lal, 2020).

### 2.5.1 Principles of Regenerative Agriculture

One of the essential principles of regenerative agriculture (RA) is the enrichment of organic matter within soils and “strengthen coupled biogeochemical cycling of carbon with water, nitrogen, phosphorous, sulphur and other elements” (Lal, 2020 p.1). The implementation of RA is a “system-based conservation agriculture”, which adopts such methods as no-tillage crop production and combined with “residue mulching, cover cropping and integrated nutrient and pest management” diverse crop rotations and the integration of trees and livestock (Lal, 2020 p.1). These factors will always be fine-tuned to the site-specific biophysical factors and within the cultural human context of the surroundings, which again is fundamental approach for fully integrated sustainable production (Lal, 2020).

When one considers a sustainable future for agriculture there are many factors to consider for example soil type, topography, and farm location, all of which must be considered when adopting a future production system which acknowledges the need for integrated sustainability.

### 2.5.2 Success of Regenerative Agriculture

The literature builds a clear overview of the advantages of RA systems, but further research is needed to understand the benefits of the practical implementation of RA systems and the overall advantages it can offer to farmers and producers.

One study which looks at the use of RA systems in the Central Highlands of Vietnam, which is the country's most prolific coffee producing region. The researchers comment on the coffee plants susceptibility to climate change and current growing techniques relies on input intensive, sun-grown and monocrop-based production methods. Many farmers are choosing to move to organic shade-grown farms adopting RA techniques for both environmental and economic gain (Vu Le, et al, 2021). The research results showed that RA techniques promote biodiversity and the economic results of both "farm costs and net returns" revealed that RA practices "decrease external inputs through a system of crop diversification and integrated livestock production that improves productivity and economic performance while preserving the ecological and environmental integrity of the landscape (Vu Le *et al*, 2021 p.1).

Despite the overall positive affect of RA systems, the research highlights the impact of the 'Roya fungus' (*Hemileia vastatrix*) a form of leaf rust which causes localised necrosis of leaf material and early defoliation leading to premature dropping of the berries and eventual plant death (Vu Le *et al* 2021). The fungus is one of the coffee crops most prevalent pests with a well documented historical impact on coffee production (Vu Le *et al* 2021). The researchers point out that there is little research to understand the full affects of shade grown coffee production and current research shows conflicting results on rust epidemics in shade grown cropping systems (Vu Le *et al*, 2021). Some researchers state that shade-grown production cultivates the required micro-climates for the fungus infestations (Lopez-Bravo *et al* 2012) and others argue that shade grown systems compared with that of sun-grown crops, demonstrates a reduced rust intensity but this is also coupled with reduced yield, (Vu Le *et al*, 2021) it could, however, be argued that this is a direct result of less intensive production methods. Farmers wishing to move to RA systems are also faced with a lengthy, labour intensive and costly transition accompanied with bureaucratic and costly registration with organic or fairtrade organisations (Vu le *et al*, 2021). The researchers conclude that through their extensive soil analysis, systems which utilised RA practices in a shade-grown scheme were comparable or better to that of sun-grown based farms (Vu Le *et al*, 2021). The researchers also documented increased species biodiversity and beneficial vegetative growth both of which are directly

linked to “coffee agroecosystem” which encourages higher populations of natural pest predators and a wider variety of pollinators (Vu Le *et al* 2021 p. 12). Based on their findings the researchers confirm the sustainability of regenerative shade-grown coffee as a viable method of mitigating climate change in the studied region (Vu Le *et al*, 2021).

A further study which looks at another exceptionally popular and often considered controversial crop, almond production, stated as California’s most prevalent crop in “terms of acreage and revenue generated” (Fenster *et al*, 2021 p.1). Again, this study looks at the environmental and economic benefit of RA techniques over more traditional methods. The results showed that soil health was greatly improved, the researchers tested key soil health indicators such as ‘total soil carbon’, ‘soil organic matter, mineral levels, which were all significantly higher in the regenerative systems than compared with conventional farming setups which were both studied. Water infiltration of the “regenerative soils were also six-fold faster than conventional soils”, additionally profits were double that of conventional farms (Fenster *et al* 2021 p.1). The researchers conclude that the benefits of RA systems cannot be attributed to one technique, but it is the combination of RA practices which brings the greatest benefits (Fenster *et al*, 2021). The results of this study also suggest that “converting agriculture over to regenerative systems could contribute to remediating several imminent global problems, including climate change, diminishing water resources, biodiversity loss, agricultural pollution, human health problems and diminishing rural economies” (Fenster *et al* 2021 p.18).

Cusworth *et al*, (2021), research focuses on the loss of diverse cropping rotations and typically the exclusion of legumes. A family of crops renowned for their nitrogen-fixing benefits, historically popular in English agriculture, these crops have fallen out of favour for crops which have a greater return. However, the authors debate the multiple factors which have led to the simplification of cropping rotations, which include a “series of interconnected political, economic, technical and cultural processes” that have affected the current situation (Cusworth *et al*, 2021 p. 127). The researchers conducted interviews with various actors throughout the UK’s agricultural sector, the researchers were able to pinpoint “macro-level economic changes, political transitions” and the change in attitudes of those within agriculture which has led to, what the authors termed as the “agroecological break-out” (Cusworth *et al*, 2021 p. 126). Changes such as consumer demand, for example the rise in plant-based diets and UK agricultural policy moving towards subsidisation for public goods, has opened UK farming to more “micro-level changes” (Cusworth *et al*, 2021 p.126), creating a more diverse and resilient

sector (Cusworth *et al*, 2021). The empirical data from this research tentatively suggests that the UK agricultural sector is on a more holistic trajectory, it is acknowledged by the study's interviewees that this holistic response is fundamental to the future of UK agriculture, to greatly enhance farm profitability and the natural capital of the farm (Cusworth *et al*, 2021).

### **2.5.3 Criticism of Regenerative Agriculture**

Giller *et al* (2021), acknowledges the extent of the agricultural crisis and the associated environmental implications from intensive production systems and their research focuses on the application of RA systems from an agronomic perspective. The authors feel that despite RA being promoted widely through society by NGOs (Non-Governmental Organisations) and some major international food companies, often the context or terminology used can be confusing and misleading (Giller *et al* 2021). In fact, Toensmeier (2016) agrees that carbon farming, the term he uses to describe an array of regenerative farming practices, is not the silver bullet many are hoping for. With the extreme rate of global warming the application of carbon farming techniques as a way to mitigate climate change has an expiration date. This is primarily due to the rate of emissions from global soils and biomass, Toensmeier (2016) refers to the Intergovernmental Panel of Climate Change's (IPCC) prediction that with a global temperature increase of 2.5°C, soil and biomass emissions will be around 15% but with a 4.5°C increase emissions will rise drastically to 40%.

Giller *et al* (2021) comments that the *laissez-faire* approach to RA systems will supply little clarity between other agroecology or sustainable alternatives and this lackadaisical approach to definitions offers little grounding for further agronomic research. Once again, the authors comment that the central argument for the application of RA or similar sustainable production methods "is attributed somewhat mythical properties" and that RA is unlikely to "deliver all of the positive environmental benefits as well as the increase in global food production that is required" (Giller *et al* 2021 p. 22). It is acknowledged by the researchers that the complexity of truly defining RA could undermine the success of using RA systems to answer the agricultural crisis at a more mainstream level (Giller *et al* 2021) and the authors continue by stating that "neither the 'soil crisis' nor the 'biodiversity crisis', both of which are central to the rationale for Regenerative Agriculture, is universal" and that "their root causes are manifestations are not necessarily the same" (Giller *et al* 2021 p. 21). Due to this complication with the wider application of RA, Giller *et al* (2021) comment that the tension between the

‘fix-all’ ideology of RA, leaves little confidence in the application of RA at the local level on a universal scale.

Some techniques of RA systems will reduce yield rates compared with that of more intensive agriculture systems and this can also be dependant on the aspects of RA techniques used and the cropping systems implemented, for example planting for ground cover and the use of nitrogen fixing species (Toensmeier, 2016) Furthermore, some of the inefficiencies of RA systems offer little guidance on control of pests and diseases, despite this being one of the largest issues farmers face and the emphasis on the reduction of chemical controls and the anti-genetically modified organism (GMO) approach of farmers using RA. This is irrespective of, as the authors state, the potential of GMO crops to increase plant resistance and reduce the need for chemical inputs (Giller *et al* 2021). Furthermore, there is a lack of distinguished clarity on the use of chemicals regardless of the associated health risks of pesticides compared with that of fertilisers (Giller *et al* 2021).

Giller *et al* (2021) reiterate their argument by comparing the over-use of fertilisers in North America, Europe and China and subsequent reduction in this practice would undoubtedly reduce inputs and costs with minimal impact on profits but that in African countries, cultivation is highly reliant on nutrient input for a successful harvest, so reduction in inputs would greatly affect success of production. We must also consider the implementation of livestock within RA systems, a publication from the Food and Agricultural Organisation (FAO) ‘Livestock’s Long Shadow’ (Steinfeld, 2006) states that direct or indirect anthropogenic emissions from livestock production is approximately 18% of Greenhouse Gas emissions (GHG). Although this not universally relevant and is highly dependant on such aspects as farming practices, stocking densities and changes in land use. The publication comments that the introduction of livestock into silvopastoral productions systems would dramatically improve emission rates in developing countries where forestry ecosystems are cleared for animal production (Nair *et al*, 2006). It is also acknowledged that despite the many benefits of the use of nitrogen fixing plants in RA cropping systems, some omit nitrous oxide, which is a highly potent GHG (Toensmeier, 2016), although Nair *et al* (2006) argues that there is insufficient research to corroborate this statement.

### **Principles of Organic Agriculture**

The history of the organic movement has many key founders, but its starting fundamentals are often credited to British landowners Lady Eve Balfour (1989-1990), Sir Albert Howard (1873-

1947) as well as Swiss scientists Hans Müller (1891-1988), Maria Bigler (1894-1969) and Hans Peter Rusch (1906-1977) (Darnhofer *et al* 2007). It was during the 1980s that the movement became more widely accepted (Seufett *et al* 2017) and the 1990s saw greater policy support from the European Commission (Darnhofer *et al* 2007). Similar to RA, organic agricultural systems have a holistic approach achieved by increasing soil productivity through the use of crop rotation, increasing farmland biodiversity, use of biofertilisers and cultural and biological control of pests (Sapbamrer and Thammachai, 2021). The leading British organic authority the Soil Associations' 'Organic Market Report 2024' showed that just 3% of British farmland is organic and the sector is still reliant on imports (Organic Research Centre, 2024). The market sales for organic production grew by 2% and is now worth £3.2 billion of sales with supermarket sales accounting for £2 billion, an increase of 2.7% and independent retailers responsible for £475 million, which is an increase of 10% (Organic Research Centre, 2024).

### **2.6.1 Benefits of Organic Agriculture**

A comprehensive review written to analyse the environmental benefits of organic agricultural systems states that this production method does provide greater biodiversity benefits, and this is achieved through a more considered approach to managing farmland infrastructure for example, hedgerows, ponds. (Shepherd, *et al* 2003). Practices such as wider spring cropping rotations and production of root crops for autumn livestock grazing can benefit farmland birds and some invertebrates (Shepherd *et al*, 2003). As well as the limited stocking densities, often required through organic criteria improves grassland habitats, decreases the parasitic burden, and retains grassland sward diversity (Shepherd, *et al*, 2003). However, the negative effects could be associated with spring and summer activities such as mechanical weeding and mulch affecting the life cycle of native farmland birds (Shepherd *et al*, 2003). Soil health is considered a fundamental aspect of organic production, and the review highlights that microbial populations are much healthier in organic production systems and soil structure is greatly improved however, the research recognises that there are some anomalies with arable land in conventional systems offering similar levels to organic systems this was assigned to greater chemical residue returns (Shepherd *et al*, 2003). The fundamental success attributed to improved soil health, however, is the regular return of organic matter to the soil (Shepherd *et al*, 2003). Higher levels of soils management also helps to reduce nitrates being leached as can be the case with conventional production systems (Shepherd *et al*, 2003). The authors conclude that there are environmental benefits to organic agricultural systems, however, they state the uncertainty of those benefits if production was scaled up due to the higher rates of livestock

needed in such systems, lower yield rates and the organic regulations controlling farmland management (Shepherd *et al*, 2003).

A review carried out by Hole *et al*, 2004, states that most of the comparative studies focus on mixed or arable systems and there is very little research focussing on the significance of grassland areas, which particularly, in Britain has been in decline due to the intensification of rural areas and associated decline of biodiversity (Hole *et al*, 2005). As a result, the authors state that it is unclear of the benefits of organic agriculture in these grassland systems is unclear (Hole *et al*, 2005). The biodiversity benefits are considered higher in organic systems but the key to achieving these benefits are in the delivery of the management systems, the specificity of requirements set by the authorising body and the approach and moral application from the farmer (Hole *et al*, 2005; Shepherd *et al*, 2003; Greenwood, 2000; Tuomisto *et al*, 2012).

It is considered difficult to create a precise plan for organic systems and it is suggested that optimum strategies, which can be applied in a variety of scenarios depending on the site-specific requirements to achieve the maximum benefit from organic systems (Tuomisto *et al*, 2012). The role of policy should be to acknowledge the complexity of these organic systems and progressing information of the cost-effectiveness of the organic approach to agriculture as well as the evolving knowledge of social factors in relation to environmental systems (Tuomisto *et al*, 2012). Incentives should be offered to encourage best practice is adopted at a wider level and this should include alternative land use options with a greater environmental benefit (Tuomisto *et al* 2012).

It is often claimed of the health benefits of organic produce although the specifics of this is widely contested in the literature (Brandt and Mølgaard, 2001). Consumers perceive organic produce to be a healthier option containing higher levels of nutrients (Seufett *et al* 2017). Numerous systematic reviews imply there are lower levels of pesticide residues in organic produce, but this is comparable to pesticide usage in conventional systems and as previously discussed the specificity of those systems (Meemken and Quaim, 2018; Baranski *et al*, 2014, Dangour *et al*, 2010, Huber *et al*, 2011). When exploring the data surrounding the health benefits of consuming organic diets for consumers, researchers associate a link between reduced allergy levels and infantile eczema (Alfven *et al*, 2006; Kummeling *et al* 2008). However, despite the associated health links and benefits, strong conclusions cannot be drawn to suggest an obvious benefit, this could potentially be linked to a bias based on the lifestyle

choices, social status of those who purchase organic produce (Meemken and Quaim 2018; Huber *et al* 2011; Kesse-Guyot *et al*, 2013; Baranski *et al*, 2014; Dangour *et al*, 2011).

Meemken and Quaim (2018) states that the notion of organic agriculture being environmentally and nutritionally beneficial is influencing policy in developed countries. The authors argue that although there are some environmentally benefits, the lower yielding output of organic systems could be problematic if adopted at a wider level and result in more land used for food production and less focus on the nurturing of biodiverse ecosystems (Meemken and Quaim, 2018). It could however be argued that this research does not consider key social issues, particularly in developed countries of over consumption by consumers with agriculture meeting the need for current consumption levels and the use of arable land to produce livestock feed, which are typically raised grass-fed where possible in organic systems. The researchers believe that organic agriculture is not the silver bullet for modern agricultural production, we resurface at the multifaceted approach of a site-specific perspective in generating sustainable agricultural systems (Meemken and Quaim 2018).

Despite the results from this study, some researchers feel that it is possible for organic production to meet food production demand both at a local and global level (Badgley *et al*, 2007). This would be achieved through multi-cropping and polyculture systems, frequently used in organic production, additionally the authors acknowledge the higher level of productivity in smaller farms compared with large more intense production systems (Badgley *et al* 2007). Furthermore, the demand for increased research into agroecological production should be promoted and greater incentives provided for both farmers and consumers to engage with more sustainable production systems (Badgley *et al*, 2007).

A more recent study recognising controversial narrative surrounding organic agriculture concentrates on four fundamental “sustainability metrics, productivity, environmental impact, economic viability and social wellbeing” (Reganold and Wachter, 2016 p.1). In the case of productivity, it is recognised that yields are lower than conventional production although this once again is site specific and the researchers draw attention to organic systems adaptability to drought conditions, which for is and will be increasing (Regnold and Wachter, 2016). There are no traces of pesticide residue in organic systems compared with that of conventional systems and the data shows that those who consume an organic diet have fewer traces in their systems than conventional produced foods (Curl *et al*, 2003; Lu *et al*, 2006; Forman *et al*, 2012; Reganold and Wachter, 2016). The environmental benefits are well documented, and the

researchers discuss the improved soil health, increased biodiversity and subsequent increase in healthy ecosystems (Tuomisto *et al* 2012; Lotter, 2003; Reganold and Wachter, 2016). With the omission of chemical usage, water pollution is dramatically reduced, alongside reduced greenhouse gas emissions and more energy efficient (Reganold and Wachter, 2016). The profitability of organic systems is achievable, but this of course is dependent on overheads and organic produce achieves a higher price at consumer level than conventional goods, nevertheless, organic production will always compete with conventional production methods which run economically lean and with minimal labour (Reganold and Wachter, 2016). If the negative externalities of conventional agriculture were calculated into a fiscal value and compared with the cost of organic systems it is estimated that Britain would reduce costs by 75% (Pretty *et al* 2005; Reganold and Wachter, 2016). Additionally, organic farming offers an increased social benefit through increased labour levels, more consumer to farmer interactions and reduced exposure to chemicals for farm labourers, this is more apparent in developing countries (Reganold and Wachter, 2016).

## **2.7 The Challenges of the Sustainable Development Goals**

The formulation of the SDGs has been a complex process and the implementation as equally as challenging. The breadth of issues they look to address, many of which are intricately interwoven into the fundamental structure of society, are not only tackled at a global level but also at a domestic one. Not only does the true definition of sustainable development still cause many debates amongst academics and professionals, but the political formation and the practicalities of delivering the SDGs have also received great criticism.

Many argue that the lack of a comprehensive definition for sustainable development has led to the concept being strongly contested and the term often seen as vague (Ala-Uddin, 2019; Hopwood *et al*, 2005; Hull, 2008; Zygmunt, 2016). Despite the Brundtland report forming a clearer definition of sustainable development in 1987 the concept is still being developed in academic literature (Ala-Uddin, 2019). However, many argue with the narrow framework of the Brundtland report (Mebratu, 1998) the ongoing debate remains, that economic growth cannot be sustainable owing to the weakening of natural resources and the “deterioration of environmental services” (Spaiser *et al*, 2017 p. 457). Academia acknowledges the complexities of defining sustainability, and it is often argued that the term is worthless unless effectively defined (Costanza and Pattern, 1995; Ala-Uddin, 2019).

Costanza and Pattern (1995) argue that the complexities surrounding the definition of sustainability is due to the fact that sustainability is fluid, and all systems have a finite life span. “A sustainable system in this context is thus one that attains its full expected life span within the nested hierarchy of systems within which it is embedded” (Costanza and Pattern, 1995 p. 195). In fact, Costanza and Pattern (1995, p. 194) go further by suggesting the definition of sustainability is in fact retrospective “what passes as definitions of sustainability are therefore predictions of actions taken today that one hopes will lead to sustainability”. These are principal factors when one considers the importance of a clear definition of sustainability, definitions and terminology must be adaptable to cope with the changing environments.

Despite the positive aspirations of the SDGs many critics view them as politically demanding. Firstly, we consider the inequality of consumption and the use of resources, it is recognised by many that wealthy nations require higher levels of imports or generally consume more goods, often at the detriment of poorer nations who supply or produce such goods with their own natural resources dramatically affecting local availability (Sikdar, 2003). This is thought to affect future generations’ standard of living and creates inter-generational inequality (Ala-Uddin, 2019).

Secondly, numerous countries face multiple barriers in the political application of the SDGs, such as “gender inequality, spiralling conflict, violent extremism and transnational terrorism and related humanitarian crises” (Ala-Uddin, 2019 p. 223) factors which drastically inhibit the pursuit of sustainable development, the “reality is that the populations in more than half the countries in the world live under partially or fully authoritarian governments. There are no goals dedicated to the political empowerment of individuals, communities and states” (Ala-Uddin 2019, p. 219). Additionally, owing to the multifaceted nature of the global application of the SDGs, which must include both developed and developing countries, Ala-Uddin (2019), concludes the simplicity of the language used within the SDGs masks these complexities “layers of global development challenges and their solutions” (Ala-Uddin, 2019 p. 218).

Lastly, the effect of the neoliberal discourse and the formation of the SGDs, with many observing the influence of the private sector and the sector’s “persistence of the bottom-line focus and co-option of the language and sustainability” (Scheyvens *et al*, 2016 p. 376; Tiwari, 2015). It is widely acknowledged that neoliberalism has driven social inequalities (Scheyvens *et al*, 2016; Murray and Overton, 2011), heavily influencing the power imbalance “between developing countries and capitalist countries in the north (Scheyvens *et al*, 2016 p. 377; Ghosh,

2015). It is therefore suggested that the neoliberal framework should not be applied when attempting to resolve global inequality (Kumi, *et al* 2014). Ala-Uddin (2019) discusses the neoliberal framework hidden within the undertone of the SDGs, claiming that, “the SDGs has made the least developed countries (LDCs), small island developing states and the landlocked countries and the farthest remote areas the new destinations of the capitalist outreach” (Ala-Uddin, 2019 p 223). This may well be the case when one considers the formation process of the SDGs and those countries and stakeholders who had their involvement in their formation.

There are many factors which are perceived to be detrimental to the practicability of the SDGs, it is acknowledged by many that often there is a distinct conflict between the incompatibility of socio-economic progress and environmental sustainability and the result from their research confirms this theory (Spasier *et al*, 2017). Bali Swain’s (2017) research also concludes this apparent natural conflict between achieving socio-economic and environmental goals. Claiming that “empirical evidence suggests that developed countries are better off focusing on their social and environmental policies and developing countries focusing on their economic and social policies in the short term” (Bali Swain 2017 p. 12). Further criticisms include the fact that the goals are non-binding and individual countries are expected to develop local road maps for achieving the goals, secondly, the “measurability and monitoring” of the SDGs is also often mentioned upon by critics (Bali Swain, 2017 p. 1).

Bali Swain (2016) quotes the research of William Easterly (2015), who, heavily criticises the SDGs claiming that due to their vast nature of the SDGs and their targets, that none of the goals can be achieved. Furthermore, that the United Nations has provided no clear action plan should the SDGs remain unobtained by 2030, claiming that it is utterly impossible to eradicate, for example, all forms of poverty, preventing maternal deaths and ending all forms of discrimination against women and girls.

Although the vast reach of the goals is often vilified, the 230 indicators often receive much of the criticism. Hák *et al* (2016) research calls for the need for a framework for these indicators to provide greater clarity and structure, vital if future progress is to be made. The researchers conclude that “all targets and particularly, indicators should be thoroughly analysed by experts” which “may lead to streamlining and/or reduction in their number (Hák *et al* 2016, p. 571). This streamlining process would provide the opportunity to create categories which are “policy-based approaches and conceptual approaches” the “former use sustainable development strategies and other policy documents as a frame of reference and are typically

organised according to strategic issues, the latter include a frame of reference independent from political priorities” (Hák *et al* 2016, p. 566). Building this approach into the SDGs could offer more stringent measuring and monitoring guidelines with stakeholders alike, which leaves the SDGs vulnerable to manipulation by these organisations, another claimed criticism.

## **2.8 Delivering the Sustainable Development Goals**

Moving towards sustainability is complex due to the macro-level changes which need to occur (Geels, 2011), it is recognised by academics that stakeholders will struggle to achieve the 17 goals without a distinct operational plan (Sachs, *et al*, 2019). It is rapidly becoming the popular opinion amongst leading researchers that with the application of targeted, goal-setting policy it can be possible to achieve the SDGS, there are currently many potential frameworks emerging.

The multi-level perspective framework developed by Geels has three primary characteristics for implementing sustainable transitions. Firstly, Geels (2011) acknowledges the research of Smith *et al* (2005) who states that sustainable transitions are considered to be goal-orientated or formulated to solve a specific environmental issue, while historical transitions are typically entrepreneurial or opportunistic (Geels, 2011). As an example of this, Geels (2011) explains that the private sector is less likely to engage in this type of sustainable transition due to the lack of incentive on offer. Engagement of the public sector is vital to “address public goods and internalise negative externalities” this approach would alter economic framing and offer support to greener aspects (Geels, 2011 p. 25; Elzen *et al*, 2011)

Secondly, because of sustainable systems creating a communal good, there is the potential to offer little benefit to the user and it is regularly the case that sustainable systems “score lower on price/performance dimensions than established technologies (Geels, 2011 p.25). With this in mind, Geels, argues that “changes in the economic frame” for example through the implementation of “taxes, subsidies and regulatory frameworks” are needed to create the required change (Geels, 2011 p. 25). This would ultimately be achieved through policy changes, but Geels (2011) highlights the inevitable vested interested in politics and the wider economy creating resistance for such sustainable transitions to occur.

Finally, a certain aspect of experimentation is required by big industry, international organisations, for example “supermarkets, food processing companies, oil companies, electric utilities and car manufacturers”, which own “complementary assets” for example specialist manufacturing capabilities, “experience with large test trails, access to distribution channels,

service networks and complementary technologies” (Geels, 2011 p. 25; Rothaermel, 2001; Sachs, 2012). Although such organisations may not be the drivers of sustainable transitions, Geels (2011) states that their co-operation could lead to the acceleration of sustainable transitions through their expertise.

Mazzucato further develops the concept with the need for mission-orientated policy to tackle the complex issues that 21<sup>st</sup> Century Governments are encountering, through the application of policy making which is focused on accomplishing set outcomes (Mazzucato, 2018; Mazzucato et al, 2020; Mazzucato, 2021). Such an approach is vital in delivering “better quality growth while addressing grand challenges” (Mazzucato, 2018 p. 813). For a successful approach to mission-oriented policy Mazzucato and Penna (2016) outline the fundamental approach which should be adopted when developing forward-thinking policy:

- **Missions should be well defined** – focusing governance on the task to avoid the involvement of vested interests.
- **A portfolio of research and development and innovation projects** –due to the unpredictable nature of research and development and innovative projects, they should be viewed as a learning process of successes and failures of projects.
- **Missions should occur because of multi-sector investment and the involvement of various actors** – such an integrated approach allows for the greatest impact both across the private and public sector.
- **Missions call for joined up policy making** – creating goal-based policy which is coordinated and carried out by actors at all levels.

(Mazzucato and Penna, 2016).

These guidelines are developed further in some of Mazzucato’s more recent work which discusses the SDGs and how they deliver the perfect basis for mission-based policy based on the targets set out within the 17 goals. A fundamental strength of the SDGs is the multi-stakeholder engagement, the SDGs have been formed and developed at an international level (Mazzucato, 2021). “They offer huge opportunities to direct innovation at multiple social and technological problems to create societies that are just, inclusive and sustainable” (Mazzucato, 2021 p.109). Another major advantage of the SDGs is the approach to intricate and cross-sector problems, as has been previously acknowledge, these problems are without easy solutions, “they require a better understanding of how social issues interact with political and

technological ones, behavioural changes and critical feedback processes (Mazzucato, 2021 p. 110).

For policy missions to be successful, there must be a certain reliance on bottom-up activities that encourage innovation, other elements would also include investigation and risk-taking as well as reward for pioneering solutions (Mazzucato, 2018). This requires a “portfolio approach, based on different solutions, and a broad range of interactions” and this would be addressed by “multiple actors, stimulating cross-discipline academic work, with a strong focus on the intersection between natural sciences, formal sciences, social sciences and humanities” (Mazzucato, 2018 p. 811). Building on her earlier research a report created for the European Commission by Mazzucato (2018a) discusses five fundamental criteria for choosing relevant missions for goal-orientated policy. Firstly, missions should be bold, offer inspiration and generate significance to the wider society, this would be achieved through connecting with relevant societal debates, for example climate change and health (Mazzucato, 2018). Secondly, missions need to be clearly framed with measurable targets and a fixed time scale, the third criteria focus on an ambitious mission with relevant research and innovation at its core (Mazzucato, 2018). The fourth criteria are based on “cross-disciplinary, cross-sectoral and cross-actor” innovation, this approach can lead to “system-wide” solutions and development (Mazzucato, 2018 p.811; p.812). The last criteria are to create numerous bottom-up solutions, Mazzucato, (2018) states that missions should be adaptable to multiple solutions created by the system-wide approach. Figure three demonstrates how this approach might be implemented when applying the SDGs to create mission-based policy.



Figure Four: Mission based approach to policy changes (Mazzucato, 2018a p. 11).

One of the last front runners to create a framework for a practical application of the SDGs is the work of Sachs *et al*, (2019). Their work summarises six key transformations as the cornerstone for achieving the SDGs. The first transformation is through the provision of education, which encourages the improvement of human capital. Thus, improving economic and social standards decreasing poverty, creating decent work and “overcoming gender and other inequalities” (Sachs *et al*, 2019). The second transformation encourages fundamental investment in health and wellbeing, with a focus on primary healthcare. This transformation is aimed at being “synergistic without any major trade-offs, provided that the no-one left behind principle is applied” (Sachs, *et al* 2019 p. 806.)

Access to modern energy resources, the decarbonisation of the energy system and reducing pollution within the soil, water sources and air, is the focus of the third transformation, in-line with the target set by the Paris agreement (Sachs *et al*, 2019). Transformation four tackles the use of land and our food systems, addressing malnutrition, hunger and obesity and relieving

the over-burdening impact of food production on natural resources (Sachs *et al*, 2019). The fifth transformation addresses the need for access to a clean water supply, effective sanitation and proper sewage and waste disposal in both urban and rural areas (Sachs *et al*, 2019). Finally, the sixth transformation is the use of artificial intelligence and digital technology. Despite this area being very contentious, Sachs *et al*, (2019) state such as benefits of heightened productivity, decreasing production costs and the ability to reduce emissions. Recognising the negatives aspects of artificial intelligence and digital systems such as potential job losses of lower paid workers and digital identity theft, the researchers call for a “comprehensive set of regulatory standards, physical infrastructure and digital systems to capture the benefits of the digital revolution for the SDGs while avoiding the many potential pitfalls (Sachs *et al*, 2019 p. 810).

With those transformations outlined, how stakeholders choose to implement them is crucial and the researchers state the need for “deep, deliberate, long-term structural changes in resource use, infrastructure, institutions, technologies and social relations” in order to achieve the goals (Sachs *et al*, 2019 p.811). The researchers elaborate on their plans to execute their transformations, again this is achieved through a multifaceted approach. This would be attained by meeting the standards of technical feasibility, using the transformations to address and resolve trade-offs, financial support through both the private and public sector, acceleration and development of new technologies, integrated policy coherence, the private sector offering the motivation and co-financing to push forward the organisational and technological changes (Sachs *et al*, 2019). Lastly, for successful execution of the six transformations engagement from civil society and public engagement to create awareness surrounding the need for sustainable development (Sachs *et al*, 2019).

## **2.9 Lived Experience of Farmers, Growers and Food Producers**

The lived experience of English farmers is rarely documented, the focus of this research is to address the consequences of the CAP on the English farming sector and understand the social, environmental and economic impact that policy decisions have made on a day-to-day basis. Due to the minimal amount of relevant research, it has been necessary for the researcher to look further afield for published literature relevant to the topic of farming and lived experience.

Research carried out by Osborne *et al* (2014) used the lived experience methodology to analyse the physical effects of farming on Irish farmers with an articular focus on lower back pain. Despite the small sample group, the researchers were able to build an extensive overview of

the factors leading to reoccurring back pain and the occupational reasons behind the persistent problems. All the farmers had developed management strategies to cope with the issue, either through a range of holistic or non-holistic methods (Osborne *et al*, 2014). The results showed that regardless of the pain the sample group suffered they continued with their workload in the face of substantial pain (Osborne *et al*, 2014). This research highlights the extenuating social circumstances, of many farmers who are forced to continue working despite experiencing chronic pain. Such factors may not have been identified without the use of the phenomenological research methodology.

Other UK based research conducted by Geoghegan and Leyson, (2012) which applies the lived experience methodology, explore the effects of climate change on the farming practices and cultural geography of the Lizard Peninsula, Cornwall. By interviewing local farmers, the researchers were able to establish that climate change can have a social construct through the observation, memory and dialogue (Geoghegan and Leyson, 2012). The researchers argue that these findings help to bridge “the gap between the scientific and non-scientific ways of knowing climate change” (Geoghegan and Leyson, 2012 p. 64). As a result of this methodological study the researchers were able to isolate the unique state that those local residents who witness climate change and its effects at a more local level are able to adapt and respond accordingly (Geoghegan and Leyson, 2012).

Looking further afield for research with similar methodologies, highlighted one study focussing on the lived experience of Northern Iranian farmers. Studying the effects of land degradation and land grabbing as well as the impact of complex historical social regimes, the researchers were able to highlight the importance of lived experience in research (Mohammadi *et al*, 2021). The historical land reforms and the Iranian revolution all played a role in the land-use and land management techniques of the Savâdkuh region of Northern Iran. By researching the lived experiences of the local community, the authors were able to further understand how land reforms had negatively affected land use and the imbalanced relationship between land use and land management which had influenced the change in land use (Mohammadi *et al*, 2021). All three studies highlight the importance of the use of phenomenological study as a methodology and the differing perspectives and research anomalies which been learnt from understanding the lived experience of the participants.

### 3. Methodology

The purpose of this research was to understand the lived experience of farmers and growers in England who are dealing with the implications of agricultural policy and with the challenges of sustainability. All of it is framed into the questions of regional rural development. In order to achieve the aims of the study the researcher has utilised a phenomenological methodology which has been adopted to fully explore the lived experience of farmers, food producers and growers (FPGs) in England.

The exploration of the lived experience as a methodological approach has grown in popularity in recent years amongst sociology scholars (McIntosh and Wright, 2018). The implementation of this research approach allows for the representation of perspectives to be understood by academics, often dispelling myths and creating an understanding of the ‘real world’ (McIntosh and Wright, 2018; Reid *et al*, 2005). However, McIntosh and Wright, (2018) argue that despite this popularity there is quite often little clarification on the term ‘lived experience’. In the field of psychology, the term ‘lived experience’ is better understood as phenomenological analysis, described as an “inductive ‘bottom up’ rather than a ‘top down’ approach” to research (Reid *et al*, 2005 p. 20). The application of this methodology allows for participants to express their own expertise, provide explanation of thoughts and “feelings through telling their own stories, in their own words with as much detail as possible” (Reid *et al*, 2005 p.20). The preferred methodology for understanding lived experience is through semi-structured interviews (Reid *et al*, 2005).

With this methodological approach in mind the researcher formulated a strategy for exploring lived experience of English FPGs. The main project will consist of two key phases, the initial qualitative phase is the completion of FPGs interviews. The second phase is the completion of an online survey of those willing interview participants from three key agricultural producing regions of England. The interview stage allows for the collection of qualitative data which explores the critical lived experience of FPGs, understanding the more in-depth implications of agricultural policy in England. Also identifying areas which require most support post-Brexit and barriers faced by FPGs (see appendix 1). The introduction of the survey (see appendix 2) allowed for a quantitative approach to the data collection and allowed the researcher to obtain demographic data and to explore the relevance of the SDGs to FPGs both at a national level but also at a business level.

For the purposes of this research project, the regions chosen for analysis are the top three most prolific regions for agricultural and horticultural production in England as shown in figure 4, which are the Southwest consisting of the counties of: Bristol, Cornwall, Devon, Dorset, Gloucestershire, Somerset, Wiltshire; the East Midlands consisting of the counties of Derbyshire, Leicestershire, Lincolnshire, Northamptonshire, Nottinghamshire, Rutland and the final region East Anglia consisting of the counties of Essex, Suffolk, Cambridgeshire, Norfolk, Bedfordshire, Hertfordshire.

In order to select three key regions for analysis a report published by Department for Environment, Food and Rural Affairs (DEFRA) was used, titled ‘Regional Agricultural Profiles’, which collates data on agricultural and horticultural production, the latest copy which was published in June 2020. These profiles are based on figures from the Office of National Statistics and depict the ‘Total Income for Farming’ (TIFF) for the eight regions of England (DEFRA, 2021).

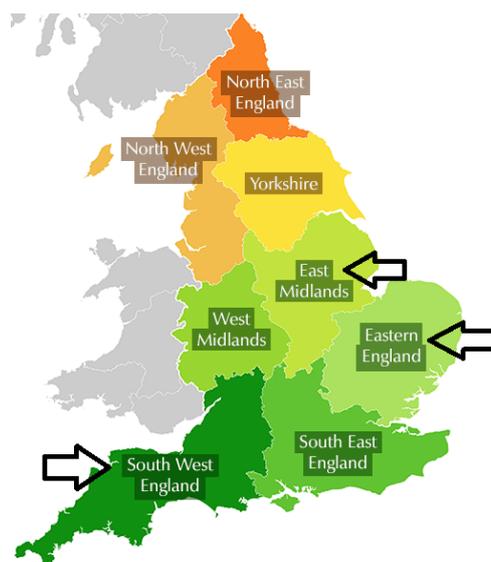


Figure 4: A map of the counties of England.

The key statistics used for regional selection included arable and livestock output, financial income from farming for the region and the quantity of production compared at a national level. Once the three regions had been chosen for the study, the researcher firstly began to collect contact details of possible participants and collated the data on a spreadsheet for each region (see appendix 3). Due to the lack of a central data base of English FPGs and also data protection laws, a regional Google search was completed for each county using example key search terms “farms”, “dairy farms”, “fruit grower”, and “vegetable grower”. This approach allowed the

researcher to identify relevant participants, although it was a time-consuming option it proved successful in obtaining significant numbers of interviewees.

The criteria for participants were based firstly on the relevance of the business to the study the aim of this sampling stage was to identify primary producers. For the context of this study, it was those who produced the base crop or product for example dairy farmers and not cheese producers. Quite often businesses were diversified or horizontally integrated with many FPGs developing business models which added value to the goods they produced, offering dual aspects to the data collection. The preferred method for contacting sample candidates was via email or occasionally through social media, due to the extent of the research and the researchers time constraints it was not workable to telephone potential participants and it was deemed to costly to contact participants via postal requests.

During the data collection a spreadsheet was used to record the name and contact details of the FPGs, and the nature of the business was also recorded via a colour co-ordinated legend, for further potential analysis. The spreadsheet used for data collection also documented the response rate of the FPGs contacted and was used to track the progress from first contact through to the interview process and then the final stage of transcription and coding. Those willing to take part in the study were asked to complete a consent form generated by the researcher for the purposes of the study.

The interviews adopted a semi-structured interview technique to ensure that interviewees were unencumbered by formal questions. The aim of this stage of the research approach was to gain the key lived experience from the FPGs contacted for the research and to help further understand the implications of operating rural businesses through various regions of England and to understand how best businesses can be supported in terms of sustainable development goals. Each interview was carried out over the phone and recorded with the consent of the respondents, occasionally via zoom. The majority of the interviews were completed during the Covid-19 pandemic whilst the UK was in various stages of 'lockdown', therefore it was not practical or often legal, to travel to various participants to conduct interviews face to face. Once each interview had been conducted, it was then transcribed, coded for anonymity purposes and filed according to the region and county. On completion of the interview stage, interviewees were asked to complete an online survey which focused the demographics of the interviewees and the FPGs opinion of the Sustainable Development Goals (SDGs), the involvement of the

SDGs within England's food system and their future inclusion within policy. Both the interview and surveys were then completed across all three regions.

After the interviews were all transcribed the analysis process began, with the use of a spreadsheet focussing on the environmental, economical and social themes from the interviews (see appendix 4). This allowed for a clear and in-depth thematic analysis to be conducted on the interview results, this was performed manually rather than using software. The adoption of colour coding of key themes, of each transcribed interview was used to select the main environmental, economical and social themes from each interview. A data collection spreadsheet was prepared for each region and the coding used from each transcribed interview to accompany the statements to ensure the participants remained anonymous (see appendix 3). By creating regional spreadsheets, the researcher has also been able to conduct cross-regional analysis for all the FPGs interviewed. Additionally, the survey completed by the participants looked more closely at the demographic of the participants and the understanding of the relevance of the SDGs to both the farming sector and also their businesses as a whole.

Undoubtedly, there were significant limitations with the study. The research design was a very time-consuming process, firstly researching all 19 counties for suitable candidates was slow and laborious. Each potential participant was contacted via email, and it was often difficult to pin down interviewees for a specific time and date for the interview to take place, understandably many were extremely busy, but this process created an additional workload. Secondly, each interview was transcribed by the researcher and with some interviews exceeding 60mins this became a very lengthy and arduous phase of the research; however, it did give the researcher time to explore the interviews in greater depth and make notes on particular points of interest. Something that may not have been achieved if the transcription process was sub-contracted. However, despite the workload it would have been interesting to research more counties to create wider understanding of less prosperous regions which suffer from for example more extreme weather conditions and more volatile market fluctuations e.g. hill farmers. It is felt by the researcher that the sampling demographic was a fair representation of the food producing sector with a representation of both large- and small-scale producers, those with their own supply chains and those which sold to more mainstream markets and also agriculture and horticultural producers. Despite these limitations the research did produce a unique set of results focussing on the FPGs lived experience of running a rural farming business in England and the daily complications they tackled, the financial stresses they have

experienced operating under the CAP and social factors which heavily influence their business operations.

#### 4. Results

As explained in the methodology section, three of England’s key regions for agricultural production were used as the focus of the research, East Anglia, East Midlands and the Southwest. With these three regions of England selected for analysis, table 1 provides a summary of the number of participants contacted per county, the response rate dictates the total number of interviewees for each region. In total of 590 farmers, growers and food producers were contacted, 72 interviews were completed across all three regions, which totals a 12.80% response rate. Upon the completion of the transcription process the interviews were coded according to the county and order of the interview for example, S7 represents the seventh interview in Suffolk, the coding is represented in table 1. The number of participants and farmers, food producers and growers (FPGs) contacted for the research is by no means a conclusive list of those producing in the region.

County	East Anglia		County	East Midlands		County	Southwest	
	Contacted	Response		Contacted	Response		Contacted	Response
Suffolk (S)	37	8	Lincolnshire (L)	43	5	Gloucestershire (G)	48	5
Norfolk (N)	27	5	Northamptonshire (No)	25	5	Wiltshire (W)	32	8
Cambridgeshire (C)	28	4	Rutland (R)	10	1	Somerset (Som)	44	3
Bedfordshire (B)	17	3	Leicestershire (Le)	17	1	Dorset (Dor)	45	4
Hertfordshire (H)	15	3	Nottinghamshire (Not)	32	1	Devon (De)	46	5
Essex (E)	37	6	Derbyshire (D)	22	3	Cornwall (Co)	65	2
<b>Total</b>	161	29	<b>Total</b>	149	16	<b>Total</b>	280	27

Table 1: Table depicting contact rate of participants.

Table 2 offers a more in-depth overview of the varying businesses contacted for the research and this data is broken down over the three regions. This table shows the range of businesses contacted by also varying production levels over the three regions, for example in the Southwest, a vastly wetter region has high levels of meat, dairy and mixed production compared with that of East Anglia which is typically a much drier region and therefore is more suited to arable production. It is also interesting to note that the number of horticultural producers is also reasonably consistent across all three regions, this sub-sector of agriculture is facing comparatively harder times due to labour shortages and competitive supply chains. The

table also shows the number of mixed systems within each county. A mixture of arable and livestock is encouraged in regenerative systems to increase natural levels of fertility and biodiversity on the farm, and it is promising to see a healthy number of these systems represented across both the East Midlands and the Southwest. A slightly lower representation of mixed systems in East Anglia may possible be linked to the higher number of arable systems which see a greater proportion of the CAP and are more likely to produce crops for the commodity market than many other FPGs.

Counties	Business Types						Total
	Agricultural	Horticultural	Meat	Dairy	Mixed	Other	
<b>East Anglia</b>							
<b>Suffolk</b>	9	11	6	2	5	4	37
<b>Norfolk</b>	7	6	5	4	2	3	27
<b>Cambridgeshire</b>	12	11	3	0	2	0	28
<b>Bedfordshire</b>	4	2	8	2	0	1	17
<b>Hertfordshire</b>	4	2	1	1	4	3	15
<b>Essex</b>	11	9	10	2	3	2	37
<b>Region Total</b>	<b>47</b>	<b>41</b>	<b>33</b>	<b>11</b>	<b>16</b>	<b>13</b>	<b>161</b>
<b>East Midlands</b>							
<b>Lincolnshire</b>	6	16	7	1	11	2	43
<b>Northamptonshire</b>	9	2	10	0	4	0	25
<b>Rutland</b>	3	0	5	1	1	0	10
<b>Leicestershire</b>	0	5	7	1	1	3	17
<b>Nottinghamshire</b>	6	6	6	0	9	5	32
<b>Derbyshire</b>	0	1	12	6	1	2	22
<b>Region Total</b>	<b>24</b>	<b>30</b>	<b>47</b>	<b>9</b>	<b>27</b>	<b>12</b>	<b>149</b>
<b>Southwest</b>							
<b>Gloucestershire</b>	2	8	19	6	8	5	48
<b>Wiltshire</b>	4	6	7	8	7	0	32
<b>Somerset</b>	2	9	15	4	7	7	44
<b>Dorset</b>	3	9	8	10	11	4	45
<b>Devon</b>	2	4	24	4	10	2	46
<b>Cornwall</b>	2	8	25	10	17	3	65
<b>Region Total</b>	<b>15</b>	<b>44</b>	<b>98</b>	<b>42</b>	<b>60</b>	<b>21</b>	<b>280</b>
<b>Total</b>	<b>86</b>	<b>115</b>	<b>178</b>	<b>62</b>	<b>103</b>	<b>46</b>	<b>590</b>

Table 2: A representation of the business types contacted for the research.

#### 4.1 The Survey Results

Once participants completed the interview phase, they were asked to complete a short online survey relating to the SDGs and their inclusion in farming policy, of the 72 participants interviewed, 36 went on to complete the survey. Of these 36 participants who completed the

survey 90% were male and 10% were female with an average age of 50.4 years. These statistics would be considered characteristic of the sector due to the well documented issue of farming becoming an aging sector and male dominated. The third survey question asked participants if they were aware of the SDGs, 52.7% of participants were aware of the SDGs with 33.3% not being aware of the SDGs and the remaining 13.8% were unsure. This is higher number of participants that showed awareness of the SDGs during the survey phase than may have been discussed during the interview phase, this could be as often if a candidate was unaware of the SDGs the researcher explained the concept and also the lower response rate of the survey compared with the interview would create a higher figures.

As part of the survey participants were asked to choose five SDGs most relevant to the English food system, figure five shows the results from this question. The top SDGs which received the most votes were:

- SDG 3: Good Health and Wellbeing
- SDG 7: Affordable Clean Energy
- SDG 12: Responsible Consumption and Production
- SDG 13: Climate Action
- SDG 9: Industry, Innovation and Infrastructure

This question has provided an interesting mix of results showing a social interest from farmers, food producers and growers to promote good health and wellbeing of society, there is a clear awareness for the need for health improvements of the English society a fundamental aspect of which, is course based on diet. The results from this question also showed that FPGs had keen interest in climate issues, this was strongly emphasised in the interview phase of the research, many FPGs taking strong actions to improve business practices for the environmental good, once again this was heavily reflected in the interviews.

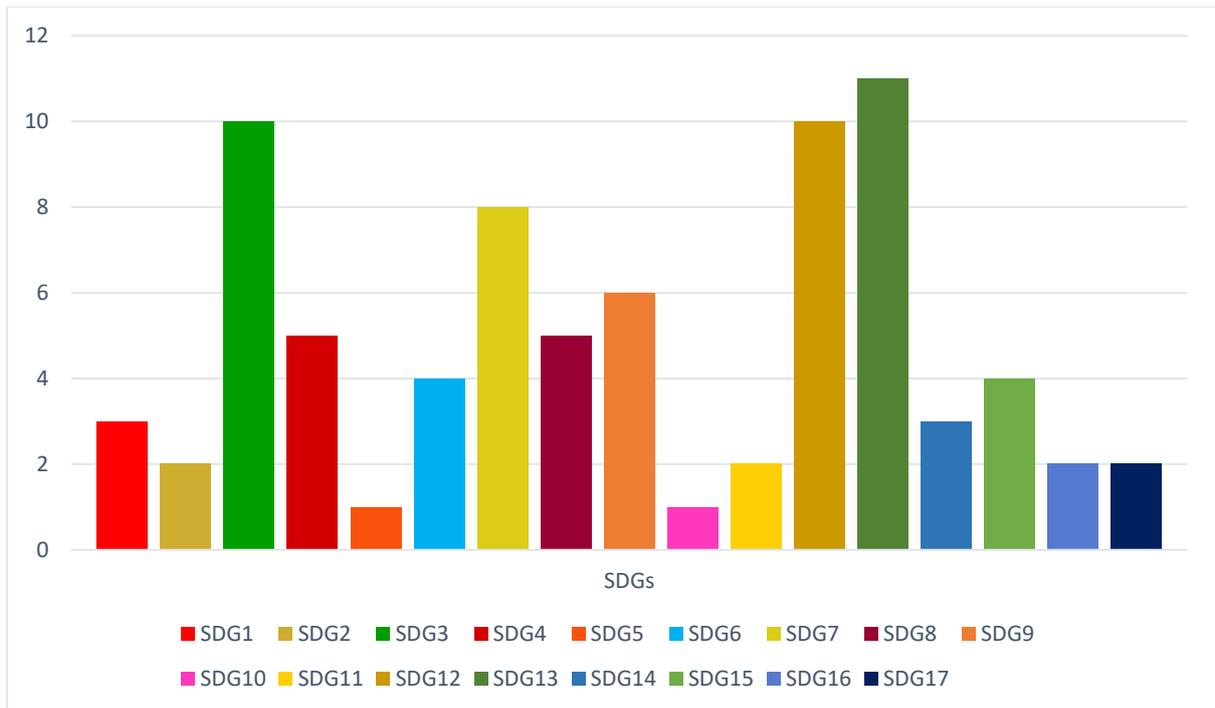


Figure 5: Results from Question 4 of the online survey.

The SDGs with the least number of votes also provide an interesting insight into the food production sector, the SDGs were:

- SDG 5 Gender Equality
- SDG 10 Reduced Inequalities
- SDG 2 Zero Hunger
- SDG 11 Sustainable Cities and Communities
- SDG 16 Peace, Justice and Strong Institutions
- SDG 17 Partnerships for the Goals

With this selection of SDGs it shows some wider issues relating to the social aspects of the SDGs for example SDG 5 Gender Equality and SDG 10 Reduced Inequalities are very much front running issue in modern times, and this most apparent despite the small sample of FPGs who took part in the survey 90% were men, it is unclear why FPGs see that gender equality and reducing inequalities are not considered an issues for the sector. It is also well documented that farming is an aging industry and many farms have been inherited through male lineage, but more could be done to tackle this disparity.

Within the UK larger companies are expected to complete Gender Pay Gap reports showing the discrepancies within their own companies, but further action is needed in farming to promote women and ethnic minorities involvement within the sector. Additionally, SDG2 Zero Hunger has also received few votes, typically something which may not be associated with the six wealthiest economy in the world, however, poverty levels in the UK are increasing at drastic levels and this is now set to escalate further as a result of the Covid-19 pandemic, and more recently the cost-of-living crisis. It is not surprising to see SDG 16 Peace, Justice and Strong Institutions and SDG 17 Partnerships for the Goals receiving such few votes, this are more relevant with a more extensive knowledge of the SGDs and their importance in the formation of a truly sustainable system is known. Lastly, SDG 11 Sustainable Cities and Communities is a contradictory choice with SDG 12 reaching a higher number of votes, it could be argued that these goals are deeply linked and with the majority of English populations living in urban areas, it is important that these two goals are simultaneously implemented to achieve sustainable systems.

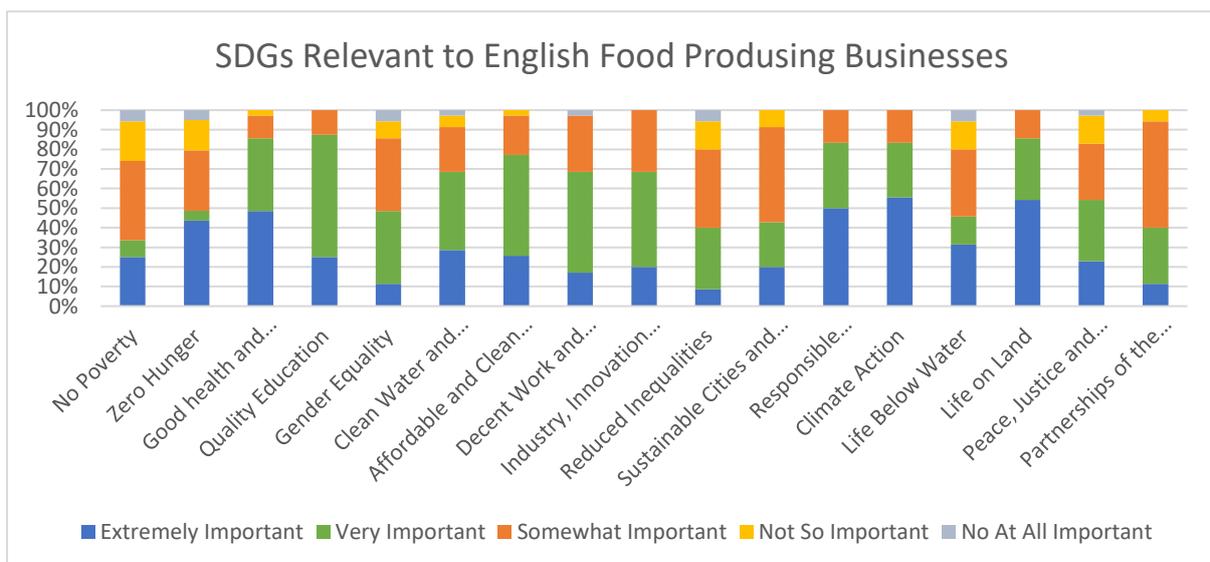


Figure 6: A table showing the SDGs relevant to English FPGs.

Lastly, figure 6 represents the results from question 5 which participants were asked which SDGs are most relevant to their individual businesses and production methods. Those SDGs which participants considered extremely important were:

- SDG 13 Climate Action
- SDG 15 Life on Land
- SDG 3: Good Health and Wellbeing

- SDG12 Responsible Consumption
- SDG 2 Zero Hunger

These results show a fairly integrated representation of the SDGs, with a mix of environmental, economical and social factors forming farmers worldviews and their pictures of the world. Both SDG 13 and SDG 15 show that environmental elements are key to those who are on the frontline of food production, many of whom are working to address the impact of climate change in their farm production systems. SDG 3, 12 and 2 show the social considerations of FPGs, for example the diet and health of the consumer, which was also discussed in the interview phase of the research. The selection of SDG2 offers an interesting insight, this is potentially linked to the view of farming's role in food production as the main priority of the sector but of course with regenerative systems biodiversity and habitat are also important.

SDGs which participants considered 'Very Important' were:

- SDG 4 Quality Education
- SDG 7 Affordable Clean Energy
- SDG 8 Decent Work and Economic Growth
- SDG 9 Industry, Innovation and Infrastructure
- SDG 6 Clean Water and Sanitation

The choice of SDG 4, it would appear would link with the results from the interviews which FPGs expressed a desire for better education of consumers and children in the food system, allowing for consumers to potentially make better choices and understanding the complexities of food production. Economic factors such as SDG 8 and SDG 9 is reflective of the poor investment in rural communities and the knock-on effect of industrialised farming and the urbanisation of the English population.

Those SDGs which were considered not so important by the participants were:

- SDG 1 No Poverty
- SDG 2 Zero Hunger
- SDG 10 Reduced Inequalities
- SDG 5 Gender Equality
- SDG 14 Life Below Water

These choices could be considered reflective of an aging sector which shows a lack of interest in tackling inequality in the farming community such as equal gender representation, poverty and hunger. Often these factors are perceived as not relevant to England but of course these are all factors, in particular poverty which has been affected by recent inflation.

## **4.2 Interviews**

### **4.2.1 Subsidies**

Interviewees were asked about the implications of current policy on their own businesses, at the time of the interview phase current agricultural policy was based on the EU's Common Agricultural Policy, many responded with negative views of the policy. The sectors reliance on subsidy had resulted in a lack of innovation within the industry market distortion and further intensification of crop production. The anti-competitive nature of the subsidy system has allowed for less innovative business to continue operating:

*“It has been very useful it has probably promoted mediocracy in the industry and facilitated average productivity and has allowed people to farm in many ways that they shouldn't be so to be honest we are fairly glad to be seeing the back of it”*  
(W6).

This side effect of the subsidies propping up less efficient businesses, has also impeded the next generation accessing land and the opportunity to farm, which has been a recurring issue raised throughout the interview process:

*“One of the big problems with area payments it keeps people in business to long, arguably it is a barrier to retirement, its props up failing businesses longer than they would be able to which restricts profitable growing business, from taking those opportunities or indeed new entrants”* (No5).

The value of the subsidises added to land prices affected the rental prices for tenant farmers pushing rent levels to uneconomical levels and many farmers commented that the increased land prices restricted their opportunity to grow and develop their own businesses and further intensified production of large surrounding farms which have only grown in size as farming land is often seen as an investment commodity:

*“expansion of the farming business is nigh on impossible, because, there isn't the land isn't available we are surrounded by very big agri-businesses who want to snap up whatever land becomes available either renting for a rent which is*

*something I cant match or they own the land anyway, so if there is a small farmer who is going to retire it usually snapped up by one of the big land owners, and so in terms of the farming business it has always been a problem it is simply not affordable” (No5).*

However, the conflicting reliance that farming has on subsidies is due to the turbulence within the supply chain and the retailer’s capacity to push costs back to farmers and growers:

*“from our business point of view its just poor distribution of wealth and in reality what it actually caused is cheaper food in supermarkets, so because farmers were given that funding it meant supermarkets could drive the costs down, so it people see it as subsidising farmers but in reality it is subsidising cheap food, which has created quite an imbalance in the supply chain in that you know you have food which is sold for very little above what it cost to produce it. With the CAP sort of funding covering the gap” (D1).*

Many felt that the cost of food was lower than the cost of production which only deepens the reliance on the subsidy provided to the sector:

*“Farmers should get a decent price for their food and not rely on subsidies that’s what I have always thought (De1).*

Although some saw this below cost production as a positive influence of the CAP, keeping food cheap for the consumer:

*“I think current policy has worked quite well, kept food cheap, it’s supported us there is a lot of real physical on the ground benefit” (S3).*

Horticultural growers are generally not able to receive the CAP due to its agricultural focus many of the growers have seen this exclusion as only a positive thing:

*“We have never really been impacted by the CAP, that obviously hits products that fall outside of us. So horticulture has always had a very different kind of experience and therefore horticulture had to complete their changes in a very different way, so agriculture receives the bails or the support over the years but it has made them quite lazy in comparison so we are quite agile and fit because if the margins aren’t there we have to change or you will be forced to shut down” (Do3).*

Some farmers also felt that subsidies have also provided the business support that they needed in such a volatile sector:

*“obviously it doesn’t make a lot of sense to pay people just for owning land, but from my point of view its two thirds of my income, ultimately its underpinning the business and allows me to reinvest and move forwards, any move away from that and all of a sudden I am losing my smarties and I’m quite concerned where I will be going in the future”*(E1).

Nevertheless, many see the solution lying in the removal of subsidies altogether from the farming sector, this of course will create further issues. There are also environmental concerns surrounding the impact of the CAP, with interviewees claiming that land management schemes were not fit for purpose and some even causing ecological damage:

*“the higher level stewardship it wasn’t perfect there were things we disagreed with that we were made to do under it.....we had to cut down a lot of trees and bring heavy machinery to do it all to try and encourage the butterfly which really wasn’t nature friendly and hasn’t achieved anything other than bracken growing were bracken wasn’t growing before”* (DE2).

This subsidy method has a direct impact on ecological diversification on farms:

*“subsidy based system it has favoured large scale arable farmers to the detriment of livestock and particularly horticulture, diverse mixed farming and it has encouraged intensification, specialisation, mono-cropping that sort of thing which has taking us down a very damaging path in terms of cereal particularly environmental biodiversity so I am really pleased that we are now moving away from the legacy of the 1980s style for subsidy support, towards one which is more based on environmental outcomes”* (L4).

In summary, the key points from interviewees thoughts on the effects of subsidies included:

- Subsidies had resulted in the sector becoming uncompetitive and lacking innovation.
- Supporting businesses which are unviable and reducing the numbers of farmers who retire.
- Inflated land prices affecting business expansion.

- Subsidising cheap food for retailers and not truly subsidising farming, many felt the cost of food was in fact lower than production costs.
- The horticulture has not been as affected by the CAP, as a result has had to remain an agile and competitive sector.
- The allocation of the subsidies does not effectively support farming businesses and favours larger farms.

#### 4.2.2 Future Policy

When interviewees were asked to discuss their hopes for future policy candidates talked about a range of possibilities, but recurring themes focussed on more Government support for agriculture in various forms, a call for a more regional policy and pushing for a focus on environmental sustainability.

Many hope that the opportunity of Brexit will give the UK Government chance to create more relevant and regional policy and feel that the new Environmental Land Management Scheme (ELMs) is move in the right direction remunerating farmers for the public goods they provide. Understandably, the Brexit vote has divided the farming community, as it did the British nation, however their expectations that it will have a positive affect on future policy:

*“I am delighted now there is a government that can make some specific to this country or part of this country, I think the downfall of CAP was that it was covering 27/28 nations, agriculture in this country is so diverse north to south, east to west that you know there is no way a CAP could work for that 28 nations in one go so I think that it is control of a UK government who can actually make better decisions for our type of farming has to be a good thing as long as the decisions they make are the right ones.” (No4)*

However, many businesses are mourning the loss of the subsidises and the lack of certainty in the years ahead for modern agriculture. The potential that the ELMs scheme will leave many farms out of pocket on future schemes and has left many FPGs concerned about the support they will receive in the coming years, and many are looking to diversify their income streams and pushing to maximise profits in their supply chains:

*“It’s a shame that farming has to be supported, with outside money it’s a shame that we can’t just have that payment. It’s been going since the second world war so 70 years, so it’s built into the whole of Europe’s supply system, it is pretty hard,*

*they are basically giving us seven years to adjust with out direct payment, where we have had it for 70 years, so each year is worth 10 years of our payments” (No2)*

*“I have done my budgets, just roughly for between now and 2027 on how they say they are going to scale back the payments and it doesn’t look particularly encouraging” (DE4).*

*“I know I think we have got a very tough decade adjusting I don’t see the proposals of support really compensating the reduction in single farm payment enough to stop that change from happening, I think will be a good thing but how this industry is going to look in 10 years, apart from I predict less people involved, I’m not sure what it is going to look like I really don’t, it will either look like a great big park and people will just to take the money to become a park keeper, or there will be some innovative farming techniques, will are a lot lower cost that what we are doing now, that’s my view” (L2).*

This noticeable insecurity coupled with the lack of detail of the Government’s ELMs scheme focusing on “public money for public goods” has left some farmers concerned about the state of the UK’s food security. The clear issues with food supply chains were exacerbated during the early days of the Covid-19 pandemic, with many supermarket shelves being empty:

*“obviously that can be used by government to reach whatever policy objectives that they have at the moment obviously everyone is focused at the moment on becoming more sustainable and protecting the environment and protecting water courses and rivers that sort of thing, it seems very logical for the government are proposing to sort of distribute funding and encourage farmers to focus on those aspects. The only thing I am not sure about is how is that going to impact food security and the food that we produce and what you don’t want to happen is then suddenly people can then afford to farm less and produce less produce and we balance that in to the food security in that we have to import more form abroad which is potentially on less sustainable systems and less environmentally friendly” (DI)*

Other issues raised about the ELMs scheme is the effective privatisation of farming with the potential for carbon capture schemes open to big businesses:

*“The Government I think wants to spend as little as it can and therefore is pushing this private investors in carbon credits which I don’t see how that is going to save the planet, people still pollute but put it on to farmers anyway, I think we are entering a really dangerous territory and I think ELMs is going to be not what it was promised, I think the money coming from ELMs is going to be very little I think and they are going to privatise farming” (D2).*

This raises many concerns such as the failure to address unsustainable operational practices of big businesses by simply paying to offset their practices. Secondly, the Government not tackling this issue head-on by allowing companies to pay for this service from farmers who cannot be blamed for enjoying the considerable financial security this will bring with the loss of subsidies from Government:

*“So we are now looking into carbon capture on the farm, we have been approached by London hedge fund people, that are coming to us say we have got a dirty old company in London, who needs to offset 5,000 tonnes of carbon, to do that we need 200 acres of a special tree from Germany, which has that maximum amount of carbon capture capability, and we need land to grow it on which is deer fenced to protect it, and we will pay £350 per acre to do it”(S3).*

One must also consider the biosecurity issues of such schemes, when clearly promotion of native habitat would potentially be more beneficial to rural environmental sustainability. Feasible solutions for the development of future policy in farming and food production showed the experience and environmental core of modern farming. As previously mentioned, there is a hope for more regional policy which would help to solve a variety of issues:

*“we need a better approach to arable farming and how farming is treated in this country, and what suits bests for both farming and the aspirational hopes for the country, so it might be there is a points scheme for different areas of the country so it isn’t a one size fits all, it has to be specific to regions and maybe even counties, for different soil types, what the farming practices are, what the water area is, what might be running off it to other areas (B2).*

A regional policy should help with the adaptation of the worldviews. It would also help to build a stronger Government and farmer collaboration:

*“Greater collaboration between farmers and whoever is monitoring whatever they are doing rather than a system of inspections and sanctions, so if they were friendlier more constructive ways of working with whatever the powers that be say this is how you have to farm that would be a plus” (De2).*

Some of the smaller producers that were interviewed also expressed a desire to be included in future policy and Government offering greater support for smaller producers:

*“I would like to see strengthening of small producers, going away from pesticides and usage, which you can only do if you go small scale, and it would be such a huge reversal, it will probably take a few really big catastrophic events and disasters before anything will change, but even then I don’t think the dots will be joined by the vested interests because if it is running according to profit, what is going on is financialised its seen as commodities, we are not growing the ingredients for cakes or bread anymore we are growing things which can be dealt at an exchange and those financial transactions” (Do3) ,*

*“they don’t want to be talking to the people with 4,000 acres they want to go down to the people like Bert with 20 animals, has common grazing he is the bloke that they need to support, and the family farms who don’t have a computer yet, everyone assumes that they have a desk and office” (Som2).*

Further steps in improving policy farmers would like to see a more reward for sustainable and diverse production systems:

*“I certainly think we need to encourage home grown usage and consumption of food I think we need to support smaller farmers in terms of micro and niche products and look at the local situation for food stuffs. We need to concentrate of seasonality as a nation instead of demanding strawberries in January, that kind of thing” (N4).*

This desire for a more sustainable approach delivered through greater environmental policy is sought by another candidate:

*“So finding a means of say remunerating a business or individual who is looking to use less agriculture inputs or burn less diesel, using less soil disturbance, means of establishing crops, so things like that from a efficiency perspective and being*

*paid from an environmental perspective for delivering good environmental benefit and essentially being means tested, I say means tested, or results tested (W6).*

With the possibility that organic production would receive further support as it already has the potential to deliver the public goods that the Government is hoping to achieve through the ELMs scheme:

*“I actually think they are going down the right route of the ELMs scheme in terms of paying farmers for environmental goods they produce/provide I think that the payments have to be right in terms of that so it keeps farm incomes at a level that we can be sustainable at. As I actually think they are going down the right route, I think being organic ourselves that needs to be supported because it does deliver what the public wants and the public good from the farming system anyway” (W1).*

Alongside the acknowledgment of more sustainable production methods interviewees also wanted to see the true value and cost of food considered in future policy. This could be reflected through the externalisation of production costs:

*“I think we could all compete on a market based system if the a lot of the costs were internalised at the moment with a lot of the agriculture which has been most damaging those costs have been externalised, pollution of water ways the loss of soil structure right through to the depletion of finite resources like fossil fuels, phosphorus and potassium, more to the point where we return to polluter pays principle” (L4).*

With the potential for mainstream agriculture to return to more old-fashioned farming methods with a more common-sense approach to food production, radical changes to future policy would shake up the food system from an environmental perspective. However, it is the supply chain and crop production itself which causes many issues in our modern food production system. For a lot of the FPGs interviewed, a fundamental issue with many farmers was the lack of backing from Government for UK agriculture in general:

*“Some of the politicians don’t want British Agriculture, do they? They want to get rid of the whole dam thing and get it in from abroad” (C1).*

Better support from Government would be developed through that closer collaboration mentioned earlier on, allowing the Government to develop a more relevant policy adaptable to the many diverse businesses we have in the UK.

To review the main points from FPGs interviewed about the adjustments made to future policies the key comments focused on:

- The CAP was developed for too many different countries and struggled to be relevant to all areas. Many FPGs were hopeful of more regional policy to combat this concern.
- Withdrawal of the CAP has left businesses with little time to adjust.
- The ELMs scheme may change food security.
- Carbon capture schemes have the potential to effectively privatise farming.
- The hope that post-Brexit more regional policy will be developed, with the inclusion of smaller FPGs.
- Rewarding farmers for more sustainable practices and a diverse production system which uses less inputs.
- Some farmers felt a lack of support from British Government.

#### **4.2.3 Crop Production**

Many of the farmers interviewed for the research had a strong environmental focus and this was applied in many ways either through regenerative agriculture, wide cropping rotations or adapting growing systems to reduce inputs.

For many farmers a wide cropping rotation is key and helps to reduce to crop specific pest and disease build up and also aim to generate some level of natural fertility:

*“We have tried to have as diverse combinable crop rotation as we can, I think it is fairly clear that the more and more monoculture that you have the more pest, weed and insect problem you have, and so the neonic comment is apt, if farmers had a more diverse crop rotation for the last two or three decades, when oil seed became a crop then would the cabbage stem flea beetle, would that pest have developed to the level that it has if people had a wider rotation” (S2).*

Obviously being able to reduce inputs has significant affect on profits and the rising costs of inputs is also forcing farmers to look at alternative growing systems:

*“we did grow rape but then there is a big influence based on flea beetle, and then the amount of inputs we are having on so then really the influence is not just on the rotation we have got also what we are getting is the output based in the inputs we are putting in , we get a lot of money per tonne of rape, but the quantity of sprays we are having to put on to make it a viable crop became unviable (B2).*

*“except every year you have to spend more and more on all these inputs which get more expensive but because the bloke is coming to you every week and telling you all this stuff you just carry on doing it and there is no one actually advising you that you don’t need to do it, you don’t need seed dressings the seed grows perfectly well on its own” (H3)*

No-till farming and regenerative agriculture are seen by many as the future of sustainable farming techniques and there is a clear need to push farming practices forward to meet environmental production goals:

*“Why does it need to be sustainable, things need to be made better, that’s what I think, I don’t think sustainable is the greatest choice of words, in terms of food production in general. Our whole food production system depends on 6 inches of soil, and if there is a lack of understanding, the teaching I had 20 years ago was way out on what needs to be taught, to the future start looking after the planet more, that’s what needs to be happening, not keeping a broken system the same” (Do2).*

Consequently, many FPGs are returning to old fashioned farming techniques:

*“the other thing we are and always have been concerned about is that you should farm as if the planet is going to last forever you have got to look after it, so you don’t put rubbish in it, you put things that are bad for it, we have never joined any schemes, you know the countryside stewardship schemes and all that we think you should farm responsibly anyway and not necessarily be paid for it, so we don’t cut our hedges in the spring or autumn when the young birds and animals are fledging we wait until the winter time and things like that, so we have always farmed responsibly so that means you don’t put any rubbish on the land” (B3).*

*“one thing I liked from the recent announcements was returning to a type of farming your grandparents would recognise, so that really appeals to me and moving away from that monoculture, speaking about rewards for farmers sort of things like, looking after endangered species and rewilding, and bringing life back into the countryside, these things are very attractive” (R1).*

In addition to adopting new but simple methods to improve soil health and productivity and moving away from current conventional methods of arable production which can have a negative impact on biodiversity:

*“It’s because its ingrained in farmers minds that they need to cultivate, they have been doing it for 2000 years, so ploughing to get rid of weeds and give the seeds a good start in life in a nice clean soil but every time you cultivate you are destroying the soil, which is fantastically complex eco-system of bacteria, fungi and protozoa and things that eat them and things that eat them and things that eat them, and you end up with worms and beetles and thigs you can see, it is a wonderful system and the more you support it the better it becomes and the soil becomes a solid sponge which all these things work and all the roots of your plants work the mycorrhizal fungi, and things like that which are destroyed every time you cultivate so our aim is to not disturb the soil at all but to keep it nourished while having things growing all the time so we are growing cover crops so over winter we don’t have any bare ground there is all ways something growing (H3)*

But recent intensification and monoculture which has been the resulting impact of the CAP, has had a devastating impact on the countryside and this has led to the removal of a diverse habitat, so there is a desperate need for change in the form of more regenerative farming methods because:

*“They are really important but the other thing for me is that the countryside is a floral desert the best place to keep bees is towns and cities by a mile, because you have parks” (G2).*

Although some farmers and growers are working hard to resolve the floral desert for example the lack of flowering crops or plants grown in rural areas, and this can be managed effectively:

*“The work we do is to benefit the wildlife on the farm, its to prescriptive really I think I would like to see it a bit freer, with timings and the margins the work we do to encourage wildlife it is better when its not within the time frames given by schemes so for example if everyone in the country has a deadline to cut a margin or something they remove all the habitat by one date so different communities and different areas need a different focus which I think it will be, hopefully incorporate different freedoms and different timings to have more scope to make changes within their scenario rather than just a blanket date or treatment across the whole country” (Do2).*

The use of chemicals in farming creates a conflicting situation for many farmers, some of whom, are predominately growing combinable crops is their main focus, a typical example of

this would include crops such as oil seed rape. However, the recent ban on neonicotinoid chemicals has put off many farmers from growing the crop since its withdrawal in 2018, due to the catastrophic affect on pollinator populations. This however has led to a conflicting situation with the loss of combinable floriferous crops resulting in the aforementioned “floral desert” in the countryside, one bee farmer commented discussed the impact of losing the neonicotinoids.

*“I was against the ban, I don’t like them in any way shape or form, I think they are horrible things, but I think one should be careful what you wish for.... The other problem we have got, which isn’t so much of a problem for us, because we want rape honey like a hole in the head, because it sets so quickly but an awful lot of bee farmers now are finding that their early season crop which is mostly rape as more and more people get out of rape, there is less and less available for the bees early in the year, so starvation is an issue..... whilst it is technically illegal you have to spray open flower, so whilst technically they shouldn’t do it, I live in the real world, and I know dam well they do. And if they do it during the day when my bees are on things like field beans, they are going to kill those bees and you have to do it more frequently, that’s why a lot of farms have got out of rape, their yields went through the floor..... I would be happier if we decided to grow wheat properly, without glyphosate rather than ban neonics (neonicotinoids)” (G2)*

Although rape is a problematic crop for bee farmers and keepers, the reduction of the crop in farming rotations has contributed to the clear floral desert we are faced with. As mentioned in earlier chapters, the CAP has led to intensification and mono-cropping systems, but we must ask ourselves why we are producing such great quantities of combinable crops when we look at the food they produce and the nutritional quality they provide consumers. As these farmers state the majority of domestic grain is used for animal feed and green energy for example, biofuels and anaerobic digestion:

*“Because 70% of the grain we produce is fed to animals, or it’s put into industrial processes to make bio-petrol or what ever it’s called” (H2),*

*“I don’t grow maize there are a lot of anaerobic digestion basically they rape the land round here all the time growing maize for their anaerobic digestors” (De4).*

But those innovative farmers who experiment with their cropping systems can see the benefits paying off:

*“we have a lot of wildlife things here and we are in a stewardship scheme which pays a little bit every year its not a lot, for what we do, we are teeming with wildlife I have got a lot of bird spotters, who find lots of knew and exciting things going on, but it is good. They ask what we are doing, and I say that we are just managing things in an organic sustainable rotation, and the wildlife is turning up its not like I am realising sail buntings or anything, so what we are doing seems to work.”*  
(De4).

This is an excellent example of the natural capital, the natural benefits that provides a source of income as well as supplying environmental benefits, farms can supply and a positive example that simple farming techniques support the diversity of habitat needed in the countryside.

In summary the main concerns for FPGs crop production include:

- Diverse cropping systems reduce the infestations of pests and weeds.
- The cost of some inputs is making some crops unviable.
- Sustainable farming is no longer enough, needs to have a more regenerative focus.
- Some FPGs are favouring a return to old fashioned techniques.
- The health of the soil is fundamental for successful production.
- Bee farmers consider the countryside to be a ‘floral desert’.
- Government policy and subsidy criteria often dictate when certain jobs can take place on the farm.
- Banning chemicals can sometimes create more problems.
- Many arable crops are produced for green energy.
- Organic farming for wildlife realises the natural capital of farms.

#### **4.2.4 Future Farming Methods**

But many FPGs do not see a future in old fashioned systems, many larger farms are able to invest more in technology and as with all aspects of farming it is not a ‘one size fits all’ sector and some are founding the future of food production on technological systems:

*“like precision farming, one thing we are using at the moment is we are applying cameras to things like sprayers so when they go across a field they don’t just blanket spray the field with whether its fertiliser sprays or fungicides they are spotting the weeds and applying the herbicides precisely to kill off the weeds rather*

*than across the whole field trying to capture all the weeds, so not only have you got environmental benefits but you have also got financial benefits as well because you are using less pesticides so and that is just an example, so we are using drones as well in mapping fields as well to get an idea how where the nutrients sit in a field so you vary the amount of seeds you can put in the ground and how much nitrogen which is inert in the soil anyway so you can be much more accurate in that respect anyway and map the field using drones so there is that sort of technology and I also think there is an awful lot of potential in harnessing data from farming systems and that data might be anything from the ability to predict yields to predict potential diseases to natural capital” (L3).*

*“The technology is improving all the time, AI in growing is not that far away, we have designed this greenhouse has been designed for that this product will be picked by robots, you just to have to think ahead” (S6).*

Undoubtedly, precision farming and robotics will have its place and with the decline of available workers in labour intensive cropping systems, particularly within horticulture. It is of paramount importance a solution is found and it seems there will be a heavy reliance on robotics but of course there are concerns about the ethics of introducing such systems:

*“within 10 years I reckon 75% of soft fruit will be picked by robots, and that is another worrying factor, so what might happen is the marketing groups get exclusivity of a robot for example and they say we will have this robot and no one else can have it, but there are so many worries as business owner that you just have to go with it” (E5).*

Another controversial application of technology is the use of Genetical Editing (GE) crops and the use of Novel Breeding Techniques (NBTs), a topic which is as divisive in the public domain as in the food production sector. Some FPGs are call for greater understanding of the products in a bid to reduce the application of pesticides and fungicides:

*“I think there needs to be more understanding that gene editing and NBTs are not GM plant breeding and they are quite different and they are essentially fast tracking normal plant breeding techniques by identifying which gene does what in a plant and then breed a particular trait quicker if NBTs and gene editing allowed for more disease resistance to be built in, in a particular variety then bob’s your uncle you use less fungicides.....NBTs allowed for plant breeders to breed in*

*new resistance traits quicker than you could see a radical reduction in insecticide use across the board. I think that one of the things troubling farmers at the moment” (S2).*

Many FPGs can see the positive use of GE and NBTs to mitigate the rapid affects of climate change and see the potential future adoption by Government policy change as positive steps forward for agriculture and horticulture:

*“Genetic Editing is definitely the direction to go, so George Eustice has a really good idea there, he was a strawberry farmer himself he understood what varietal development good do for a business and we have got a platform where we can’t apply agrichemicals like we used to, which is good but the easiest way to deal with that inability to apply agrichemicals is obviously look at better resistance and we are all going through that at the moment we all understand what resistance is.....gene editing is the future, its not GMO it is just simulating the cross that plants would naturally do so that is the way we should be going, investing in science in horticulture and agriculture to be environmentally sustainable which is one of the biggest drives globally, because we have got to be able to adapt and I think the speed the world is changing at the moment with global warming, I think the problem is plants cant react quick enough and therefore we have to deal with the situation of global warming and slow all that down and be able to adapt to feed the world with a small amount of science will make a huge difference to that.....its just that consumer don’t necessarily understand not that they aren’t capable its just that they haven’t been told properly maybe the source is wrong.....In the natural world it is called epigenetic change so the genome isn’t changing but there are an awful lot of epigenetics going on in the world, and that is something you cant stop that is the plants expression, and we go though epigenetic change, people don’t realise that but its true, its is just awareness side of things if they could just understand so Mendel’s peas was the first example of scientific endeavour to understand the natural progression of plants and animal changes , gene editing is just speeding it up. It isn’t to say its bad its just a slightly more efficient process.  
(Dor3)*

Some FPGs however, only see the negative connotations with the adoption of Genetically Modified (GM) crops:

*“The Government are being lobbied quite hard by big pharma people, you know ‘Ph’, saying you know the future is genetically modified which is quite terrifying, politicians are busy people, but they will listen to those that are talking, they like a high-tech solution.” (H2)*

FPGs also discussed the Government's readiness to back the of option of GE crop production as problematic with little consideration for the wider issues within the sector:

*“I am a little bit more preoccupied with where the sort of DEFRA policy is taking us, particularly at the moment with gene editing it just seems to be, if they think that is the solution, they don’t understand the problem. What we are meant to be doing is moving to diversification and what they are talking about is putting another tool in the tool kit and it is not the tool to be addressing the sort of objective of sustainable farming if you are looking at improving soils improving the environment trying to reduce it depends on reducing chemicals, antibiotics, all sorts of issues we are trying to deal with as well as social issues getting people into farming making sure they are paid well, it’s a complete distraction and the fact that have this such an important part, since Brexit this is the first thing which has come out of it as a consultation I just think it is incredibly frustrating, that they have chosen to focus on something like that.” (L4)*

Others felt that with the adoption of such techniques, it may help to boost the organic sector as consumers choose a ‘safer’ alternative:

*I think that in some ways the gov says about how they are going to allow gene editing my possible help me as organic farmer because it might drive people away from conventional farming because they have read a few headlines in whatever crappy paper they read and tell them its Frankenstein foods on the market and they will go and buy organic because organic is never going to be that at all (DE4)*

The main focus of FPGs concerns regarding technology are:

- Precision farming helps to reduce inputs and allows for less chemical usage.
- Some FPGs are designing their businesses around the introduction of robotic systems.
- There are concerns about the fairness and application of robotic systems, with the potential for smaller less affluent farmers being priced out of the market.

- Adoption of GE and NBTs receives mixed response. Some FPGS feel that this is the best way to reduce chemical usage and help plants adapt to climate change.
- The Government are quick to adopt the use of GE and NBTs as a high technology solution to help farmers, but it is felt that the Government do not appreciate the wider issues.
- Lack of consumer understanding will impact the acceptance of GE or NBT crops.

#### **4.2.5 Greenhouse Production**

Technology is already well utilised in modern greenhouse production making it incredibly efficient, one interviewee spoke of how their association grew an astonishing 80 million cucumbers and 90 million peppers equivalent to 75% of the British crop, the benefit of such production systems in the modern day and age are wide and varied:

*“Glasshouse growers are nearly carbon neutral anyway, with water, Co2 & Fertiliser recycling, renewable energy and climate-controlled glasshouses” (H1).*

The utilisation of this technology can also be used to produce crops out of season which are currently and perhaps controversially imported:

*“mostly recently in the last year we have built 6 hectares of glass.....where we are going to be growing strawberries and that fits in to our system because we are also big producers of energy so we have two big anaerobic digesters plants one 2KW and one 3KW give or take provides enough energy to power about 10,000 homes. And through one of the AD plants at Carrington they do produce quite a lot of waste so the digestain waste that gets chucked out at the other end, so to speak, we use it as fertiliser but also they produce a lot of heat so the question was, ‘well what do we do with that heat’ so we built a glasshouse so we can put the heat into the glasshouse, so we can grow strawberries at a time of year where traditionally farmers cant grow strawberries, those strawberries are being picked at the moment and they will be picked in march and in supermarkets from that period onwards, so really just replacing imports” (L3).*

However, despite the potential within this system it receives little support financial from Government:

*“Unlike farmers, glasshouse growers in Britain do not receive any government subsidy or financial assistance, therefore it is only viable if the right price is paid*

*for the produce.... The last time the government provided grants for glasshouse building was in the 1980's" (H1).*

*"there is no funding available, we haven't received a penny, as a new project we could receive funding from the banks.....One of main goals here was to take low grade agricultural land and make it productive, I'm not a fan of taking high grade agricultural land to put a glasshouse on it..... I want to find a way of improving production methods so that the economics of growing in glass house more relevant, and we can become more self sufficient so there are technology grants available, but they need to be made available" (S6).*

A summary of the main points of greenhouse production made by the FPGs interviewed are:

- Is typically a very efficient system which can run carbon neutrally and adopt circular production methods.
- Greenhouse production could produce high demand out of season crops, reducing the need for foreign imports.

#### **4.2.6 Food Standards and Imports**

One fundamental issue for the FPGs interviewed was the problem surrounding food imports, the majority of UK farmers grow under the Red Tractor assurance scheme the main farming and food production assurance scheme, in the UK, which has a mixed reputation amongst those interviewed for the research. Such schemes uphold production standards which are held so very close to the heart of English farming:

*"if you don't belong to one of the certified authorities then you would have great difficulty in selling your stock, that is a kind of safeguard and I think that many a large proportion, a great majority of farmers do keep their animals sensibly and humanely but there are those who don't and they should be rooted out and prosecuted" (No1).*

But many view these assurance schemes as a waste of time due to the lack of consumer awareness:

*“It doesn't work, its nonsense. It doesn't mean anything, if you ask a 100 people on the street what they think the red tractor means, they wouldn't know what you were talking about” (N4).*

There are of course other schemes that growers and farmers register for, but such schemes come with the burden of added costs and added pressure, one dairy farmer working specifically with a leading UK supermarket commented that:

*“We have our Red tractor standard auditing that we have 24-hour notice spot checks, because their argument is, and I agree, that anybody can pass the Red Tractor with 1 month or 6 weeks notice so we get 24hrs and we get a 50-point check. It's a big check, its quite tricky we also get grazing spot checks as well, they come and look at the grazing infrastructure as well the different things they put in place the 120 day a year pledge for grazing is watertight and it would be” (Dor2).*

In an already pressurised industry, assurance schemes can add even further pressure through FPGs meeting the strict grading criteria:

*“For the dairy we have to do a farm assurance scheme and its fine, I quite agree with the scheme obviously we all want to do a could job and be accountable but sometime they just pull you up on such silly things, and you just think I love my animals I look after my cows and we look after them properly and then they pull up on applying for a passport 2 days late and that gets very frustrating, some weeks I work 80 hours, not every week but plenty of weeks I do, its my choice. But they don't realise when you are out there day in day out calving cow's half the night, then you might forget to apply for the passport. If you have a calf born on the farm you have to apply for a passport within 27 days which sounds like a long time but it's surprising the time soon goes, why they can't make a rule that if you haven't applied for a passport within the 27 days you have 2 weeks grace and pay £50. The hassle you get if you don't either you have to shoot the calf, or you have the dam and calf DNA tested to prove it is the calf. They could easily change it.” (W3).*

*“The higher standards you set the higher it is going to cost to produce it there has got to be some sort of subsidy because other countries have subsidies, how can we work without subsidies when other countries do, and you compete against that” (D2).*

Some other assurance schemes help farmers gain a marketable edge for their products and of course, many producers register with organic certification schemes but again this divides opinion:

*“We are a LEAF mark farm, which gives us an edge in some marketplaces” (S2),*

*“We are not certified organic, but we run it organically. I think is there a need? If your business model is around like a direct connection to people and the trust is built up through that human scale level of interaction for me certification is just a minimum standard and it doesn't do anything particularly positive other than if it is selling a commodity and it needs a label to rubber stamp it” (Som3).*

A primary concern felt strongly by many of the interviewees was the lack of support from the UK Government for UK agriculture and these concerns are clear when one considers the issues surrounding food imports.

Firstly, despite the high standards of UK farming the Government still import crops from countries which use chemicals currently banned in the UK.

*“one thing I think is exceptionally important is that we should not be importing food from other countries in the world, who use crop protection products we aren't allowed to use, because you are essentially importing your environmental footprint to somewhere that doesn't give a dam and therefore it isn't a level playing field if it can be sprayed by x, y and z and we can't, it will be a cheaper produce but it will have a worse environmental footprint” (S2)*

and the same interviewee rightly comments that:

*“Why should we take products from countries with poor practice, it doesn't encourage countries around the world to improve their practices if you just buy whatever” (S2),*

which arguably we should be striving for to raise the sustainability of global food production.

One other interviewee commented that:

*“we aren't allowed to use neonicotinoids to protect sugar beet or protect oil seed rape but other European countries are allowed and yet when we run short of product, the first thing they do is import food from the countries that are allowed to use the chemical that we aren't allowed to use. That is one of our main bug bears*

*is that we aren't allowed to use them, yet other countries are and if we run short, we go and but it from them, France is only 20 miles away!" (S4).*

Secondly, the impact of these cheaper imports having on UK food prices further undermining UK's agricultural production:

*"For instance I could send my lamb crop from here to Merthyr Tydfil to St Miriam's and they would then send it back to the Midlands Tesco distribution hub and when it has done about 160-180 miles it would then come back to our local Tesco, about 15 miles away so the model isn't good but equally we looked the NZ lamb carbon foot print they don't rely on fertilisers they have a better climate, they can transport massive amount of de-boned carcasses in a chilled, semi-frozen condition and their carbon foot print is as good as British Lamb, so you could easily point the finger and say we don't want NZ lamb but if their carbon foot print is almost equitable then there have to be other reasons why people would want to buy and whether people in Cheltenham might want to buy from the Cotswold hills above Cheltenham or whether they really care, price is a big factor and ultimately I perceive that people would like to buy locally but they are price sensitive and when they have a family to feed or they are on a diminishing amount of income then cheap food is important to a large proportion of the UK (G1),*

another interviewee commented that:

*"So with our chickens, there are a high welfare standard here to produce them which is good, but then you are still allowed to import birds from elsewhere which are grown at a much lower standard so that essentially undermines what British farmers are trying to do but then if you can still import low welfare meat then obviously most supermarkets and big chains are going to go there, so maybe if that was even across the board and that makes sense to at least buy British, and then locally as best as possible has always been our answer here" (Som1),*

*"One topic at the moment is the Red Tractor farm assurance, there is a lot of backlash at the moment from farmers because we have to go through it whether you are organic or not and an organic inspection is real rubber gloves stuff, they go through all your invoices and everything and Red Tractor is basically just checking that you aren't doing anything illegal or dangerous and they keep upping*

*the red tractor standards, its basically just an old chap in a cap who comes round once a year and you just show him a receipt that if an animal has died on the farm it has been properly disposed of, or your plastic has been recycled or whatever it is. And a lot of farmers are pissed off about that because red tractor keep putting off their standards saying “oh well we are producing premium agricultural crops”, if you are producing milling wheat for producing bread in this country it gets mixed in with imported grain that is got no standards at all and all the buyers in this country say that they wont buy yours unless it has a red tractor assurance sticker, and then just mix it with a load of god knows what grown in cleared rain forest in South America, whatever scheme they come up with it does need to be global and we need to think far more globally which I think is why cutting ourselves off and saying “we are going to be a little independent state and go our way” is not the way the world should be going, whatever emotional arguments that are fore or against it” (D4).*

This comment is a frank and clear statement which really shows how the UK Government’s actions are undermining UK food production, such actions show a desperation to achieve food security through any means.

Again, this sentiment for lack of Governmental support is reinforced by this comment from another interviewee:

*“every government is absolutely petrified of food price inflation we will see the import restrictions relaxed and we will see more and more highly intensively produced food imported from overseas at the detriment to the farming industry as a farming business of a) diversifying and b) getting closer to our market so we can achieve a premium in that way without relying on subsidies or the commodity market, I don’t think realistically that is where we are going to be in 10 years time.(W4).*

These were further cemented when in October 2020, in a post-Brexit vote the UK Government opted for an amendment which would allow the UK to import food from countries with lower food standards than the UK.

For many lessening this lack of support has led to sourcing local supply chains which provide flexibility and security needed for businesses to thrive:

*“we are no longer really exposed to global markets we don’t sell wheat or barley or other commodities so leaving Europe and trade deals with the US are less of a worry to us, and purposefully we are looking to produce high end produce, local produce, so we aren’t competing, so our wagyu steaks are going to be competing with feedlots in the US, or Argentina, so although I don’t particularly agree with the politics of a trade deal with the US and adopting their standards, I feel that we have taken steps to insulate our business as much as we can” (NI).*

So, to summarise the key points from the food standards and imports section:

- The UK has exacting standards, many FPGs are compliant with food assurance schemes, but feel that general consumers do not acknowledge the schemes and there is little Government support.
- Assurance schemes create a high-pressured environment for FPGs, they also increase costs for farmers. Some FPGs felt that some assurance can give their products a marketing edge.
- Some chose not to register at all, particularly with organic certifiers and build consumer trust through local relationships.
- Many FPGs felt that the UK Government’s actions often undermine FPGs, and they want to see a fair playing field for food imports, without offsetting the UK’s environmental impact.
- Unequally food import standards also discourage the exporters from raising their standards.
- The set up of some UK supply chains make domestically produced goods environmentally unviable.
- Some FPGs are avoiding producing for the highly competitive commodity market and seek local supply chains.

#### **4.2.7 The Supply Chain Issues**

Countless numbers of the farmers and growers interviewed expressed their concerns of pressures within the supply chain and many of these issues stemming from relationships with retailers. Primarily, farmers and growers are price takers within the supply chain unable to specify a profitable wholesale price for their goods and reliant on the contractual price set by supermarkets:

*“We are at the bottom, we are squeezed as producers, all our inputs are machinery, seed, fertilisers all produced by big multinationals, and they set the price in the market, we are price takers on that, and we are price takers on what we sell. Just to reiterate, my only way is just to get close to the end market, and try and set a price but we are price takers even on potatoes there is a market on onions its trying to negotiate forward contracts with good customers that allow us to make a profit, with a fixed price a lot on potatoes and onions and my specialty stuff I am doing forward deals so its important to get close to the customer and have a good long track record, were they will give you a bit more because they know you are a good supplier, we are squeezed, we are definitely squeezed, if we can hold the prices year in year out we have done a good job nowadays, to get asked for priced increases you are laughed out the door, the fact that we haven't been getting price decreases on stuff were we are close to the consumer I think that is a result nowadays, I think that just shows you how dire it is.....We are very customer driven, the crops that generate profit in our business and generate sales, we are very close to the end user and that's were we have to stay focused on that and be very adaptable and take up crops if we need to, to do it better and cheaper to keep in to the crops that we are supplying, because we wont get price increases, so we have to just get better and better at doing it, and so for us to be very close to the end user is important and that's were I see we have got a chance of surviving, its providing what the customer wants and providing commodity crops and even potatoes are classified in that bracket are not going to saving as a company going forward, we have got to be very nimble and customer focussed, I think the most refreshing thing we do on some of our crops innately fennel, celeriac, squash is that we are very close to the point of retail and that is vital to cut out a lot of the lost revenue that happens between selling in bulk to the supermarkets.....we don't want to be any closer to the retailer to be honest, we used to sell direct, its not a nice place to be but I want to be just one step back but I don't want to be any further away either..... They just pass costs back, if you are not big enough to say 'no', you just saddled with more and more cost its like being on a hamster treadmill and it just gets turned up every year, at least being indirect or one step back, I can say no” (L2).*

These imbalances are reflected throughout the supply chain:

*“At the moment the whole market is set up to provide supermarket with cheap food and its marketed very well, when actually what a lot of people do is not reflected in the marketing. I think the problem with that whole system there are a lot of farms out there which are producing something and then waiting to see what they get paid for it and if you take the eggs for example, all of our eggs are on contract at the moment for one supermarket so essentially we have egg packers who negotiate with the supermarkets on their own interests so they pick a price and try to get business, at no point is the producer of the eggs ever considered, ‘can we pay them a fair price for what they are producing’ ..... we are below cost of production by a long way, we take all the risk, I buy 24,000 birds at £4.62 each at the start of the flock I then feed them for a month before I see an egg, so we take all the financial risk and then they pay us 5 weeks in arrears for any egg they collect” (D3).*

This price taking situation is also echoed with those who sell more on to the commodity market:

*“every farmer is a price taker not a price giver so we don’t have any say on what price we are selling at in 12 months time, whereas we are putting all our crops in the ground in 12 months time, and with cows its 2 years down the line, we don’t know what price we are going to get and the price fluctuates so much that one minute we are making money and the next minute we are losing money and then it would flip over and we would be making lots of money, from a cash flow point of view for forecasting it’s a nightmare because you don’t know what you are going to get year on year” (No2).*

Furthermore, these issues in the supply chain are not just relating to the price of goods, added problems of dealing with contractual supply issues with retailers and seen with various supplier in both horticulture and agriculture and these experiences are concerning.

*“What it comes back to is being more productive what has happened the supermarkets want to deal with really big farms because they can strip out costs, they don’t want to deal with 10 small growers when they can deal with one big grower, so the way they strip out costs is to go to the one big grower and say ok we will give you orders, if you are a big grower and you are tied in to Tesco, the grower, he maybe a big grower but he is nothing compared to Tesco, so when the come to negotiate, Tesco can manage without this big grower no matter how this*

*big grower is but the big grower cant manage with out Tesco, let's say he produces 2,000 tonnes of soft and maybe he has agreed to sell 1,000 tonnes to Tesco, Tesco can walk away from negotiations but the grower can't he knows he has got to find 1000 tonnes, he isn't going to find a buyer for 1,000 tonnes very easily, so what the supermarkets do is tie in big growers, to the supermarkets, we were a member of the largest co-operative called Berry Gardens, up until about 4-5 years ago, and then because we weren't a great size we were supplying Asda at that time, an Asda said they didn't want to buy our strawberries any more so Berry Gardens said that we weren't big enough so they said bye-bye, we had to find markets that would, when you are a member of a co-operative, it's the way of the commercial world, the big people get priority, really over the smaller people, you don't have a voice if you are really small" (E5).*

This situation of retailer's cut-throat relationship with growers is not uncommon and leaves producers vulnerable to losing their market at short notice and ultimately not being able to shift their produce.

But still, similar issues continue to unfold:

*"but the percentage profit on turnover isn't very large, even 1 or 2% but they are very successful, in one of the most competitive retail markets in the world, I think we are the third most competitive in England after China and America, the NFU did some research, our retail food sector is amazingly competitive, whenever you ask a supermarket for price increase, which we don't any more, they just flip it, they ask 'what are you investing to take costs out?' you know it's a no! we have done well to not have price decreases, I know some speciality lettuce producers that are growing at half the price they were 20 years ago but, yields have gone up, they have got better at it but they still aren't making anymore money but that is market places when you have got huge powerful, or course we competing against each other of course that's other the silly thing, in standard carrots, speciality greens and brassicas there are some fairly large players, who will compete against each other for market share, driving it down and supermarkets move it round like a merry-go-round..... The more generic producers, carrots, brassicas, they would feel a lot more squeezed than we do, they are competing at a much more competitive market than we are. The brassica industry is very picked on and there*

*are very few players left, huge turnover and no profit, they are under very very slim margins.....Very labour intensive, a lot of brassicas are hand cut, calabrese, cabbage most are hand cut, huge labour costs, going up every year, the minimum wage going up 4/5/6% a year, and no price increases, seed going up, fertilisers going up, land rents going up and they are out competing custom with themselves, and pushing prices down and they are incredibly squeezed.....its very frightening, there are only 6 or 7 left in the UK now but they are big firms, you wonder why they bother..... I don't know where that will end, it will get to only a handful a few more will drop out, and then they will probably be able to set the price a little bit more, there will literally be 3 or 4 in the country, you know food has got to go up at some point. We did grow some brassicas 15 years ago and it was painful then, and it hasn't got any better. Buying more seasonally would certainly help, a lot of packing companies, brassica growers are subsidising that out of season stuff with their own production, they are giving a year round price, flying in expensive stuff from abroad out of season and then getting less income from their own stuff produced in the UK to average out the price, they are subsidising that, they grow their own in season, then they are tasked with producing a 12 month supply so they have the responsibility of the imported season at higher money so it just devalues production in their own season" (L2),*

This a particularly concerning situation for vegetable producers, who become contractually obliged to supply goods to supermarkets for a 12-month supply at a cost to themselves and a detriment to the crops they produce. These other crops are often flown from the southern hemisphere to fill the gap between domestically grown winter crops and the summer season, not only does this seem unethical, pushing for a narrative of unseasonal produce but also environmentally unsustainable through the transportation methods of these crops.

Unfortunately, this is not an isolated incident:

*"you also have America so one of the things supermarkets insisted on was having continuity at all times, and certainly between the late 80s though to the mid-00s less so now because they are trying to distance themselves from this they insisted that you had to have availability 365 days a year and if you didn't you could be potentially be losing some of your business, so that created the non-sustainable imports from America, we have tried to make it as sustainable as possible because*

*we have tried to make it a better story than it is because it is a bad story, you have grown watercress in America, you are putting it on a plane and flying it back to England, that is mad, it is mad now but 10-15 years ago it was less crazy, 20 years ago it was perfectly normal, maybe a bit strange but not bad, so what we do is put it on to the cargo hold of the airlines coming back from America, Virgin flights, Virgin Atlantic they have passengers flying backwards and forwards, 15 flights a week and there is nothing in that cargo hold, and they sell it really cheap so they make financially sustainable for us, so what we do is cut it this morning, load it on the flight tonight, and it would land tomorrow morning and then we can have it on supermarket shelves in 24-48 hours. So, it is a really fast process, but its not a sales point anymore, is it? People don't want that but that is how our business is set up, so at one stage when sales demanded it we could be bringing in 600 tonnes from America every year, this year we have probably brought in 120-150 tonnes there have been a huge drop in air freight, that's probably going to continue because the passenger airlines aren't going to Florida, maybe 3-4 flights a week and we have only brought in on 3 flights a week. That is an interesting kind of model how a business has to be forced in to this and we won the entire account for one supermarket on the basis that we won that farm in America because that is what they wanted but now its less so attractive but now they still want the sustainability and the continuity of supply and we have become used to that as well I have tried to, in the last 12 months tried to sell all of our American watercress in America but that was proving extremely difficult, its bizarre you think the size of America you would sell it easily but you just couldn't. its catch 22, what do we do, you can decide what is better what isn't, but we are still trucking it from Spain it is a two day shipment time its on the road for two days its quite common place, 10s of thousands of trucks come in from Europe every week, and what we are doing hopefully is providing a high nutrition, healthy crop and that is our only positive is that we are distributing that product to the UK nation and it is really healthy and they are consuming half a million bags a week of water cress which is a nutrient dense product.(Do3).*

Consequently, production has been reliant on winning contracts with retailers, who now distance themselves from environmentally damaging production methods. Despite the huge

investment of companies to win contracts for 12 months supply, the infrastructure to meet tight supply deadlines is no longer needed but growers are invested in this production system.

To summarise the supply chain section:

- FPGs are price takers both on the inward and onward supply chains, big multinational companies set the costs of inputs.
- All risk and investment is placed with the FPGs.
- Supermarkets prefer to deal with one large grower but can make FPGs reliant on the relationship.
- Horticulture is a highly competitive sector, UK growers are often contractually obliged to supply out of season, foreign imports for 12 months of the year. Which often undercuts the profits from their domestic produce.
- Some sectors have not seen price increases for 20 years due to supply chain power imbalances.

#### **4.2.8 Supply Chain Solutions**

But farmers and growers have found their own solutions to these pressures many farmers and growers talked about sourcing local markets and growing for a specific end user:

*“over the last 5 years now what we tend to do we sit down with the people who are going to be buying from they aren't always the end customer they are the intermediary we sit down before anything goes in the ground we talk to them about trends, we talk to them about the lines they are having success with we try and do a projection of what their needs are going to be over the next two years, and that's what we put in the ground at one stage we used to grow what we thought people would want and go out and sell it afterwards but as I say the last 5-10 years has been far more collaborative process and one of the great strengths of the people we are dealing with now which is anywhere from the artisan bakers to mills, particularly on the grain side is they can visit the farm throughout the year and see how the crops are growing and they can deal with a bad harvest or a good harvest and they adapt their recipes and they way they sell their produce according to what comes off the farm, it takes a lot of the sort of natural variation of supplies out of the equation and I think if we were producing, lets say we had a contract with the*

*main supermarkets for supplying carrots for a certain amount we would have to over produce to ensure we were going to meet that which means we new either going to have a surplus at the end of it or if we have a really bad harvest we are going to have to buy in to fulfil that contract and that is not how working in a natural environment works, and they small local food networks are actually more responsive to the variables that we deal with.” (L4)*

This approach to local supply proves how farmers can remove the volatility firstly in the crops they supply and the prices they receive and secondly adapting to the changeable weather patterns that is bringing even more turbulent conditions to modern farming. Creating such crop diversity and product adaptability will play a vital role in modern farming, and many prefer this method of supply, building a stronger local market and avoiding the volatility of the commodity market:

*“I am trying to get to a stage where we grow stuff that people actually eat, because 70% of the grain we produce is fed to animals, or it’s put into industrial processes to make bio-petrol or what ever it’s called, which is completely bonkers. We are currently working on trying to grow food for local people, it seems a sensible way to always make sure we have market for what we produce, this time of pandemics you realise how fragile the food system is, the government is talking about rewilding and importing food from abroad, which is all very good when everything is working nicely but as soon as there is something wrong in the system then everyone goes hungry then you are in trouble, we grow what there is a market for but I would rather create or develop a local market. (H2).*

The following example proves how small-scale markets allow growers to be responsive to their local markets and work with consumer trends, unlike supermarkets which quite often dictate product availability to the consumer:

*“The good think in being small and growing retail you soon get to know if people don’t like a product, you get stuck with it basically.....but we are selling to the end user, we really understand what people want, people wont buy it from our stall if it’s not what they want, the supermarkets tell people what they want but its not, actually we can find a niche, they the supermarket don’t think its worth it, and we find people do want it, but we are told by the supermarket that nobody wants it. We are very responsive to what people want, every year we assess what we are selling,*

*what should we plant more of what should we plant less of, we are doing this all the time, its really having the retail part, that really helps a lot in that” (E5).*

By developing local markets allows farmers and growers to chase the higher yielding profits and niche markets:

*“So, we are looking to produce for niche markets and get close to the market that we are selling into. So, some of our milk has started going into the Jewish community, so we have just tapped into that market as well. So, we have 3-4 Rabbis who turn up and watch the whole milking process, that’s an interesting one but it’s a niche market, supplying into London. We are exploring any smaller niche markets I guess, so the big processors, so the Arla’s of this world we try and stay away from them” (W1),*

*“I don’t like markets as much because you cant base the cash flow over the course of a year, you can produce more stock and put it on the market, but you can get hurt you can run lambs in one week at £45 and the next week they are worth £95, every lamb we produce we get a set fee for, when we put them through the butchery they are worth £85 to me and that is how we stipulate it, and we sell them out at 100% or above that to cover all the labour costs in the last but that only allows us to do a certain amount and that is more profitable than doing larger quantities if that makes sense” (C2).*

By creating a smaller supply chain this also allows for growers to be inventive with their products, helping to reduce waste products and further increase profits:

*“We grow one particular variety called ‘Piccolo’ which is very sensitive and we get to much waste, to many spilt tomatoes, to many which are to small or too big, but they are exceptionally flavoursome there are varieties which are 99% as flavoursome, but they aren’t quite as good but the waste difference on them is enormous.....We get up to 10% on variety and another variety would be 2%. For the supermarket the flavour is the dominant factor, and I get that, and I wouldn’t suggest that we would switch..... We have only been operating for 2 years, we have tried to be innovative, we sell tomato juice, so we have a meeting next week with a company making tinned ‘Bloody Marys’. We have developed a local sales brand, so started off just with community shops, even to this today we sell at a discount price, lower than what we get at the supermarket, at most we get*

*50% of the supermarket price, we have a two tiered pricing system to the community shops so they can sell on for a cheaper price, and still make a good profit. So, for the supermarket it is all vine products, what I primarily sell on to the local market is the loose and offcut products” (S6).*

*“what is happening is that you grow watercress which is 45-50cms high and you only take to top 10cms, and we then sell that, and the reason we only take that as it is the maximum length we can get through these machines, that pack the bags of salad so we said why don’t we sell bunches and then we said why don’t we take all the stubble all the waste material and start converting that into other products so we started a watercress research company which is working with Cambridge university which is trying to find new solutions of how we are going to utilise water cress so we have several avenues, firstly we are taking the waste and combining it with other ingredients to make blocks which are soup blocks, and we can sell those to the NHS at a really low price and they get masses of vitamin C and calcium in these compressed blocks which contain all the other bits, potato, onion, the stock and all you do is drop the blocks into hot water and you can serve it straight away. So it is a fresh- frozen, frozen-fresh solution for the NHS, so we want to produce 5-10 million portions a year that’s one part of our sustainability and the other part is we take the waste we put it through a processor and we extract this liquid product which we can then use in the healthcare industry, its particularly good when incorporated into wet wipes, so we have done some research and patented a process which extracts and anti-inflammatory response in watercress juice which has been stabilised and it can be put into wet wipes particularly incontinence ones, for children or the elderly” (Do3).*

Some suppliers based in the East of England work alongside the East of England Co-Op, a regional supermarket chain, which runs a ‘direct to store’ supply chain allowing producers to deliver to local branches, this has proved a popular choice for growers in this region for several reasons:

*“The supply chain is unusual in that we grow and pack, our soft fruit on the farm and deliver it directly into stores, we deliver into 55 East of England stores, and several smaller shops and farm shops, all of which are in Suffolk. So, the supply chain is pretty efficient, most of it is local and it works really well. We just deal*

*with the East of England co-op which is one of the few independent supermarkets in the country, it is still linked the co-op umbrella, but it is and independent business with that, and we deliver into smaller shops and farms shops on route that we can find. It has evolved, it took a few years to work out supply and demand balance, but the last 2-3 years we have managed to have a supply from early May to mid-September, late September without any breaks. Strawberries are a short crop.....The value to the co-op is that they are getting a product which is very fresh, because we know we have a short supply chain we can allow the fruit to ripen up on the plant a little bit more, and the customer gets a much better product and we do get some really good feedback. Before we got involved with the co-op, I was part of a larger fruit growing group, in this region there is quite a lot of fruit growing, we met up with either Sainsburys or Tesco we wanted to arrange to supply them with all their soft fruit throughout the growing season directly to their store, and they logistically they couldn't do it, it wasn't possible for them to receive fruit directly to the store they have to go through their warehouse" (S5).*

Many FPGs create their own solutions to supply chain volatility, and this is achieved in several ways:

- FPGs build relationships with clients further down the supply chain which allows for crop and product flexibility.
- Numerous FPGs are focusing on growing food for local supply, concentrating on crops which have a higher demand.
- The COVID-19 pandemic highlighted the fragility of the wider food supply chain for many FPGs.
- More diverse crop production allows FPGs to produce crops and products which generate higher profits and sell into niche markets.
- Also, FPGs can utilise more of what they produce with more relaxed product specifications of local markets compared with supermarket criteria and generate income from previously perceived 'waste' products.
- Supplying products locally allows for a fresher and riper product which creates higher customer satisfaction.

## 4 2.9 Consumers Issues

The results from the interviews showed that FPGs are aware of the issues that surround consumers and the disconnect that the general public have with the England's food system:

*“People think either farmers are very rich or farmers are always complaining and I think there is a massive gulf between the perception and the reality of coping with the day to day, and the fact that people don't think about food and the fact the people think that they still want cheap food and how can food be cheap, it shouldn't be to cheap we are importing cheap food often, there is the environmental side.....It is quite challenging. I think that's why we got involved in the education and its amazing the ignorance of teachers, you cant believe of the lack of knowledge, I mean you would laugh sometimes but it isn't a laughing matter but it just shows that people are going to supermarkets and picking up plastic wrapped stuff and not knowing at all about the food they eat, where it has come from or how to cook it or anything about a healthy diet, its quite frightening. We get some amazing letters from children, it's a real eye opener. There is a reason why the harvest time was a great celebration because they knew how hard the harvest was. Nowadays what does the harvest mean to anybody, I mean we have had teachers say they didn't realise that cows needed to have calf in order to give milk, they thought cows just gave milk and that is a primary school teacher, we had one who was a primary school teacher and a mother! But that just encourages us more and more, it is hard for some farmers to do what we do, we can engage with all ages and that part is what we have always done” (Le1).*

The clear loss of consumer knowledge having evolved from as an industrialised nation has led to what was once a celebrated annual event to the consumer having little concept of harvest time or the seasonality of products, which it could be argued, that the retailers have exacerbated through the supply of unseasonal goods.

There is also further understanding of the more acute issues of the food production system. It is the problem with food quality. The farmers perceive the food quality as poor due to globalization of agri-food system and blame the government of not acting. The farmers see in their pictures of the world the existing food system as unfair against them and also against the consumers.:

*“We have a system which is against people getting healthy food, our food system is in a mess, people get poor food and there is no regulation of that at all and on the whole because we are into global agriculture and supply chains that obviously affects farmers here and what they might grow” (G3).*

As well as this awareness, farmers and growers see the multiple social issues which are affecting the consumers and primarily that many consumers are forced to be price driven:

*“People aren’t prepared to pay the real cost of food that is the problem, they need to understand more about food is produced and what the real cost is. With Brexit whether we were going to hang on to our food standards and I think that is vital, because some people can’t afford to pay the cost of good quality food, I don’t know what the answer is to that really.... Supermarkets always push down the price of food so customers will go in and buy it, food on the continent is a lot more of expensive” (D2).*

Farmers and growers feel the long-term effects of the retailers pushing the narrative that cheap is best over quality, with many households prioritising over goods over the cost of the weekly shop:

*“What does the average household spend on food, 8,9,10%? And it used to 15, 20, 30% and if you went back to age of subsistence farming it was 100% of your income by default, there is a price to be paid for sustainable agriculture, it is likely the more sustainable it is food would go up in price” (S2),*

Another farmer commented on the relationship between quality and price. The farmers see low prices as a symbol of poor-quality food. But the system is based on the aim to get the cheapest prices:

*“a whole generation of people have been completely brainwashed to think cheap is best, we are constantly told that Asda is cheaper than Tesco and Aldi is cheaper than Asda, its cheap, cheap. There is very little drive on the quality end, come and get this its fantastic, its always about the money” (N4),*

This approach to food pricing is a race to the bottom, chasing ever lower prices has come as a sacrifice to production standards and as previously mentioned the quality of imported foods:

*“even people who can afford it think it is really good to buy a cheap chicken, they have no concept of animal welfare because they have no idea about production of food because they have never been to the countryside and ever spent any time working there, because we have been an industrial nation for so long we have a lack of connection with food production” (Co2).*

*“So people have lost the ability to think about food and I think the supermarkets are responsible really, and what actually is good for them and nutrient dense food is probably quite hard to come by unless you have time to source it locally and carefully and we try and do that a bit, its time for us. Something needs to change” (Do2).*

There is an obvious lack of food preparation skills from consumers, and this was o mentioned by those who supplied meat boxes to consumers. When asked farmers talked about the challenges they faced when offering a meat box direct from the farm to the consumer:

*“it really was dealing with individual customer requests that sort of thing, we put in a chiller room and a freezer room, we said to people ‘look an animal is made in a certain way’, the butcher presented it back to us so you had a full quarter joint an rear quarter joint, steak that sort of thing and most people brought into that and they just had a little bit of everything, particularly we had some people who said “don’t send me any more brisket, because I don’t know how to cook it”, what we were missing was providing people with recipes to say this is what you have got this is how you deal with it, what we found was it wasn’t that well matched up to how people run their lives, so they get how at 6pm and bung something in the oven and 30mins later they have something, whereas a lot of the meat that was in there needed a lot of planning ahead you wanted a slow cooker, to work with those. We started working some local restaurants and that worked well to start with, they said they will adapt their menus to what comes in the box, which was great but then then they just wanted us to send them steaks and if we took all the steaks out there is a lot of customers out there who aren’t going to be getting steaks. In the end it was just far easier for us to send the animals away the thing is it’s a whole different skills set and different resources to be customer facing, you need time and you need staff to deal with that, and we found just running the farm was a full time job, and we didn’t really need the added complication of that as well. In theory it sounded*

*really good, we had a huge amount of demand there, we invested and got registered with the environment agency and talking with other people who went through a similar cycle for about 5 years, and they worked with it but in the end, getting the numbers to add up is quite difficult” (L4).*

The complexities of a customer facing position is not always a skill which comes naturally to everyone and such dealings with consumers requires time and effort to keep the supply chain. Another issue causing many farmers problems is misinformation spread by media and abuse received online. The misinformation spread both on social media and via other media platforms has a damaging effecting on the portrayal of the English farming sector:

*“The general public are misguided on what they see, what they understand and what is reported through the media, and how can we get them closer to that and where their food comes from. So we started doing direct sales.....I mean there was a programme on the BBC, talked a lot about the impact of farming and climate change but weirdly only focussed on what was going on in America I think it was wrong for the BBC to portray that, it was portraying the industry in this country as doing similar, but actually it needs to be if you buy a certain product with a certain ingredient in it the impact is going to detrimental to the ecosystem or habitat or whatever, but actually I think, buying more locally, understanding where it comes from and making that connection. (L3a)*

One other farmer commented that the impact of this misinformation has on English farming, particularly the comparison with foreign farming methods, despite many UK farmers working at a minimum to the Red Tractor standards, with some going beyond these standards:

*“probably the general public and the vegan army they think farmers, especially in this country, a rich country and people will talk and they think most farmers are damaging the environment with how we operate and animal welfare and they don't know we are heavily audited in this country, I would 95% of farmers follow red tractor, so we get inspected and on the arable side its against our work policy to damage our soil because that is what gives us our crops, the yield and the money, they sort of perceive that we are killing the environment or damaging the soil, its misinformation that is being spread which is creating a real barrier for us, there is quite a divide between us farmers and the general public, so that is quite a barrier to re-educate them and the vegan army and the soil association the send a lot of*

*mixed messages, wrong messages the BBC are a prime one with their anti-meat campaign they have had the last year all their documentaries focus on north & south American beef production which is a world away from our grass fed beef”.*  
(No2)

Sadly, some farmers talked of the abuse they had received online because of misinformation and lack of consumer education:

*“We had trouble with vegans trolling us, a couple of years ago, it got quite bad at one point. Ironic because we have very high welfare, but what I got from that was people who did actually bother to phone us up about the farm they didn’t have a clue, that made me realise we don’t educate our children on food and farming it is fundamental, it is so important to understand how to eat food healthily, sustainable food, where does it come from, and allowing people to grown up and make their own decisions, rather than have some crazy militant vegan making all of this stuff up on the internet which teenagers are believing because they don’t know any different (S7).*

The potential for misinformation can create an impossible environment for farmers who work to supply, high quality local produce farmed using sustainable methods, and such a situation is heavily influenced by the Governments lack of support for English farming and not supplying a clear message as to what is sustainable and healthy food production, whatever choice that maybe.

The impact of consumers choices greatly affects the farming sector and countless FPGs feel the affects of the disconnect and lack of education surrounding out food system:

- Strong disconnect with food system effects consumer choices some FPGs work hard to educate local communities about food production.
- Consumers do not necessarily want to pay for the true cost of food production.
- Supermarkets promote low prices, encouraging consumers to opt for cheaper prices often at the detriment of animal welfare.
- Average household budget for food has rapidly decreased in recent decades.
- Consumers prefer to choose products which easy to prepare or familiar.
- FPGs need different skills to create a customer facing aspect to their business.

- Media narratives on farming and food production can negatively influence public perception of the English farming sector which has resulted in some FPGs being trolled online.

#### **4.2.10 Consumer Solutions**

There are solutions to these negative affects of the loss of knowledge and skills that has a deep impact on modern consumer choices and many farmers and growers see their role in influencing change to resolve these issues. The farmers see such solutions in reconnecting farming and consumers through various channels for example education and local supply chains. Such an approach can improve perception of the farming community and improve the consumer producer relationship:

*“we believe there has been a real disconnect between consumers and farming, people really don’t understand or they have lost, knowledge about farming and we feel as part of our roll is to without being patronising is re-educate them about farming, get them on to farm to get them to understand how we farm, what we farm, why we do the things we do, so we have a better relationship with the end consumers. Now I live in London, and most of the people who live around me haven’t got a clue how crops are grown and a lot of people still think their milk comes from Tesco, there is a real job to do to engage people and part of what we do in that journey on the land we have a lot of empty farming buildings so we have renovated those farming buildings, we have holiday lets, yes its nice for people to come and stay there but when they do come to stay we make an effort to have a look around the farm and take an interest in what we do, so we trying to build much shorter supply chains with a much closer relationship with the end consumer” (L3).*

A call for better understanding of seasonality and sourcing of domestic produce, would reassure farmers that there is a keen demand for UK produce.

*“I had an interesting trip around a large asparagus grower in Herefordshire, a couple of months ago, and we were questioning him whether he wanted to create all year-round asparagus. And his response was “No I don’t, I just want a really good price for my in season asparagus, I don’t want to help facilitate all year round asparagus, I want there to be a short window if English asparagus and everyone pays really good money for it because its seasonal, and I’m more than happy for a modest amount to be flown in from Chile, which is generally inferior because its*

*been flown in and grown somewhere else therefore you remove the special nature of when it is in season here”, and he was absolutely convinced that trying to do something here all year round was just a race to the bottom, he was convinced that it would be an inferior product so what was the point. A lot of vegetable and salad producers would be looking for 365, but then you are selling an inferior product which people are getting bored of. I think seasonality needs to be taught to consumers, and a few empty shelves will show them that you can't have it every day. That would chop a load of co2 out of the supply chain wouldn't it! (S2).*

This comment is reinforced by the early statement which discussed retailers need for vegetable producers to supply a 12-month contract despite the generally inferior quality compared with in season domestic product the CO2 emissions associated with that supply and often at a cost to the producer considerably cutting their profit on their own product. Another huge issue in the food supply chain is waste, but farmers of premium products feel that consumers are more respectful of local products, strengthened by the relationship of a local supply chain:

*“is it about a third of food is wasted, I think that makes sense when you can buy a chicken in the supermarket for £3, people don't really think about it, bit I would be surprised if any of our customers chucked theirs in the bin knowing that they paid more for it but they also have that relationship with us, a lot of them have walked the footpaths around the chicken fields so I think if there is that relationship between farmers in arable, veg livestock or whatever and the people actually consuming the produce they would be less likely to waste it”. (So1).*

One particular farmer discussed his supply chain and the steps he took to avoid wastage and issues mentioned early with the supply of meat direct to the consumer:

*“So we have spent the last few years trying to remove ourselves for any type of commodity markets so we don't sell anything on a contract so we know every person that has brought something from the farm so that might be a meat box, that might be a restaurant buying three pigs a week, it might be a bakery buying half a tonne of grain every two weeks basically we have just tried to put a human scale to everything and the most steps would be for the pigs going to a restaurant so they go from us to the abattoir, to a butcher to the restaurant, that's the most steps in the chain, everything else we deliver. I find the wholesale a really useful way of getting the business rolling, so ultimately you just want pork boxes, its difficult to*

*get you production to producing 2 pigs a week throughout the whole year without having a ready made supply so its good to get yourself going, you can build a business on a restaurant saying that they will buy three pigs a week and then gradually build up the other side of the business, the principles apply to both and the rule of thumb is that we don't work with anyone who wont buy a whole carcass from us and we are lucky that the pig is versatile and smaller than a cow, but ultimately whether its veg or poultry or pigs or whatever it is consumer behaviour which has to appreciate that if you want a certain type of production then you can't have the same kind of food behaviours that you have when you just nip down to the supermarket, I think its also our responsibility to force that type of behaviour and actually we were worried at the start when we first started doing it but what we found was by putting gin that red line in it immediately filtered out anyone that wouldn't be useful for us to work with, we would only work along the same lines as us and shared the same values, and it was a benefit to do that and so with the boxes it was the same thing, which is why we do boxes and not individual cuts so we might kill four pigs and make 18 individual boxes but each box is balanced there is nothing left.” (So3).*

This type of supply chain is an archetypal example of how producers can influence the change needed in the food supply chain, by building relationships with the wholesalers and public alike to ensure that food produced is well respected and wastage is minimal. Another example of farmers tackling the issues with the supply of meat boxes:

*“People like to choose it is amazing how people choose different things some people love mince and others hate it. If there has been a telly programme on with a recipe for brisket, suddenly everybody wants brisket, when no one wanted brisket before, it is quite fickle in that way. You get to know your customers and what cuts they like, and I am slowly building a database of customers who want to be contacted when we have a fresh meat day or a special offer on. I will send out different recipes and then that helps as well, if something isn't selling well you can send out a recipe and that tends to shift a bit more” (De2).*

The loss of knowledge and food related social skills as had a fundamental role in the modern food system, but celebrity chefs have played a huge role in the resurgence of such skills and inspiring the people to cook from scratch at home.

*“Customers make that choice there are many different factors, freshness, taste, and they are also tuned into organic production and what that means and the whole sort of local thing are people willing to pay more, are they used to cooking from scratch and that whole side of it. The likes of Hugh Fearnley-Whittingstall and Jamie Oliver have done huge work for public education in food and making cooking fresh much more accessible and much more exciting and I think that connection with food production, getting youngsters involved and slowing working though and keeping the message going through TV and media, a lot of work to be done and a lot of progress” (W5).*

This contribution has even more clear during the pandemic when many chefs in the UK created programmes filmed on mobile phones using simple to hand ingredients, to help people to cook at home during lockdown, making use of readily available ingredients due to supply shortages of lockdown. The effects of these influences are discussed by another grower who sees that crop demands have changed:

*“As customers have ventured away from more basic vegetables” (L2).*

For many the importance of a strong local economy is vital and countless farmers see that supporting other producers is just as important as their own production

*“We support 20-30 local producers making jams, chutneys, pickles and gin and cheese we have helped to launch quite a few businesses as well, of local people. I think a lot of people were changing to shop more local and be more aware of what they are eating and then the covid hit and then that helped people concentrate more on what they put into their bodies so you I think small businesses and good produce has had a resurgence now and that cant be bad and if we all help each other a bit it makes the world go round.” (B3).*

But public feeling can be a challenge for many farmers and growers and building the local connection and relationships has proved to be difficult:

*“at the beginning it was definitely trying to find people that wanted to buy organic and pay a premium for it and that gradually built up through word of mouth and door knocking, advertising locally, there is the demand out there but its trying to find the people who want to buy it is one of our biggest challenges and then right at the beginning in 2002, public perception was still right on the edge about*

*organic so it was changing that as well. And then engaging with people on a public forum, videos and things like that, interestingly covid has been really good for us because its has got people thinking about where their food comes from and as a last resort getting something from us rather than getting it from a supermarket, I think it is changing peoples shopping habits, once they do hear about it most people do want to support good food and animal welfare, British farmers but it often isn't convenient so its changing those habits.” (So1).*

A summary of FPGs consumer solutions includes:

- FPGs acknowledge the importance of engaging and educating consumers and the promotion of quality seasonal produce.
- FPGs work hard to engage local consumers to create local supply chains and feel that the consumer has greater respect for local food.
- Celebrity chefs can influence consumer choice and change consumer demand.
- Numerous FPGs mentioned the creation of a local network supporting other FPGs.

#### **4.2.11 The Labour Market**

Labour is a contentious issue in modern agriculture, with many factors contributing to declining employment uptake. This of course was an issue discussed with interviewees but there was little positivity from those interviewed. Some farmers talked about their passion for the sector and how the career choice is more than a job but a way of life and the many generations of families working the same land allowed for skills to be passed down:

*“Steve loves farming and he wanted our children to be brought up with that knowledge, because once you lose that knowledge of the cows and animals and the ground then it is lost forever” (B3).*

A few talked about the efforts they went to create a healthy work environment, one dairy farmer who moved to cheese production talked about the creation of the benefits of a healthy work environment:

*“One of the things I have had to learn of the years is to become better as a team rather than a single player, I am now having to think as a team of people, and your mindset has to be totally different to get good people at your farm the culture has to be good, it has to be clear what we expect form everybody to behave and act*

*like. Ultimately if you have good business culture you attract good people, in turn it helps the business grow more” (S7).*

Creating this healthy environment is vital to keep staff, which is a vital issue in modern agriculture, one mushroom farmer talked about his efforts to create a healthy work environment and the effects of the pandemic on staff and the stresses it placed on the employees:

*“but my staff have been brilliant, I am of very unusual , maybe because we are family-run but we don’t have much staff turnover, if you talk to any other mushroom farmer they will talk about 40-50% turnover, I don’t not have anywhere near that I try to have no turn over, they were so on board, foreign and English, they obeyed the rules, you cant very easily isolate in a mushroom shed, you just can’t and we were very vulnerable and we still are but we kept going, and everyone was brilliant we had an unprecedented demand for our product we could have grown  $\frac{3}{4}$ / $\frac{5}{5}$  times the amount of mushrooms and I still could have sold them so when we got over the summer everyone got a very large bonus, in appreciation of their work and dedication which I wanted to reward.....we are small enough that I know everybody, I know their problems, and help them out with they are moving house or problems with paper work or tax issues the support is there, I pay over minimum wage, which is unusual in this industry. If someone wants to return home, they will find me someone to fill the job I never advertise” (S8).*

The negatives riddle the labour division of agriculture and horticulture in England this pressured sector and sadly there were many negative comments when interviewees discussed the issues they faced. Firstly the lack of uptake of employment from domestic workers has always been a key issue:

*“there is no point putting down 10 acres of cauliflower if you haven’t got he labour to cut it and that’s another issue, all the Eastern Europeans being banned from coming to Cornwall, because they say we can find local labour, well the local labour is crap they haven’t a clue, nobody wants to work seasonal work, they don’t have the stamina, they don’t know anything about the land and they aren’t interested they want to sit behind a computer, and move their right finger that’s all they want to do, and they don’t want to actually get up early and cut cauliflower” (Co2).*

This lack of interest from local labour is the driving issue, the seasonal nature of the work offers little financial security for workers who are reliant on a steady income, such seasonal gaps have since been filled with work from other sectors, which have been lost from rural economies, either lost or industrialised. Also lack of promotion of the sector has affected the perception of farming with younger generations who do not see agriculture as a viable career choice:

*“I think that is an issue is opportunity for younger people or lack of young people entering the industry, quite a lot of youngsters don’t see agriculture as a good career opportunity that they good be going into” (Le1).*

The pandemic provided the industry with a snapshot of the capabilities of domestic workers, through the UK Governments ‘Pick for Britain’ scheme, giving furloughed workers the opportunity for paid employment in agriculture. The combination of Brexit and restricted travel resulted in a severe slump in workers and many feared crops would go unpicked as a result. However, there was not much of positive response to the scheme:

*“What gives me fear, the Pick for Britain scheme in the summer, I employed 15 people on furlough, they all lasted about 10 minutes. One particular batch of about 10 people, maybe I should have vetted them better, they all applied independently, more of half of them knew each other, they used it as a meeting point, which wasn’t allowed at that point, we had to sack most of them, because they wanted to film themselves doing dancing for TikTok, instead of working. We can employ more British people and we would like to; we have to take it with a pinch of salt, it is hard work, people have to work 3m in the air off a platform. We are encouraging anyone that works for us to apply for status to work in the UK, because it is seasonal labour will be harder to come by. One of our ways around this is to employ more full-time people, and if you are a grower all year round rather than just, for the summer months, you need less seasonal people.” (S6)*

*“I had two English people, who started with me on Asparagus, one lady, one man, when they finished asparagus, they didn’t want to do strawberry picking, in fact, she had some savvy she went into the packhouse and helped in the farm shop, the man helped at the farmers markets he was in his 50s, he had to do half days for asparagus cutting, and in the end I cant do this anymore, basically we worked for about 2-3 weeks and then said, I cant do this type of work anymore and youngsters, give it about a week two weeks and give up. English people want a relatively easy*

*life, I wouldn't say this on TV or radio, its hard physical work its dirty, you are working in hot conditions, we start picking at 5/6am there are easier ways to earn money, and Eastern Europeans come here because the work there is worse there than here and they get 20% in pay than they get here". (E5)*

The seasonal nature of the work creates issues for employers and is a key driver in the lack of domestic uptake. Employers can look to stagger crop harvest but there are still certain months where there is little work:

*"The problem with horticulture is we need a lot of people working during harvest time, soft fruit on the UK nowhere near fills the whole year, you wouldn't want to have a career which only fills 6 or 7 months a year, this is something we struggle with. In the past we have grown runner beans to extend our labour offering into the autumn. The first year we didn't do because we extended our strawberry crop, but we will probably do it next year under covers, but even so we still have 3 or 4 months of the year where we can't employ anybody, because there just isn't the work, that is challenge, maybe we could work with other business who require labour during the winter months. (S5).*

*"a good source of reliable labour, its not really fashionable to be going into farming, and agricultural, I might rephrase that I think it has actually got a little bit better, I think food product and farming has a better profile than it did 10 years ago". (S2)*

For the majority though relying on domestic labour leaves farmers with little confidence in the future productivity of the sector but the of course the alternatives offer little comfort:

*"Labour is the biggest issue, if the government said you can't have any more Eastern Europeans, I would close the farm tomorrow, I wouldn't even to try to run this farm with English labour, every farm is like that and the government knows this, they won't say it. They are being told this all the time, English people don't want to go and cut flowers down in Cornwall or cut leeks or pick brussel sprouts, they just don't want to do this sort of work, for the time being we have to have Eastern Europeans to do it, the Government have increased the scheme that has just come in that has allowed for 30,000 places, for this year. We can also use labour that has applied last year, so those you picked for us last year, as long as they filled out the right forms they can pick for us again, but slowly the pool of*

*labour will go down and within 3-4 years there will be robots starting to pick fruit, it will probably be on a per kilo, so you wont buy the robot you will rent it and there will be a royalty charge per kilo picked, you wont buy the robot that won't be the business model, they can make more money that way".(E5).*

Secondly, it is well documented that the industry has a heavy reliance on foreign labour, which has already been previously mentioned in earlier comments. But farmers and growers focussed more on this issue:

*"I have been in this job for 40 years, the NFU did a survey about how many Eastern Europeans work in farming, I think its about 80,000 work on farms I would say, this is why the government jumped up and down about Eastern European's in this country they haven't said it but they realise now, because all farmers are saying the same thing, English people do not want to harvest fruit and vegetables period".*

The complex social issues surrounding foreign workers, but there is a skilled nature in particular with horticultural work:

*"when I started in the industry, I am 55, a lot of British people coming into the industry, just like I did, and progressing through the ranks, it doesn't really happen anymore, that stopped about 20 years ago with the minimum wage coming in, so there were other jobs available that seemed more appealing for the same money, so if you are taking on somebody and not wanting to be disrespectful in this, when English isn't their first language they struggle much more to progress within your business because they cant pass a spray course, they get a forklift licence or spray certificate, they don't have the computer skills needed, we struggle to find growers for the future, they do exist but there are fewer of them , I think we need to move in a direction were we use technology and more data driven technology, so that you can have your more skilled grower using seeing a wider area. Which is almost back to where I was before I joined this project, I visited all my sites every week and giving advice on them, I was doing 45,000 miles a year, more than most sales reps do, if you can do that through cameras and technology, then you can have a more comfortable life I guess!" (S6)*

This reliance on foreign workers is plain throughout all aspects and has been severely affected by Brexit despite steps taken by the Government to address the shortfall:

*“we rely on a lot of eastern European staff, without them we couldn't process the birds, we cant really get English labour, once we leave the EU if they don't make seasonal poultry workers part of the exempt list then I think we are going to struggle or we will have to do it illegally, which isn't really an option for us. ”*  
(B1).

Lastly, the very nature of farming offers its own labour issues through the long hours, hard physical work and the aging demographic of the industry are just a few issues, and this is explored further by the interview participant:

*“What I think is difficult is the stresses of farming and the affect that that has on us, Anthony knows because he had a heart attack it was at a time where people were over producing milk and milk was getting thrown away it was a really difficult time, it was a long time ago, it was when the farming charities began to realise that it was a real problem, we do have now Farm Crisis Network, Farm Community Network and I am involved in RABI, the Royal Agricultural Benevolent Institute and they support farmers who are going through real hardship.”*(Le1)

The stresses of the industry push extreme pressures onto farmers creating a volatile environment for them despite the ingrained passion many have for their work:

*“I had got fed up with the industry as it was I probably wouldn't be in cows now if I hadn't of done something by now, its an industry which is generally negative always finding the worst in things, most farmers don't get away from their farms enough, they are working to hard they don't see the bigger picture, and I got tired of that. We could have carried on as we were but you know you just end up working all the time because you can't afford to pay somebody to work on the farm with you so you just do all the work yourself and you don't have a life, and then you can start to understand why there are so many suicides in farming because people don't have anything else in life other than work. Once you get a taste for something a bit different and you realise that it is enjoyable and you can make a better living, you push on more and more. As a farmer you love growing things as a dairy farmer I love growing calves, see them grow I love growing crops, making cheese or growing a business.”* (S7)

The aging demographic of the sector is complex but just reinforces the complex pressures farmers face:

*“most farmers the average is about 60, they are trying to encourage people into farming they have some success but again lamb prices are high and most people cant afford it, but most farmers are exhausted, Greg is nearly 70 he works 6.5 days a week he works about 70 hours a week, yes we are motivated because we are organic, the average farmer just does not have the energy no one has a concept of what it is like to work 365 days a year, 70 hours a week with hardly any breaks, in all weathers struggling against adversity, weather, Brexit, covid, the fickleness of the general public who don't give a stuff about where their food comes from whatever they say.” (Co2)*

Some growers see that the only possibility is to cut labour costs but increase efficiencies creating a pressured environment for staff, which will provide further strain for the employability of the industry, the introduction of robotics is inevitable, but this solution is still a long way off:

*“We have to cut more costs out we have got to invest in removing people, still. Especially, in the veg sector, there are huge amounts of people being employed, doing huge amounts of menial tasks, robotics and mechanisation is coming, but its more capital expenditure, I think we will a lot more tech coming in the veg sector, there is a hunger for it, its just the standard or equipment is there yet for people to say ‘yep that’s what I want’, right I’m going to buy that, there is prototype stuff out there that is very exciting, it’s a chicken and egg situation, but you know our labour bills in the veg sector is huge, far to big and its such an easy, we have got to pay for problems in this country, as everyone well knows, we only have a few wanting to do this kind of work and we are going to have less going forward, so probably 25-30% of the veg farm turnover is on labour its such as easy thing to invest in to get rid of, if the equivalent is there, its not yet.” (L2)*

*“If you are selling to the primary supermarkets you have to be super-efficient because they grind you right down, they really grind you down you have to be super-efficient. We really are not what I would call super-efficient I would like to think we are fairly productive; you really have to pressurise that staff and that is not how I really like to do things.” (E5)*

Modern agricultural farmers a less reliant on large numbers of staff, efficient machinery and large-scale intensive production requires few workers

*“We employ 12, a person per thousand acres, we can have the resources we need, keeping labour to a minimum to keep down fixed costs during harvest time we employ 6 more seasonal staff,” (S2).*

The efficiency of machinery has led to a loss of staff and further weakens the rural economy and increases the urbanisation of workers. It is a sorry case that some farmers do not earn a proper living for their work, there is growing emphasis on workers receiving a living wage, but the same publicity needs to be applied to those key workers who have pushed through the intensity of working during the pandemic to uphold the food system

*“you tend to look at very much from your own perspective, as a farmer you think in economic streams, I don't make enough money to pay myself properly I am going to low £30,000s out of the equation, I cant pay myself £30,000, if I cant make some rapid changes or my breeding business makes a great success but it is a long uphill struggle for about 10 years.” (De5).*

In summary the key points from the interviewees discussing the factors affecting labour are:

- Many FPGs discussed how they create a healthy work environment.
- Access to reliable labour is a persistent issue for the sector.
- Agriculture is not generally seen as a viable career choice with younger generations.
- Several FPGs talked of their negative experiences of employing furloughed workers during the COVID-19 pandemic.
- The sector is heavily reliant on migrant labour, with several FPGs commenting that would rather shut their business than try to employ English workers.
- Farming is a stressful sector with many farmers struggling to pay themselves a decent wage, there is little profit spare to employ additional staff.
- Many feel the use of robotics will fill the employee shortfall.
- The efficiency of modern machinery reduces the need for labour.
- The seasonality of crop production affects the uptake of domestic employees.

#### **4.2.12 Labour Solutions**

There are few solutions offered by farmers and growers to combat the labour issues discussed above, the complexities run deep within the sector and are not only economic but social as well

but reinstate the farm at the centre of the local community: where the farm is at the centre can help to rebuild the social connection that many are missing from modern society. It is also supported by the ideas concerning the diversification of farming activities (out of agriculture) which is seen as being attractive for those who are now not thinking about working in agriculture:

*“I believe my farm can employ not one person but more like 50, I believe the food business off the back in the yard can employ another 100-200 people and then I believe that elements of tourism and events can employ another 20-40 people and what needs to happen is those people need to live locally as well. They need to be living locally, working locally, genuinely being a community genuinely working with each other, helping each other out, that is how society is really enriched” (E4).*

Addressing the seasonal nature of the work has been tackled by some growers by training staff to be able to multitask through the various stages of the business:

*“The veg grower is quite dependant on that to, they are seasonal staff, but they are not new staff to them. So they have a pack house, they will take people out of the pack house system, e.g. forklift driver, people on the grader, all the office staff they will run the packhouse down to a minimum during harvest and use the staff which are already on the books and then during harvest. Then when harvest has finished, which is about now, everyone is then moved back to the packhouse system, they are seasonal but not migratory. They are multi taskers. Without sounding weird, the people that run the packhouse, they don't look like your typical pack house worker, it would be a real good guy or girl who can drive the tractor as well. They are multi-tasking 50/50 people, we weren't really affected by the lack of foreign labour this year, the thing about vegetables, it is very automated and mechanised, were these people really struggle is the less mechanised systems, so lettuce picking, fruit picking, bulbs for flowers and all that, that's were there is a bigger hit.” (S3)*

The seasonal nature of some towns and cities has helped some farmers employ local workers to address staff shortages at busy times of the year and provides a positive solution to the seasonal nature of the work:

*“We are near Skegness, which is a seasonal town, so when there are seasonal work people are closed for Christmas, they will join the agencies and we give them work over the Christmas period until it opens again”. (L1)*

For some, offering a pay increase for workers would encourage more employees into the system, but of course that creates further economic questions:

*“if we could afford to pay more, a lot more on to get people to stay or to be attracted in to do that type of work, but we are talking a lot more money I think, to get to that point, I would think 50% more, so that we have people wanting to come into the industry”(L2).*

The main labour solutions suggested by FPGs included:

- Employing locally and working to make the farm part of the community.
- Training staff to multitask throughout various aspects of the business helps with seasonal tasks.
- Working with other seasonal sectors to share agency employees.
- Some FPGs spoke of a desire to pay staff more.

#### **4.2.13 Covid-19 Pandemic**

Of course, we cannot overlook the unprecedented year that the world has faced and the implications of that was of course discussed by the interviewees. Countless participants talked of the rise in demand for local goods and those that could stepped up to fill the gaps left by supermarket supply chains, who fell victim to panic buying in the early part of 2020:

*“But we also saw the demand for local product go through the roof, we saw it from the supermarket demand go mad as well. Outstripped anything we could produce, as soon as lockdown finished, sales dropped away quite a bit, an element of that is related to a people not going to supermarkets” (S6).*

This high demand for local goods left numerous farmers and growers outstripped for production and whilst for some this was welcomed. One farmer reported the pressure of working in such conditions:

*“If I’m honest since February, up until 3-4 weeks ago, I have worked 7 days a week and 18hours a day, I have had probably two half days off since the end of February, I am completely burnout, and my brain is gone.... just down to sheer demand and*

*perhaps not being to get the stuff in that I have needed to get in, the margins have been extremely tight which has affected cash flow and the way that we work, it has been a very challenging time trying to stay, keeping all parts of our business sustainable, and not go bankrupt. I have heard, you can back to lockdown and you buy in flour we put it out to sell you can buy it in today at £8.99 a sack and tomorrow you will buy it in at £18 a sack and we had already sold 10 sacks at £12 a sack, things like that and veg just went from a tray of caulies being like 80p a cauli to being £2.20, that really bugged us and then the fact we had 6 solid weeks of just relentless work of contract work, spring jobs like spraying crops things like that, we couldn't really take anyone else on because of the scare of them bringing Covid on to the farm, the butchery, people's house, its just we worked such a tight shift lockdown system, keeping with what the government asked us to do. A lot of people you speak to are just happy they aren't bankrupt, people are over worked, so many people out there at the moment are stressed and worried, its quite scary one month you can make £5-6000 profit and then you can lose the exact amount the very next month, to be fair it's been such a struggle, to be fair global politics haven't been at the top of my agenda. We are still going, I'm still working 7 days a week, its just so relentless, I have never worked this hard before, never for so little. Farmers don't think on the 'how's' they are working they just work, yeah, people say to me they have done a 40-hour week and I smile and just think, well I have done that by Wednesday, it is just the industry. We just never know when we are going to take any money, we might take some this year, but we won't take any next year. For us it's just building a sustainable business, before covid we were on a right path, we just can't build any sort of business model. How will we cope if we slip into recession, we sell luxury items. We also have a catering business, so we have lost probably £30,000 of turnover from that this year, to be fair we have burnt out the staff in the butchery, and they don't want to do the catering if we stay with the same workload" (C2).*

This statement shows the impact on farmers of working during lockdown and the economic uncertainty they faced in the early days of the pandemic and the unsustainable working conditions. But this also worsens the economic uncertainty that farmers face showing that they are working on a financial precipice with or without the challenges of the pandemic.

Of the course the pandemic drew focus on the inefficiencies of the retailer supply chain, and this was obviously noticed by farmers and growers and their role in UK food production post-Brexit:

*“But the covid shows that we haven’t got much food sitting around on shelves or in warehouses. And I think with Brexit, and with food coming across from the channel, which three quarters of our food does. And if it takes an extra day or two to come through the regulations, some food wont last that long”. (S4)*

Another farmer commenting that:

*“Covid has highlighted that actually we need farmers in this country, if the barriers go down, we need to be able to produce our own food”, (L3a).*

This of course related to the perceived lack of respect that Government pays to farming in England, although the much-needed status of “Key Worker” was applied to FPGs, a term applied to those workers, who during the pandemic were considered fundamental for daily life for example, supermarket workers, refuse collectors. It is hoped that this will draw attention to the plight of many local producers and customers will maintain their loyalty and they will gain the well-deserved respect form Government.

The main points from this section include:

- Demand rose dramatically for FPGs for local produce during lockdown periods.
- Many FPGs worked longer days with few days off to meet demand.
- Fluctuating wholesale prices affected profit margins and cash flow during the pandemic.
- Brexit and covid negatively impacted food supply chains.

### **4. 3 Barriers**

The interviewees were asked to talk of the barriers they faced, this question covered many different topics, some of which have already been discussed in the earlier chapters. But the chapters that follow provides a summary of the key topics.

#### **4.3.1 Economic Barriers**

Access to money was a typical answer for many, either for progression of or the initial set up of their business:

*“For me it the cost of money, we have no problem selling our product, we have land, we have planning permission so that isn’t a problem. The technology is improving all the time, Ai in growing is not that far away, we have designed this greenhouse has been designed for that this product will be picked by robots, you just to have to think ahead. The cost of money for a new business is extremely high. It’s the biggest hurdle for profitability therefore to expansion.” (S6)*

Another participant talked of the impact that financial access had on new entrants gaining access to farming:

*“I firmly believe that agriculture and farming we need to create a system there is a labour force required to do things. It’s a difficult thing to solve, its very difficult for young people to get involved in agriculture, just accessing the capital to set up as a farmer, it very difficult, if you wan to get in to agriculture you really need to work for a big agriculture business, take a lot of risk borrow a lot of money.” (No4).*

Cash flow for many of course is also a problem:

*“we have a real cash flow issue in that sense so we can only really grow as fast as my cash flow allows the demand outstrips supply for me but I cant, I am still a really young business and I cant go and borrow millions from the bank its all cash flow to get there, so I am just organically growing so the fact the money is tied up in the product is the main issue for me” (Co2).*

But one farmer felt that by reducing their inputs used on the farm they can avoid some of these issues:

*“we are definitely a much less risky business because we don’t spend any money on external inputs but to try an get a farm, the dream is to support lots of different people on the farm so doing like things like veg and the bakery, so all those things require money so for example, convert a building put up fencing, buy a van to deliver stuff so we find ourselves constantly running from one thing and then starting another thing up, whilst the business is profitable it just goes straight back in, it disappears. But that is the same with any small business. (So3).*

The lack of finance available to farmers has diminished their ability to grow their businesses and inability to compete with big investment companies who buy land has led for the need for farmers to diversify in order to create a profitable business:

*“expansion of the farming business is nigh on impossible, because, there isn’t the land isn’t available we are surrounded by very very big agri-businesses who want to snap up whatever land becomes available either renting for a rent which is something I cant match or they own the land anyway, so if there is a small farmer who is going to retire it usually snapped up by one of the big land owners, and so in terms of the farming business it has always been a problem it is simply not affordable”. (No4)*

Short-tenancy agreements was also discussed not only for the economic barriers but also the social barriers that FPGs face and the unlikely chance that short-term tenants will invest in the environmental aspects of the farm:

*“I would like to see farmers better rewarded for longer term stewardship, I think what George Dunn is saying from the Tenant Farmers Association, I am no tax expert but there are fantastic tax benefits in owning farm land he is saying that possibly you shouldn’t get this from renting out farm land unless they are willing to grant good length tenancies, the average the FBT in this country is something pathetic like 3-4 years, I am very lucky I have a 15 year tenancy which is almost unheard of in a new tenancy, we have been here three years and the estate have said that they wont take the farm back provided we all get on in 15 years and then we can have another 15 years I like the security. I was only renting it for three years and I was paying top dollar rent and I had to get as much out of the land possible why would I be interested in improving the soils or the wildlife or the habitat or anything because in three years time I might be out on my ear, even putting agricultural lime on the field which is a pretty basic practice, takes 2-3 years to take effect. I have just 120 tonnes of lime on this year, which is going to have most of its benefit in 2-3 years time. If I was only going to be here for 2-3 years, I would be pretty dubious about doing that unless my landlord had written in some pretty good compensation into my tenancy. (De4)*

Due to the volatile economic structure which effects farmers and the price they receive from retailers has a significant impact on their ability to reinvest and reach the ever-growing environmental legislation of Government and assurance schemes, leaving many with an unpredictable future:

*“The whole time I have been doing it we have been on a similar milk price so since the mid-90s, a lot of people are on that same price they were in 1996, so how is the next generation going to say, ‘lets go dairy farming’. Look at the costs, we have the same amount of money because you have all the pressures of welfare and public perception its impossible you don’t have the money to spend on reinvestment to make things better, so it isn’t a massively positive future for new people, if the next generation want to come in to it.....The ability to see anything changing we are 10 years in to a 36 year tenancy and you start to wonder our invest time is shrinking all the time and our investment time is shrinking all the time, so we put in our new parlour and other investment but now we have been hit with new slurry regulations and different things there and is the money there to do it that’s what we were asking. I don’t think that price will change anytime soon but how efficient can we be through genetic selection and different management practices we can pushed on quite well over the last 10 years but I am not sure about the next 10 years how much further we can go if in 10 years time we are on a similar milk price. (Do2).*

The rising cost of inputs massively affects farmers and growers:

*“ultimately your costs are rising to some extent, just looking at the price of machinery, looking at the price of inputs which are rising quite considerably and depending entirely on the global market and prices you might or might not have the return on the crops to justify expenditure, potentially capital expenditure, which as a small farmer might restrict what I can do.....Global prices of metal to some extent but also regulation to some degree as well, when you look at the price of tractors which has increased considerably, and quite a lot of that is driven by the technology on the tractor, you are looking at tractors now which conform to all sorts of regulation to do with the environment so the engine design has changed completely its no longer a simple diesel engine you have all sorts of emission controls on it, and as a consequence of that they are becoming far more complicated, and also the electronics are far more involved its no longer a simple machine” (E1).*

This rise in costs is rarely reflected in the prices of the end products:

*“Financially we take all the burden and no control over price paid, so for example feed this year has gone up from £250/ton to just over £300/ton we don’t necessarily*

*see in any rise in egg price for that and we get through 3 ton of feed a day at this farm.” (D3)*

Another fundamental issue for farmers is their relationship with retailers some of which has been talked about in the earlier supply chain chapter. But many talked of the complications they have whilst trying to work alongside the retailers or the direct competition they face.

*“In the meat trade, its more the supermarkets putting up loss leader beef or sausages on for a week at silly money and we just can’t compete, we are trying to produce a quality product at the right price and sometimes we are out strung by cheap offers and imports” (N4).*

*“We don’t receive a quick payment unlike supermarkets, who take 90 days to pay, they have already taken their money, but they don’t pay their suppliers for another 90 days. Which of course this of course so how they come down to the bare bones of price, and of course we are sitting here and have to lay out our money for two years before we sell it. Although most in the Ag trade pay every 28 days, when we sell something likewise when we are expected to pay every 28 days. The supermarkets have so much strength, they say they only do what the customer wants, they do direct the customer as what they should buy, customers might vote with their money if they were aware of some of the business practices.” (S4)*

For many, local councils and planning permission has a big effect on their business development:

*“Local council! They love to say no! can we put a building up no, can we change out entrance so it is safer no, can we put some signs up, can we expand the business no, you know because we are an easy target as opposed to the dare I say it, traveller sites which are many around here, they daren’t say anything about them so anything we want to do its no! I would love to have a little café, I would love to have a safer turn in entrance, we wanted to do that, no! I put a whole load of signs up to say ‘teas and coffees’ and they ripped them all out, you just feel like you are hitting your head against a brick wall, everything you do, they constantly criticising you cant do this and you cant do that, that is very demoralising we have had to really take a deep breath and say right we wont put any signs up we will do it a different way, we will just plod on as we, there is no help from local government I think the local government are the pits to be honest with you. You put in for wedding*

*or a party and its always no, you have to get good at thinking outside the box, which is definitely our main contributor to trying to do anything” (B3).*

Another barriers FPGs faced is the lack of local abattoirs, strict regulations have led to loss of many local slaughterhouses, and this has a direct impact on farmers productivity and costs:

*“I am on a slaughterhouse run tomorrow the nearest slaughterhouse was 2 miles away. I picking up an animal tomorrow to bring back here, my round trip is 151 miles, simple because the government chase paperwork and regulations for all these slaughter houses and now there is only one open in the whole of Cambridgeshire, there used to be one in every village, going to back to simple things those office bods, or clipboard bastards I call them, think they can run businesses but they haven’t got a clue. So now I have to travel 3 hours to the slaughterhouses” (C1)*

*“The lack of slaughter facilities locally, they are few and far between they have nearly all gone. So, you have a giant slaughterhouse, but they are regional, and they are out of region quite often. I was on a supply contract for Marks and Spencer’s, and our lamb has to go over to Dawn Carnaby which is over near Hull, we are in the Cotswolds, that is their designated kill house so if you want to supply M&S and you want to see Cotswold lamb back on the shelf in Cheltenham it has to go to Hull, from Hull it goes to a distribution hub then back here. Ideally there was a slaughterhouse in our village there was one in Cheltenham the nearest one is about 30+ miles away” (G1).*

The associated paperwork for processing one animal is a long-complicated process the application of technology would ease the burden of paperwork for farmers and in light of the Government’s ability to produce an app for the Covid-19 ‘Trace and Trace’ system, despite its questionable faults has proved it is achievable to provide the technology:

*“There is to much paperwork on livestock, well there is and there isn’t, but it is everything it is relentless, there are just piles of paperwork, to be fair if anything is going to get you depressed it’s a pile of paperwork on the desk, and I don’t do paperwork. I do have some help with it but it is just continuous having to process everything from your cash flow to marketing to every part of everything, it comes back to paperwork all the time and really it does impinge me from being as productive as farmer as I could be, but sometimes helps me be a profitable farmer*

*sometimes, if the paperwork is kept up to date.....things like the EAML2 and for the cattle and sheep to all be on one database and all to be on an app on the smartphone, because having to do stuff at the computer, the smartphone is my office, there needs to be more support.....That would all be on one app and it would work much better. (C2).*

To summarise the key points from the economic barriers:

- Many FPGs reported a lack of access to finance either to set up or invest in their businesses, also a lack of finance for new entrants.
- A reduced cash flow affected FPGs ability to reinvest in their businesses.
- Reducing inputs freed up cash for several FPGS.
- The cost of land and the tough competition to buy land makes it difficult for many FPGs to grow their businesses.
- Longer tenancies for tenant farmers with greater reward would improve environmental and economical input.
- Retailers selling products as loss leaders to encourage shoppers in but undercuts local producers.
- Local planning laws and councils preventing FPGs from expanding or developing their businesses.
- Wholesale prices not increasing in twenty years, despite FPGs investing in equipment, technology and land management.
- The closure of local slaughterhouses due to strict Government legislation reduces access, increases travel, costs and stress for the animals and some retailers specify certain slaughterhouses despite the distance needed to travel for the FPGs.
- The paperwork relating to the movement of animals is extensive many FPGs do not have the time and would be more efficient if an app were available to process the documents.

#### **4.3.2 Social Barriers**

The social barriers that participants face is obvious for the aging demographic of the sector, age energy levels and the complications surrounding retirement.

Firstly, the difficulties surrounding retirement:

*“We are retiring basically, we are both 70 although we are very active for people of our age, in a normal career we would have retired and in farming you don’t tend to retire they carry on, and because its were we live as well” (Le1).*

For many retiring is a complicated process, as many live on the farm, selling up or giving up a tenancy means the loss of a family home as well. For others it is the uncertainty of who will continue their hard work and years of dedication

*“The three things I worry about are labour, exclusivity and the other thing is who will take on the farm I am in my mid-60s, some people think I am barmy because I am still investing, the children don’t really want to take it on, I really don’t have a strategy I don’t know how I am going to, I can’t do it physically. We have a small wood business I have been out today delivering logs, so I can’t physically do what I used to do thirty years ago. (E5).*

Secondly, time and productivity were also a significant factor for numerous participants:

*“How much time I have got, I could produce so much more if there were about 5 of me, because event though its just a small amount of land, even just with this garden and the polytunnel I could do loads more” (Do1).*

Also, the fine line between having to much work for one versus the cost of employing labour:

*“Time, and labour, because once you start employing somebody it costs a huge amount more” (De1).*

Lastly, the impact of the local customer base, although many had seen a rise in local custom due to the pandemic, under normal circumstances local customers influence price of goods and the ability to sell locally:

*“In a way location because we are quite cut off here, we are also quite far away form any large areas of population and also locally income isn’t great so if you are trying to provide a high end product around here people don’t have much spare cash to spend on something that is a bit more high quality. So, we can’t charge the sort of prices that some outlets around Exeter charge of we want to sell locally” (De2).*

In summary the main social barriers include:

- It is difficult for many to retire, most live on the farm and there is little support for those that choose to leave farming.
- Location for some FPGs affect the access for local buyers.

#### 4. 3.3 Environmental Barriers

The weather was the key environmental barrier for most of the interviewees and many talked of the impact of changing weather patterns on modern farming practice:

*“One of the barriers is weather and climate we are experiencing more volatile weather patterns and that does dictate to a certain extent what we can grow, we like to plant as much as we can in the autumn and then those that we cant we plant in the spring and these last few years we have had to plant more in the spring due to wet winters.” (E2)*

*“With weather mitigation we just try and grow as many different crops as possible, so if some crops need to be sown at different times, they react to different weather, having a broad range of crops, is really important, we are just starting an agroforestry project which we are staying this winter so we are planting, 40 hectares of agroforestry so I think that will bring some resilience into the farm, as far as, cropping is concerned as we are looking at growing perennial crop alongside an annual crop, we will probably expand that as well, its about bring as much cropping diversity as possible.” (S1)*

The impact of changing weather systems has caused farmers to rethink production methods and be prepared for changeable weather throughout the seasons:

*“The biggest barrier which we have all got deal with are the weather patterns, this is changing a lot of how you set up the ideal system, 5 years ago, systems were based on number of acres per man, horsepower per hectare and all that sort of thing. I think now with the blocks of weather we get; I think now the success is not in acres per man or how low your horsepower per hectare but now to get your total area drilled and planted in all these weather situations we have is now a key thing to what has to happen. You can have an excellent 1500 acres per man ratio but if the success of that man is 8/10, then that isn’t viable, with the weather patterns the way they are, every year there is a big challenge, either a dry spring, were we use a lot of energy irrigating vegetables, with electric bills of £11,000 per month, all*

*that sort of thing, or you get times where you don't get all your crop planted in October/ November, because we have to much rain. Weather patterns have changed and we get blocks of weather now, we get a block of wet, and managing that and still keeping your business successful, rather than a bloody great tractor and one man and now I think we need smaller tractors smaller cultivating smaller drills and another couple of men, then I think you can get a bit more success to happen. Because you are more flexible.” (S3)*

Another issue, due to intensification and the increasing size of farm machinery is causing further complications during harvest time:

*“we had a pretty bad year last year and we have got another bad year, this year so far we run a 12 meter controlled traffic farming system with 12 meter kit it is a nightmare to get on the ground, we like to drill as late as possible to get a couple of bouts of black grass and get them sprayed off but it's a significant challenge with bigger kit to actually get on the ground in wet years.” (No3)*

However, these environmental changes have been felt the most by those closest to nature, more specifically pollinators. One commercial bee farmer who was interviewed for the research, talked starkly about the catastrophic environmental change he has witnessed in recent years:

*“environmental and climate change issues are huge for us, I have only been commercially bee farming for 9 years, but I have been hobby bee keeping for 30 years, and the change in those 30 years you couldn't begin to contemplate what we are looking at today, even the last 10 years the speed of change is horrific. A number of things, firstly the mild wet winters, the cold never kills bees, I have seen bees down at -30, no problem. What kills bees is damp, European honey bees are designed to have off season they don't actually hibernate but they go into a situation where they are just in a ball keeping the queen warm and eat relatively small amounts of stores, with the mild winters they are going out breaking that ball and fling much more and using energy and there is nothing out there for them so they come back they need more stores they have to heat the inside of the hive back up, the inside of the hive in the winter has to be around 23-24°C and that is no matter what the ambient temp is you need a lot of energy to do that so they are using a lot more stores, when I first started you would leave 30-35lbs of honey on the hive, and it would see them right through, we now leave around 60lbs, and they*

*normally run out and we have to artificially feed, and we have wetter summers, so a bee cant fly in rain and there is not nectar in rain because most plants require a certain temp before it runs, so you have got a combination of mild wet winters and wetter summers and that is causing huge problems in the terms of the way the bee organises itself during the period of time when the flowers are out, and so this temp change and we now get much stronger winds, and a bee cant fly in stronger winds and so they get stuck at home, if they can fly in it they are using a lot more energy so these things are a lot more important for me than pesticides, they are really important but the other thing for me is that the countryside is a floral desert, the best place to keep bees is towns and cities by a mile, because you have parks etc. So that environmental and that climate change has been massive, and it has had a massive impact” (G3).*

The importance of pollinators and their clear decline is well documented and it this crucial element which need to factor in future policy decisions. Some farmers and growers felt that these changeable conditions could be alleviated through soil management:

*“We are trying to manage water because winters can be so wet, basically a well managed soil and let it drain through slowly and more effectively, so we don’t end up with waterlogged fields if we have managed them well. Rather than if there is no topsoil or vegetation underneath.” (Som1)*

Farmers and growers acknowledge the importance of the soils for both improving yields and reducing the impact of these changing weather patterns:

*“Having healthy soils is like having a savings account, you take out a bit here and there, but you always make sure you have a healthy balance in there. Whereas handing it over to some else for three years who will rape it with maize at maximum cost, and maximum rent and then it goes back to you who isn’t going to do that” (De4)*

*“Politicians are busy people, but they will listen to those that are talking, they like a high-tech solution. Its like the flooding business, it drives me absolutely potty, all the floods we are having you know in somerset flooded and its all silted up, they say we have to dig the silt out, the silt shouldn’t be there, the silt is only there because some idiot had been ploughing up in the hills above, and all their soil has been washed off and blocked the river, if you have an absorbent soil it soaks in and*

*is released very slowly so you don't end up with floods its fantastic low tech solution but you know politicians tend to like dramatic building up the banks of the rivers and you have a levy so the river can flow rather than dealing with the problem at its source.”(H2).*

Some see technology as the future for sustainable farming:

*“measure natural capital and every year to produce a natural capital account every single individual tree is mapped and traced on the farm so that tells us how much carbon sequestration would be delivered through that mechanism, we measure the amount of birds the number of pollinators all the fields that we have, have a 7 meter margin around them where we plant flowers for pollinators and are useful not just in an agronomic sense but also for biodiversity but being able to manage to track and trace all of that does allow for us to determine our carbon foot print so it does allow us to determine our carbon foot print so we can judge ourselves year on year to make sure we are reducing our carbon foot print every year, we are now a carbon neutral farm we use a cool farm tool to measure our foot print and we now sequester more carbon than we omit, so in terms of technology you have the precision technology” (L3).*

However, others see a natural approach providing the solution to the catastrophic environmental change we are witnessing:

*“all of these things have led me towards farming in as agroecological way as possible, and the important thing is, have you heard of the term regenerative agriculture, the term has been somewhat bastardised by some zero till farmers who still use other tools in their arsenal, regen ag is essentially the farming part of agroecology, but reaches far wider into the social aspects as well”. (E4)*

To summarise the main environmental barriers experienced by the FPGs interviewed:

- Climate change has affected weather patterns which affects crop production, sowing times and harvesting.
- Also, larger machinery struggles to access the land during wetter periods, some FPGs saw the need to switch to smaller farm machinery to be able to cope better with the weather.

- Bee populations are affected by the mild damp winters, the wetter summer months and the lack of floral crops.
- By improving soil quality FPGs can increase water storage capacity, particularly during winter months.
- Politicians like to see high technology solutions to farming problems.
- Some FPGs were able to track the natural capital of their farms through technology to calculate the success of environmental projects.

## 5. Discussion

### 5.1 Conceptual Theory

Mazzucato has developed a body of research which focuses on delivering the SDGs through mission-orientated policy changes. Her research drives the theory surrounding mission-based policy changes and with policy makers embracing this ethos, she believes policy makers could “determine the direction of growth by making strategic investments across many different sectors” (Mazzucato, *et al*, 2020 p.421). The private sector can further develop these ideas and create “cross-sectoral learning and increase macroeconomic stability” (Mazzucato *et al* 2020 p. 421). More importantly for this research Mazzucato *et al* (2020) states that this method does not focus on a top-down approach, but it is focused on creating clear “direction for growth and increasing business expectations about future growth areas and catalysing activity that otherwise would not happen” (Mazzucato *et al*, 2020 p.421).

By revisiting the framework laid out in the literature review it can be seen the clear focus for mission orientated policy formation through five main criteria:

1. Mission/policy choices should be bold, inspiring and hold significance to the wider society.
2. The selected mission should be based on a clear framework, with measurable targets and a fixed time scale.
3. Policy missions should be ambitious, centred around innovation and relevant research.
4. The approach to mission-based policy should be fully integrated working across sectors, disciplines and with multiple actors and stakeholders.
5. Policy missions should be adaptable and embrace multiple grassroots solutions generated by a system-wide approach. (Mazzucato, 2018a).

This approach, Mazzucato *et al* (2020), states is key to not only achieving the SDGs but also optimising the challenge-based policy making required for integrated sustainability.

With this framework in mind, it can be seen from the results that those FPGs which have developed an independent approach to their production methods are able to operate independently from Government intervention. Creating a bold grassroots approach, as is discussed in the rural development paradigm, this has typically been achieved through the development of shortened local supply chains with FPGs choosing to deal directly with the end user, this has helped to develop adaptable supply chains, where FPGs look to add value to the goods they produce and also adapt products dependant on yields, which equally increases employment through product creation. The development of value-added goods, in turn generates greater levels of profit which then allows FPGs to reinvest in their operations many of which are choosing to do so with an environmental focus. But the actions taken by these pioneering FPGs creates a strong basis of integrated sustainability inline with achieving the SDGs.

The bold and ambitious approach chosen by many FPGs, could be further supported by Government policy through various stages. Firstly, by offering business support to allow FPGs to develop and adapt their business to generate value added goods and/or local supply chains through local networking. Secondly, by creating protection through the Groceries Code Adjudicator (GCA), the Government department which regulates retailers, for FPGs who supply larger retailers from the unbalanced conditions in which they operate such examples could include wholesale crop price protection and unsustainable contractual obligations placed upon FPGs by retailers. Also, by introducing policy which is streamlined for processing livestock and enables the potential reopening of abattoirs, which would dramatically reduce barriers for livestock producers and allow for more local and less stressful supply chains.

## **5.2 Subsidies and Future Policy**

It can be seen from the results that the CAP subsidies have had some significant negative impact on the sector both by allowing the industry to become uncompetitive and in some circumstances lack innovation and although this may be well documented in the academic literature (Bailey *et al* 2016; Helm, 2019; Marsden and Sonnino, 2008), the results provide key evidence of the first-hand opinion of English farmers who find the financial support they receive regressive which has rarely been acknowledged. The results from the interviews

showed that countless farmers also felt that the subsidies have supported businesses which are financially unviable and consequently, insufficient for the modern farming sector. Some FPGs went onto question the time scale of the withdrawal of the Basic Payment Scheme (BPS), which will end in 2027, some felt the quick decline of this subsidy despite having received this support for many decades. The withdrawal of subsidies presents two main challenges for FPGs, as debated within the results, firstly, the uncomfortable scenario of a loss of a sizeable percentage of their turnover in a relatively brief period of time and secondly the loss in economically unviable businesses being lost through the withdrawal of support. Both challenges would inherently stimulate some innovation and diversification of the sector and help to restore the socio-economic balance of the sector inline with the SDG framework.

Other socio-economic circumstances debated in the results include the difficulty many farmers face when choosing to retire. Typically, farmers live on site and retiring means more than just leaving one's job but leaving your home and way of life with little support to move forward. This factor is recognised in the literature that both the aging population and the entry barriers young farmers face leads to a complex exit-entry scenario for the farming sector (Ingram and Kirwan, 2011; Zagata and Sutherland, 2015). To address this issue within the new policy the UK Government will be offering a revenue based lump sum payment to encourage social stimulation of the sector, which is vital in encouraging and promoting innovation within the sector. A policy commitment of this nature shows that Government understands the complexity of this situation and can achieve some of the social SDG goals such SDG 3 and SDG 8 through this pledge.

It was also discussed by the interviewees the support provided by the CAP typically favoured larger farms, due to the set up of the BPS, with larger farms receiving larger payments (Volkov *et al*, 2019). This of course greatly impacts the socio-economic stability of medium and small sized farms and their ability to expand, and advance compared with their larger counterparts. It was also recognised in the literature review the heavy financial cost of the CAP (Bailey *et al* 2016; Webster, 1997) and the associated adverse implications through, for example, the raising of land prices (Helm, 2019). This was discussed further in the results as numerous interviewees stated the limited access to new land had dramatically reduced their ability to expand their businesses, due to the highly competitive nature of buying land. The accumulation of such factors has stifled innovation of the farming sector dramatically inhibiting the economic sustainability of the industry, factors which are not inline with the framework of the SDGs. In comparison the horticulture sector has not been able to claim CAP support and the results

showed that this forced the horticultural sector to remain adaptable to the market despite experiencing tumultuous times and arguably being in great need of support (Bailey *et al* 2016). The environmental cause and effect of the CAP was also raised by some interviewees, one in particular who discussed the destruction of habitat to create a specific environment for a certain native species of moth, with limited success but was in order to claim an environmental related subsidy. A typical example of counterintuitive policy affecting daily farm life.

It was discussed within the results that post-Brexit, FPGs are hoping for more regional policy, indicating that the CAP was too broad in its aims to accommodate 27 plus nations with varying geographical, social and economic differences. It could be argued that CAP aimed to address these imbalances through the various historical reforms, however this may have had limited success. The introduction of the UK Government's new Environmental Land Management Scheme (ELMs), which is set to replace the CAP, may address some of these issues. It is a progressive policy which looks to move away from land-based subsidies creating more integrated sustainability within the sector. The scheme would encourage the transition to more productive and sustainable farming and food production focussing on farming practices which uses less inputs. These considerations were discussed in the results with some FPGs welcoming the change and celebrate the environmental focus, however some felt that the emphasis on biodiversity and environmental land management may jeopardise food security.

Although the ELMs have been called in to question in recent months by Government critics, who claim the schemes inefficiencies of paying for nature-centric projects during the current political turmoil could jeopardise food security. Even though the scheme focuses on sustainable productivity, a delay to its roll out would massively inhibit the Government's plan for net zero by 2050 (Horton, 2022). Some FPGs referred to lack of Government support for the British farming sector in general and this potential change of tack on future policy shows the vulnerable position the sector faces within Government priorities.

The interviewees also discussed the possibility of carbon capture with financial support from the private sector. It appears that the new ELMs scheme will support this move, when a policy paper stating the outcomes of the ELMs will "not crowd out private finance for climate and environmental outcomes" in regard to the schemes aims (DEFRA, 2022). The results highlighted the fears of some FPGs who felt this may 'privatise' the sector, through substantial private investment and create unfavourable conditions for FPGs. Others highlighted that the offers available to FPGs to sell carbon credits to the private sector, with the potential to offset

environmentally unsustainable business practices through such a scheme. This of course offers multiple benefits from the Government's perspective, offering substantial financial remuneration for the farming sector, therefore releasing the financial pressures from the state and secondly allowing the farming industry to benefit from the wealthy private sector looking to offset its carbon footprint but potentially cash-in on less productive land which can be used to create carbon capture. This raises many questions for the industry and has the potential for the farming industry to become victims of "greenwashing" in search of financial support, particularly when we consider the example given in the results by the FPGs, which could produce many biosecurity and habitat risks.

However, in order to achieve environmental sustainability, it may be more prudent for the UK Government to offer stricter guidelines for such practices. Such strategies may look to incorporate the offer of public goods for private investment, adopting practices which compliment local native habitats as opposed to some schemes which may jeopardise local habitats through monoculture planting which lack biodiversity and have the potential to encourage pest and disease infestations, by introducing potential foreign invasive species or restrict access for local wildlife. Such commitment from the Government would show a deeper understanding of the wider issues faced when addressing environmental and economic sustainability, whilst also working to achieve some of the relevant SDGs.

### **5.3 Crop Production**

The data from the results showed the keen environmental awareness of the FPGs interviewed, with lots of the issues raised focused on diverse and sustainable production methods. This is aligned with the principles of regenerative agriculture discussed in the literature review (Lal, 2020). Those FPGs showed a concerted grassroots approach to tackling some of the main environmental fallout caused by modern food production. Awareness was focussed on a diverse cropping rotation to reduce the hold of persistent pests and diseases, with an ideal cropping rotation of around five to seven years, this is in opposition to the CAP's three cropping-rule (DEFRA, 2020[1]). Some FPGs felt that despite receiving a decent wholesale price for certain crops, the rising costs of inputs makes particular crops unviable. For example, many comments were made surrounding the production of oil seed rape and the government's readiness to import foreign seed during times of crop failure, from countries that are still permitted to use such pesticides as neonicotinoids. This level of awareness demonstrates an understanding of the environmental issues caused by modern agricultural production and ultimately how to

address them outside of Government guidelines or stipulations, unlocking the natural capital they have onsite. FPGs talked about their efforts to improve biodiversity improving on-farm native specie populations, which in turn improves the natural capital and as a result creates a social benefit.

With many FPGs looking to restore ‘old fashioned’ farming techniques to improve soil quality to generate better water storing capabilities, improve crop health and restore micro-organism populations within the soil (Rebanks, 2020). These steps again show a clear grassroots approach to environmental sustainability. The benefits of minimising soil disturbance were discussed by FPGs stating the benefits of a healthy soil eco-system, improved carbon sequestration (Lal, 2021) and water storage and less need for expensive inputs and costly machinery upgrades. Some FPGs debated the controversial topic of renewable energy, typically the production of certain crops for anaerobic digestors (AD). This method of production has been heavily subsidised by the UK Government and raises many questions such as the crops used for production, which can often damage soils, the competitive nature for contracts and land usage (Tranter *et al*, 2011; Röder, 2016). It should be the role of future policy to provide incentives, fiscal or otherwise to achieve the SDGs and encourage FPGs but also policymakers themselves to adopt more regenerative methods of production. This could ultimately be achieved through economic support but also social support. Such methods could include business support and education for FPGs to encourage business diversity and help to bridge the gap between the more difficult aspects of business such as skills for customer facing roles, business promotion through social media and building local supply chains. All of these aspects were mentioned by FPGs in interviews as problems they faced when creating business diversity.

#### **5.4 Future Farming Methods**

The adoption of precision farming is documented in the literature as a sustainable move for intensive agricultural production (Finger, *et al*, 2019; Auernhammer, 2001). Some FPGs see the benefits in the arable sector of precision application of chemicals through reduced use of inputs and also greater monitoring of the natural capital. The application of technology in the farming industry generates a mixed response, as with many modern evolutions, FPGs have voiced their concerns about the accessibility and fairness with which these technological improvements will be included on farms in the future, an issue which researchers are looking to address through the affordability and scalability for smaller farms (van Henten, 2004). We must also recognise the human skill level and knowledge required for horticultural harvesting,

which is firstly difficult to replicate but that are also at risk of skills being lost with the introduction of robotics (Pekkeriet and van Henten, 2009). FPGs interviewed from the horticultural sector hope to see an answer to the drastic labour shortages both in the fields, but also within greenhouse production, many of whom are designing future installations around the potential to include robotics. It is however argued within the literature that despite the horticultural sector hoping robotics will dramatically reduce labour costs and the demand for seasonal labour, however their efficiency and affordability is a long way off (Stoelen *et al*, 2015; van Henten, 2006).

Within the context of technology, we must also consider the debate surrounding the use of Gene Editing (GE), Novel Breeding Techniques (NBTs) and Genetically Modified (GM) crops and plants. The results demonstrated the varying opinion of FPGs, with some viewing the techniques as primary tool in the reduction of chemicals, stating that such techniques will enable plants to adapt more effectively to climate change and create stronger resistance to pests and diseases and see that the Government's readiness to adopt such techniques as a positive step in the right direction.

Those FPGs which oppose the usage feel that the Government are keen for a high technology quick fix solution to production issues, claiming that lobbying by large multinationals, who will undoubtedly lead the development of such products, has influenced the Government's focus on these products. It could be argued that with the loss of many pesticides, herbicides and fungicides the large multinational companies are looking for alternative products to bolster their portfolio and the development of GM, GE and NBTs products, undoubtedly sold strictly under licence will certainly fill that gap. However, those FPGs which do not support the usage believe the Government does not see the wider issues facing farming in their search for a viable alternative to reduced chemical usage and mitigating climate change. The differing sides both state that the consumer does not fully understand the GM, GE and NBTs argument and feel this will impact the acceptance within the food system, however, some see this as a positive situation and may ultimately create a stronger market for the organic sector. Post-Brexit, DEFRA held a consultation to discuss the use of GE production outside of EU regulations, as a result new legislation was passed allowing the further research into GE products in UK agriculture (DEFRA, 2022a), this move was supported by the Nation Farmer's Union (NFU, 2022).

Using the framework of the SDGs in relation to the technological development of the modern agriculture sector, is complex. As discussed, the adoption of precision farming helps FPGs achieve some environmental and economic goals and in this respect a healthy future for employment, some high technological jobs would be more appealing to younger generations than more traditional agricultural roles, and great investment is forecast. The future of robotics in horticulture appears pre-determined despite the concerns from the industry, with loss of skills and the fairness of use of such equipment. With these considerations it is difficult to see how some of the socio-economic SDGs will be achieved. The approval of GE in British agriculture definitely divides opinion, and it must be questioned if such techniques are still in pursuit of the productionist paradigm rather than truly fully integrated sustainable production which is desperately needed.

### **5.5 Greenhouse Production**

Some greenhouse producers interviewed for the research discussed the benefits of modern-day greenhouse production, which quite often can operate at a carbon neutral level, whilst also adopting a circular production system with limited waste. It was also discussed the success of this production method to produce popular crops out of season, which typically are imported and therefore are environmentally less sustainable. The benefits of greenhouse production are mirrored in the literature, with research stating such benefits as out of season production, crop production taking place in remote locations and in areas with poor soils (Naseer *et al*, 2021; Butrico and Kaplan, 2018). Such production methods of course help to achieve criteria set by the SDGs through sustainable carbon neutral production but also the production of nutrient dense healthy foods and it is discussed by Esen and Yuksel (2013) of the beneficial switch to renewable energy in greenhouse production due to the rising cost of fossil fuels and the associated environmental impact. There is little academic literature to reinforce the evidence from the results, but the comments provided by the FPGs shows the capabilities of greenhouse production.

But with little financial support from the Government, the expansion of such projects is hindered, these production methods have the ability to improve domestic food security, reduce unsustainable foreign imports and potentially reduce the cost of out of season, but nutritional beneficial crops such as soft fruits and salad crops. Advantages such as this could theoretically help those who experience food poverty and are often subjected to calorie dense, nutrient poor foods which directly impact their health but incorporating systems with a low environmental impact and reducing the externalities of food production.

## 5.6 Food Standards and Imports

The UK has high food standards and the results showed conflicting viewpoints from the FPGs, firstly through the assurance schemes which aim to improve animal welfare, on-farm health and safety and production standards. FPGs believed that consumer awareness of such schemes was low and held little value, however some felt that assurance schemes gave their products a market advantage. But such schemes come at a financial cost to farmers with little Government support and certainly in the case of more private assurance schemes for example supermarket assurance schemes, the pressure to deliver such exacting standards can be stressful for FPGs, often with little reward on wholesale prices. The literature shows that the opinion of FPGs from this study, who felt that food assurance schemes are of little value, is echoed in other research data and Hockenhull *et al*, (2019) argue this due to a disconnect with the stakeholders involved in food assurance schemes. Other literature does in fact show that these schemes are beneficial in improving welfare and on-farm sustainability (Mullan *et al*, 2021) and have aided farmers with vital welfare standards such as reducing antibiotic usage (Loeb, 2019). This split opinion was also echoed with organic certification, and it was often a controversial subject amongst FPGs, some stating their choice to register with a certain certification body was a political choice, based on how the group lobbied Government and the stipulations that are imposed upon their members. Other organic FPGs chose not to register at all mostly due to registration fees and opted to build a relationship with local customers in order to convey their holistic farming practices.

The results also highlighted the strong view held by many FPGs, that the UK Government undermines domestic production through food imports. Initially, by importing crops from countries which are permitted to use chemicals banned in the UK, this often occurs due to potential domestic crop failures. Not only does this undermine UK production but also simply offsets the environmental impact of chemical usage. Furthermore, FPGs stated this also discourages those exporting countries from raising their food and crop production standards and lessen their environmentally damaging crop production practices. Lastly, FPGs commented that often foreign imports are mixed with domestic crops at the point of production, further undermining the high standards which domestic FPGs are expected to meet. These actions from the UK Government which damage domestic production were further reinforced when in 2021, post Brexit, UK Ministers voted to allow food and crop imports of lower than UK standards (Harvey, 2021).

## 5.7 The Supply Chain

Evidence from the results showed the extreme pressures felt by FPGs in the supply chain, with many commenting that they were merely price takers in both their inward and onward supply chains. This in part is affected by the marketplace for inward supplies, typically seed, fertilisers and pesticides the majority of which is owned by large multinational companies and secondly the power held by retailers in the onward supply chain. As a direct consequence of these relationships, the results showed that FPGs felt they were the main risk takers in the supply chain set up, withstanding most of the financial burden.

Another socio-economic impact of the CAP's financial support has been to keep food prices low for the consumer. The results showed a mixed reaction of the benefit of the subsidies in keeping food prices low, with some FPGs seeing cheap food prices as beneficial for the consumer. Whereas others felt that the artificially low prices altered consumer appreciation for food, allowing for too much to be discarded and also did not allow for the true externalities of food production to be factored into the production costs. The literature echoes the former with Benton and Bailey (2019) outlining the political importance of keeping food prices low, stating that politicians choose to maintain low food prices to preserve food security and also political security, together with seeing low food prices as a necessary part of economic development.

It appears from the results that the horticulture sector is the hardest hit by the supply chain set up. Numerous FPGs commented on the complex contractual obligations and pricing strategies laid out by retailers, which arguable is leading to the decline of the sector and the success of domestic horticultural production, despite the biodiversity and consumer health benefits of horticultural production. The symptoms discussed by the FPGs shows that the agricultural supply chain has become a victim of a globalised food system, both through the inward and onward supply chains. The negative connotations of a globalised food system are well documented (Clapp, 2016; Lang and Heasman, 2015, Lang, 2020). Clapp 2016 states that the impact has resulted in the commodification of crops and a dependence on international trade creating instability and risk within supply chains. Furthermore, the redistribution of surplus crops despite offering some benefit to developing nations, more current research shows the health impact of this redistribution (Thow and Hawkes, 2009; Thow *et al*, 2017), which many argue has driven the 'nutrition transition' (Popkin, 2001) and contributed to the global obesity crisis. It is also stated the conflict between globalised and localised food systems and Lang and Heasman (2015) state the importance of a localised food system but the political influence

choosing to create policies and trade agreements at the international level, greatly hinders the success of localised systems.

### **5.8 Supply Chain Solutions**

The results showed how many FPGs were combating the complexities and adversity of the supply chain. This has been achieved by avoiding producing for the commodity market, either through the creation of local supply chains which allowed for greater crop and product flexibility but, also through more diverse cropping systems. This not only allows the FPGs to receive a better price for their product, but also those in the onward supply chain can adapt products and recipes to the more successful crops produced by the FPGs. Other FPGs focussed on more diverse crop production and producing value added goods which allowed FPGs to produce crops and products which generate higher profits, and they can sell direct to consumers or into niche markets. The adaptations by FPGs means they can utilise more of what they produce with more relaxed product specifications for local markets compared with supermarket criteria and generate income from previously perceived 'waste' products. Some FPGs commented that dealing with local markets allowed them to supply a far better-quality product therefore generating higher customer satisfaction. The steps taken by the FPGs shows how they can adapt their business and production operations to achieve integrated sustainability, by concentrating on the environmental, economic and social factors which are affecting their businesses, and such efforts are recognised as positive grassroots change within the sector and should be unreservedly acknowledged by the UK Government. This positive aspect of a local supply chain, however, is highly dependant of locality and the demographic of the local area.

### **5.9 Consumers**

It was also discussed within the results the strong disconnect which consumers have with the food and farming system. It was debated in the results that generally consumers chase low prices offered by retailers, often at the cost of production standards or by buying cheaper foreign imports. Additionally, the true cost of food production is not taken into consideration by many consumers. Social circumstance can heavily influence consumer choice, in recent decades less of the household budget has been assigned to food and factors such as time and food preparation skills influencing consumer choice. Those FPGs which had experienced customer facing roles commented on the required skills set to work in a customer-facing position, with many FPGs stating their individual successes and failures in this role. This is one area that Government could provide support and guidance enabling FPGs to diversify and

successfully adapt business models to sell direct to the consumer, therefore allowing FPGs to generate greater profit margins and creating economic sustainability.

Many of the FPGs also debated the impact of UK media narratives and how this affected the public perception of the industry. Furthermore, some stated that television programmes which depicted, for example, foreign meat production, which is typically produced to a lower standard than British farming, reinforced the disconnect between the consumer and domestic FPGs. With some FPGs going on to describe the ‘trolling’ they had received either online or through nuisance phone calls by those who disagreed with livestock and dairy production and consumption.

Evidence from the results showed how some FPGs look to address the disconnect between the food system and the consumer by offering educational farm visits and engaging with local consumers through the promotion of their seasonal produce. It was acknowledged by some FPGs that creating local supply chains was time consuming and often challenging but that often local customers developed a greater respect for the products. FPGs also commented on the influence on celebrity chefs who invariably promote the use of local and seasonal produce.

### **5.10 Labour**

The labour issues within the farming industry are well documented (Devlin, 2016; McGuinness and Garton-Grimwood, 2017; Cosgrove, 2018) and numerous FPGs discussed the issues they faced from accessing reliable domestic labour. Factors such as Brexit and the COVID-19 pandemic both massively influencing the availability of migrant labour as well as the poor perception of agriculture and horticultural as a viable career option for younger generations (Eldridge, 2018) all these issues were raised by FPGs in the results. Some FPGs also discussed the negative experience they had employing furloughed workers during the 2020 lockdown during the COVID-19 pandemic, such negative experiences have only helped to heighten FPGs concerns about relying on domestic labour. The results also revealed that some FPGs struggled to pay themselves a decent wage and there was little profit available for additional staff and saw investment in technology as a safer investment for continued productivity. The seasonality of the workload in both agriculture and in particular horticulture is often a big topic for debate and one the key factors affecting uptake of domestic employees, this was raised by the FPGs during the results. Fruit pickers are particularly affected by this trend, who mainly need workers for approximately eight months of the year and one arable farmer discussed how he aims to employ one man per 1000 acres, with such employment levels it is easy to understand the levels

of rural decline as mentioned in the literature review (Kitchen and Marsden, 2009; Gregoire, 2002).

Several FPGs discussed how they mitigated staffing issues by creating a balanced and enjoyable work environment, either through training staff to multitask seasonal workloads within the business set up, working with other seasonal sectors to share a staffing pool, supporting staff with domestic and social issues and creating local networks to ensure the farm becomes a celebrated part of the local community. It was also expressed by one FPG the need to pay workers more, in the hope this would create a more buoyant labour market but the pressures throughout the supply chain and the effect this has on profits, there is little availability to increase wages. All these factors have clear strong connections with the social and economic SDGs such as SDG 8, SDG 10, SDG 12 and SDG 3.

### **5.11 Covid-19 Pandemic**

FPGs discussed the impact of the COVID-19 pandemic on their business operations, and this was mostly felt through the massively increased demand for local produce as consumers both look to avoid supermarkets but also due to the lack of goods because of interrupted supply chains. This affected many FPGs profit margins and cash flow due to fluctuating wholesale prices and increased working hours to cope with the demand. The global impact of the pandemic has become highly documented in academic literature in recent years following the height of the virus outbreak in 2020 and 2021 (Poudel *et al*, 2020; Henry, 2020; Beckman and Countryman, 2021). Such extreme circumstances have clearly highlighted the vulnerabilities of our current food system and emphasise the need for a more sustainable and less volatile system for both producers and consumers. Such volatility has been experienced since the COVID-19 pandemic with the outbreak of war in Ukraine which has increased fuel, food and the general cost of living. The effects of the war have been felt heavily throughout Europe but also had a global impact. This generates an even stronger argument for Government to promote and support sustainable domestic production and consumption.

### **5.12 Economic Barriers**

When asked to talk about the economic barriers faced by FPGs, the data included issues such as access to finance for initial business set up or for reinvestment and a limited cash flow reducing the capability to reinvest. As well as issues such as the access to land reduced FPGs ability to grow their businesses, as was mentioned in the literature review (Helm, 2019; Ingram and Kirwan, 2011). Other issues included the impact of local planning enforcement which

directly impacted FPGs opportunity to create more profitable business ventures such as onsite cafes or shops. The persistent supply chain issues were also raised, for example the persistent low level of wholesale prices, in some cases which have not changed for 20 years despite major investment from FPGs. This not only affects current production but also discourages new entrants from accessing the sector.

Another major issue discussed by FPGs was the closure of local abattoirs, this creates increased financial costs for FPGs but also increased stress for animals. It was felt by the FPGs that the closures were ultimately due to increased legislation and costs, but for those who raised livestock was seen as a major impact to the efficiency of their businesses. Other livestock related issues focussed on the paperwork involving the movement of animals, the current system was described as extensive and many FPGs do not have the time for the lengthy amount of paperwork. It was suggested by one FPG that an app would be a more efficient way to process and access documents as required, considering most FPGs have the technology via smart phones.

The data showed a few methods that FPGs have implemented to create economic sustainability through the adoption of more regenerative practices FPGs were able to cut costs by reducing the quantity of on farm inputs, this allowed some FPGs to free up their cash flow to reinvest in their businesses. Other solutions mentioned in the data included allowing tenant farmers longer contracts. This would also allow for greater economic and environmental reinvestment in rented farms, which it was believed that for many short-term leases it is of no financial benefit to the farmer to work on improving the soils or natural capital on the farm.

### **5.13 Social Barriers**

The data showed by far the biggest social barrier was access to labour and its associated complications, the effect of the Covid-19 pandemic coupled with the effects of Brexit has greatly influenced the access to labour in the UK. FPGs explored other factors such as, declining rural populations, limited interest from younger generations and the lacking reliability of domestic workers. Such factors affected the future of some FPGs' businesses and the likelihood of reinvestment within the sector.

Another social barrier mentioned by the FPGs were those with links to direct meat sales, they talked of issues surrounding the demand for convenience products and consumer cooking skills. It was often the case that easy to cook products that required minimal preparation were in higher demand but as a result many FPGs were left with less popular cuts or those which

required longer cooking times. Some FPGs offered solutions to these problems by offering recipe cards to customers or creating circular emails which provided recipes for less popular cuts. Some also explained that they only sold whole butchered and prepared carcasses, in this instance pigs and private consumers would come together as a group to purchase a whole carcass and divide it as required. The FPG in this circumstance stated that they were able to reduce waste and ensure the whole animal was used.

#### **5.14 Environmental Barriers**

When FPGs discussed the environmental barriers, this included experiencing the direct impact of climate change, mostly through changing weather patterns which directly affects the success of the harvest, crop sowing times and yields. It was also mentioned that larger machinery, which the sector has been moving towards in recent decades due to increased field size, was becoming problematic and it was suggested that smaller machinery would be more efficient at dealing with changing weather patterns.

It was also mentioned in the literature review the impact of modern farming on pollinators and this was echoed in the results. Firstly, FPGs discussed the fact the countryside is floral desert with little to sustain, in particular bee populations. But, secondly the impact of climate change on bee populations, with Britain experiencing more mild damp winters and wetter summer months such changeable weather is dramatically affecting bee health.

### **6. Conclusion**

This research has provided an in-depth evaluation of the opinion of FPGs in English agriculture. By detailing the issues brought upon the farming sector through previous British agricultural policy and furthermore understanding from FPGs themselves, how the SDGs might be achieved through policy changes in the upcoming policy overhaul because of Britain's withdrawal from the EU. The productionist paradigm of post-war Britain and the mass industrialisation of English agriculture is well documented, however the lived experience of English farmers, is not acknowledged in current academic literature and this is fundamental to a sustainable future for English farming.

What this research set out to achieve, and fundamentally has achieved is develop the human element of agricultural sector and FPGs themselves and the knock-on effect of policy. The results showed that many FPGs how many have moved away from Government support and have provided numerous examples of how the industry is thriving with minimal Government

support, but also drawn attention to areas which require further support, as has been suggested in the rural development paradigm literature. The documented evidence from this study has shown that the grassroots economic innovation developed by FPGs is helping to drive the sector forward and move away from the affects of stifling policy within the sector. For example, through the creation of shorter and more local of supply chains and by working in an aspect of adaptability with local suppliers or through the development of products for niche markets FPGs have been able to create a layer of resilience. Whilst also generating value added goods to ensure maximum profit levels at the primary level of the supply chain. The lived experience revealed that by implementing such factors farmers have been able to minimise stress, mitigating the volatility of more mainstream supply chains and generate a more positive certainty for their businesses and inspire the opportunity for reinvestment.

Furthermore, elements of social innovation which has included training staff to multitask to cope with seasonal work loads, creating a happy work environment which caters to employees needs and also by adapting business models to generate value added goods and therefore increasing the need for local labour and more importantly creating a workplace that is not dependant on farmers working solo. As well as the all-important environmental innovation leading to many FPGs choosing regenerative, or more old-fashioned methods of production to readdress the balance of industrialised farming. With many FPGs describing the pride they felt with more sustainable production methods and the recognising their efforts in generating more integrated sustainability into their businesses.

The research has also highlighted the negative influence of policy and areas where further support is needed. These were shown to be factors such as the economic, social and environmental impact of the CAP and the difficulty of establishing local businesses due to cost of land prices, local planning restrictions and complex entry-exit scenarios in agriculture. Also, the difficulties in establishing a direct-to-consumer supply chain, the lack of consumer knowledge surrounding crop seasonality and cooking skills to marry up with local meat supply and legislative decisions reducing efficiencies particularly with livestock administration and the closure of local slaughterhouses. By using the lived experience as a methodology, the stresses that FPGs felt on a daily basis were discussed in depth, with many expressing the desire to expand and progress their businesses but the explaining the distinct frustrations they felt with the many apparent barriers they met on a daily basis.

## **6.1 Research Question**

### **6.1.1 What has been the long-term affect of the current British agricultural policy on the English agricultural sector?**

The research shows the long term affects of previous policy has taken a negative toll on current farming practices, the effects of which are now showing many farmers choosing to step away from Government support. Although the impact of policy is not new information, the results show the importance of acquiring the knowledge of the lived experience of FPGs, which generates a greater level of understanding on these policy issues and the frustration felt by many FPGs. The research highlights the breadth of the issues which developed from these policy decisions for example the cost of land restricting business development and access for new entrants, the innovative restraint of the farming sector created by the CAP payments and the heavy burden of the environmental impact of modern farming techniques which has driven demand for production quantity over quality. The CAP encouraged a post-war food production drive, which has continued with many FPGs growing, uncompetitively for the commodity market with smaller scale production and limited access to affective pesticides dramatically reducing English FPGs ability to compete at a global level, which has principally led to a further dependence on Government fiscal support. Furthermore, the research explored the complex social issues such as employment crises within the sector, particularly the lived experience of horticultural growers which as a result of industrialisation and poor wages has led to a dependency on migrant labour, the faults of which were highlighted during the COVID-19 pandemic and a catastrophic side-effect of Brexit. Many in the horticulture sector discussed the stress felt by FPGs within the retailer supply chain and the oligopolistic marketplace, with multifaceted contractual obligations leaving FPGs with the continual need to minimise costs, further exacerbating the labour crisis.

### **6.1.2. Can future policy be developed to embrace sustainable development and work symbiotically with the farming sector?**

By choosing to step back from Government assistance, many FPGs have shown how future policy could be formulated from a grassroots industry-led standing. By establishing businesses which generate diverse and value-added food production, businesses can adapt production to cope with environmental volatility by growing or producing products for an end user rather than the open market. By creating such supply chains FPGs generate greater profit levels, and this allows for greater reinvestment to the business and increased levels of local employment.

Such decisions allow for a more sustainable operational approach to farming and this model of supply chain can be seen operating successfully at a regional level, unquestionably there is still a demand for a national distribution due to regional production levels. However, with retailers promoting greater demand for local supply the provenance of produce is developed, the quality of the produce is improved and crucially there are shorter food miles within the supply chains. All these factors accumulate to generate higher profits for FPGs which in turn drives up the economic worth of food production and improves the integrated sustainability of food production.

Many lessons can be learnt from the grassroots development of this regenerative farming movement, and this is concurrent with Mazzucato's principles for mission-orientated policy. If the Government observed the success and understood the adaption within the sector a valuable and strong industry-led policy could be developed in collaboration with the industry. This could easily focus on a regional approach as most of the experimentation within each sector has fundamentally been done at a compartmentalised and production specific level. Government could choose to back English FPGs by adopting this policy approach and team up with those who have chosen a regenerative approach to modern farming. If the Government implemented this method, then it would certainly go some way to achieving the SDGs by 2030.

However, there are many key factors which will alter the success of this theory, firstly Government's need to promote English FPGs production over cheaper, potentially less socially and environmentally ethical, imported goods and help farmers promote high end products which can have a high global demand therefore generating greater profit for domestic FPGs. Government must also provide further support for farmers to develop diverse business chains, encouraging skills to establish business promotion through local networks and social media and customer facing positions.

### **6.1.3 With the Government committed to fulfilling the SDGs by 2030, can the targets be met when applied to English Agricultural sector?**

Although not all the 17 SDGs are directly relevant to the English agricultural system by implementing a more integrated and regenerative approach to future farming policy the Government can aim to achieve the majority the main goals. These main goals would include:

Goal	Action
No.1 No Poverty No. 2 Zero Hunger	Complex social political issues, unlikely to be resolved through amendments to agricultural policy.
No. 3 Good Health and Well-Being	Improving diets through, access to better quality nutrient dense food, better consumer education on local foods through community relationships with FPGs.
No. 4 Quality Education	Government responsibility to improve access to better education for consumers through cooking skills, seasonality of products and general health.
No. 5 Gender Equality	Championing agriculture and horticulture in schools as a viable and rewarding career and creating better access for new farm starters.
No.6 Clean Water and Sanitation No.14 Life Below Water	Reducing agricultural pollution of waterways through reducing chemical inputs, reducing tillage and minimising bare soils reducing loss of fertile topsoil, reducing planting of crops which have detrimental affect on soil health and encouraging farmers to adopt a combine crop planting.
No.7 Affordable and Clean Energy	Continued support of renewable energy but not in favour of soil health.
No. 8 Decent work and Economic Growth No. 10 Reduced Inequalities	Greater profits achieved through local supply chains, development of value-added goods generating greater levels of profit encourages higher levels of business reinvestment. Actions which encourage regional economic and social development reducing regional inequalities.
No. 9 Industry, Innovation and Infrastructure	Providing support for FPGs to expand businesses vertically creating community hubs for employment and local supply.
No. 11 Sustainable Cities and Communities No.12 Responsible Consumption and Production	Sustainable production achieved through regenerative methods and local supply chains, better consumer education surrounding food production and seasonality, domestic usage and reducing waste created by social connections through developed local communities.
No.13 Climate Action No. 15 Life on Land	By adopting regenerative processes for a sustainable future in food production, creating diverse habitats through more sustainable production methods, adapting crop production to cope more with changeable weather patterns.
No. 16 Peace, Justice and Strong Institution	
No. 17 Partnerships for the Goals	

The ELMS scheme does show promise of a greater environmental focus for Government policy but there seems little focus on rural development, through environmental and social aspects. By ensuring FPGs build strong businesses with a connection to local communities it can go some way in fulfilling these additional sustainability factors. The evidence from the interviews shows that it is feasible to create such businesses and they in turn can help to promote rural development and create a much-needed community hub. It is, however, important to

acknowledge the potential dangers that lie ahead in modern farming through private investment for carbon offset. It would not be sustainable practice for the private sector to offset their carbon production through vast payments to FPGs. Businesses must address their own environmentally unsustainable operations in a bid to address the affects of climate change. It is, therefore, not considered legitimate to simply pay large sums of money to counteract these unsustainable operations. Although it is likely the Government will ignore this practice as many farmers will stand to benefit considerably from such schemes and thus reducing their dependency on Government's fiscal support there should be careful consideration on the legislation surrounding this proposal. If this is to be considered, the Government at the bare minimum, should insist upon the development of local native habitat taking a precedence over the planting of non-native species, in line with the Government's own ELMS scheme.

It is unlikely the Government will achieve the SDGs by 2030, certainly within the food production sector. It is an important reminder that there is little accountability if there is failure in achieving the set target and additionally the potential upcoming general election could see a change in political agenda. Since the completion of the interviews there have been additional global factors which have resulted in rising costs across all sectors and further volatility in food supply chains. The needs of the industry are vast and with only seven harvests left until the deadline it seems unlike that the vital changes can be made in such a brief period. However, with Government supporting the regenerative grassroots movement that is evolving in English farming and developing a strong collaboration will certainly go some way to addressing the fundamental issues within English food production, whilst also factoring the externalities of highly processed foods. The Government need to embrace a multi-sectoral overview and deal with key issues such as environmental factors including agricultural pollution in British waterways, social factors addressing employment issues and economic factors related to subsidies and future business support.

## **6.2 Future Research Areas**

Further research questions have been generated as a result of this study despite the breadth of data generated from the research. Firstly, it would be interesting to research regions of England with notoriously complex farming sectors, for example hill farmers who receive high levels of funding and are generally considered economically unsustainable requiring greater levels of financial support and also environmentally precarious due to the nature of hill farming and the often-detrimental effect on native habitats. Furthermore, researching regions with high

unemployment and economically poorer areas, which are typically located in more northern regions of the country. This would generate a set of results that would possibly look to answer some of the more difficult and challenging policy issues faced by English FPGs and policy makers. As the results from this research showed that between the regions of high agricultural and horticultural production, the key issues faced by FPGs were all broadly similar within their defined sectors participants. However, a wider analysis would generate a more extensive detailing of the complexities affecting the whole country and generate a broader understanding of the nuances required to deliver a more assertive countrywide agricultural policy.

In summary, this research has shown how the lived experience has generated an in depth overview of the English agricultural sector through the personal stories of FPGs and the wide variety of barriers it faces, but also the positive innovation which is being driven by the grassroots revolution which is tackling a lot of the fundamental issues generated through historical policy. If the Government chose to adopt a collaborative approach to policy with the farming sector, then this may move the sector closer to achieving the SDGs through integrated sustainability approach. However, the impact of Brexit and the Covid-19 pandemic have drawn attention to the cracks in English agriculture, but further global political issues create uncertainty and may jeopardise sustainable agriculture production on the political agenda.

## Reference List

- Ala- Uddin, M., (2019) 'Sustainable' Discourse: A critical analysis of the 2030 agenda for sustainable development. *Asia Pacific Media Educator* 29(2) 214-224.
- Alfven T, Braun-Fahrlander C, Brunekreef B, von Mutius E, Riedler J, et al. 2006. Allergic diseases and atopic sensitization in children related to farming and anthroposophic lifestyle - the PARSIFAL study. *Allergy* 61:414–21
- Auernhammer, H., 2001. Precision farming—the environmental challenge. *Computers and electronics in agriculture*, 30(1-3), pp.31-43.
- Badgley, C., Moghtader, J., Quintero, E., Zakem, E., Chappell, M.J., Aviles-Vazquez, K., Samulon, A. and Perfecto, I., 2007. Organic agriculture and the global food supply. *Renewable agriculture and food systems*, 22(2), pp.86-108.
- Bailey, A., Lang, T. and Schoen, V., 2016. Does the CAP still fit? *Food Research Collaboration*, <https://openaccess.city.ac.uk/id/eprint/15039/1/>
- Bali Swain, R., (2017) A critical analysis of the Sustainable Development Goals. *Handbook of Sustainability Science and Research* p 341-355. Springer.
- Baranski M, Srednicka-Tober D, Volakakis N, Seal C, Sanderson R, et al. 2014. Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses. *British Journal Nutrition*. 112:794–811
- Bechmann, M. and Stålnacke, P., 2005. Effect of policy-induced measures on suspended sediments and total phosphorus concentrations from three Norwegian agricultural catchments. *Science of the Total Environment*, 344(1-3), pp.129-142.
- Beckman, J. and Countryman, A.M., 2021. The importance of agriculture in the economy: impacts from COVID-19. *American journal of agricultural economics*, 103(5), pp.1595-1611.
- Benton, T.G., Bryant, D.M., Cole, L. and Crick, H.Q., 2002. Linking agricultural practice to insect and bird populations: a historical study over three decades. *Journal of applied ecology*, 39(4), pp.673-687.
- Benton, T.G. and Bailey, R., 2019. The paradox of productivity: agricultural productivity promotes food system inefficiency. *Global Sustainability*, 2, p.e6.
- Bengtsson, J., Ahnström, J. and Weibull, A.C., 2005. The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of applied ecology*, 42(2), pp.261-269.
- Boardman, J., 2013. Soil erosion in Britain: updating the record. *Agriculture*, 3(3), pp.418-442.
- Boody, G., Vondracek, B., Andow, D.A., Krinke, M., Westra, J., Zimmerman, J. and Welle, P., 2005. Multifunctional agriculture in the United States. *BioScience*, 55(1), pp.27-38.

- Bourdieu, P. (1977) *Outline of a theory of practice*. Cambridge, England: Cambridge University Press.
- Brandt, K. and Mølgaard, J.P., 2001. Organic agriculture: does it enhance or reduce the nutritional value of plant foods? *Journal of the Science of Food and Agriculture*, 81(9), pp.924-931.
- Brundtland Report, 1987. *Report of the World Commission on Environment and Development: Our Common Future*.  
<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>  
 (accessed 22/01/22)
- Butrico, G.M. and Kaplan, D.H., 2018. Greenhouse agriculture in the Icelandic food system. *European countryside*, 10(4), pp.711-724.
- Clapp, J. 2016. *Food*. Polity Press: Cambridge.
- Conway, S.F., McDonagh, J., Farrell, M. & Kinsella, A. (2016) Cease agricultural activity forever? Underestimating the importance of symbolic capital. *Journal of Rural Studies*, 44, 164–176.
- Conway, S.F., McDonagh, J., Farrell, M. & Kinsella, A. (2018) Till death do us part: Exploring the Irish farmer-farm relationship in later life through the lens of ‘Insiderness’. *International Journal of Agricultural Management*, 7(1), 1–13
- Cosgrove, S., 2018. British Berry Growers say new SAWS is needed now as labour shortages hits investment and production. <https://www.hortweek.com/british-berry-growers-say-new-saws-needed-labour-shortage-hits-investment-production/fresh-produce/article/1485506>  
 (accessed 7th September 2018).
- Costanza, R. and Patten, B.C., 1995. Defining and predicting sustainability. *Ecological economics*, 15(3), pp.193-196.
- Curl, C.L., Fenske, R.A. and Elgethun, K., 2003. Organophosphorus pesticide exposure of urban and suburban preschool children with organic and conventional diets. *Environmental health perspectives*, 111(3), pp.377-382.
- Cusworth, G., Garnett, T. and Lorimer, J., 2021. Legume dreams: The contested futures of sustainable plant-based food systems in Europe. *Global Environmental Change*, 69, p.102321.
- Daghagh Yazd, S., Wheeler, S.A. and Zuo, A., 2019. Key risk factors affecting farmers’ mental health: A systematic review. *International journal of environmental research and public health*, 16(23), p.4849.
- Dangour AD, Lock K, Hayter A, Aikenhead A, Allen E, Uauy R. 2010. Nutrition-related health effects of organic foods: a systematic review. *American Journal Clinical Nutrition* 92:203–10
- Darnhofer, I., Lindenthal, T., Bartel-Kratochvil, R. and Zollitsch, W., 2010. Conventionalisation of organic farming practices: from structural criteria towards an

assessment based on organic principles. A review. *Agronomy for sustainable development*, 30, pp.67-81.

Davies, B., Eagle, D. and Finney, B., 1993. *Soil Management*, oo.243-266. 5<sup>th</sup> edn. Ipswich: Farming Press Ltd.

DEFRA. 2007. Science and Research Projects: The national inventory and map of livestock manure loadings to agricultural land (Manures-GIS) - WQ0103.  
[http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14500#:~:text=Around%2090%20million%20tonnes%20\(fresh,UK%20\(1%2C2\).](http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14500#:~:text=Around%2090%20million%20tonnes%20(fresh,UK%20(1%2C2).) (accessed 14/04/2022)

DEFRA. 2022. Environmental Land Management Scheme: Outcomes.  
<https://www.gov.uk/government/publications/environmental-land-management-schemes-outcomes/environmental-land-management-schemes-outcomes> (accessed 08/07/2022).

DEFRA. 2022a. New powers granted to research gene editing in plants.  
<https://www.gov.uk/government/news/new-powers-granted-to-research-gene-editing-in-plants> (accessed 21/07/22).

DEFRA. 2020[1]. Three crop rule relaxed and £6 million fund for farmers.  
<https://www.gov.uk/government/news/three-crop-rule-relaxed-and-6-million-fund-for-farmers> (accessed 03/08/2022).

DEFRA. 2021. Horticultural Statistics 2020.  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1003935/hort-report-20jul21.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003935/hort-report-20jul21.pdf) (accessed 9/12/2021)

Devlin, S., 2016. Agriculture Labour in the UK These were chosen by DEFRA's 2019 Total Income for Food and Farming report (DEFRA 2019) and the counties which had the greatest agricultural and horticultural output. (accessed 3rd September 2018).

Donald, P.F., Green, R.E. and Heath, M.F., 2001. Agricultural intensification and the collapse of Europe's farmland bird populations. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, 268(1462), pp.25-29.

Dwyer, J.; Micha, E.; Kubinakova, K.; Van Bunnem, P.; Schuh, B.; Maucorps, A.; Mantino, F., 2019 Evaluation of the Impact of the CAP on Generational Renewal, Local Development and Jobs in Rural Areas; Technical Report; European Commission: Brussels, Belgium.

Easterly, W., 2015. The trouble with the sustainable development goals. *Current History*, 114(775), p.322.

Elzen, B., Geels, F.W., Leeuwis, C. and Van Mierlo, B., 2011. Normative contestation in transitions 'in the making': Animal welfare concerns and system innovation in pig husbandry. *Research Policy*, 40(2), pp.263-275.

EC, 2022. Common Agricultural Policy. European Council.  
<https://www.consilium.europa.eu/en/policies/cap->

introduction/#:~:text=The%20common%20agricultural%20policy%20(CAP)%20was%20cre  
ated%20in%201962%20by,standard%20of%20living%20for%20farmers (accessed  
08/06/2022)

Eldridge, H., 2018. Digging into Horticulture: Encouraging the next generation of producers. Soil Association. <https://www.soilassociation.org/media/15861/digging-into-horticulture.pdf> (accessed 4th July 2018).

Esen, M. and Yuksel, T., 2013. Experimental evaluation of using various renewable energy sources for heating a greenhouse. *Energy and Buildings*, 65, pp.340-351.

EUR-Lex, 2022. Glossary of Summaries. [https://eur-lex.europa.eu/summary/glossary/sustainable\\_development.html](https://eur-lex.europa.eu/summary/glossary/sustainable_development.html). (accessed 12/01/2022)

FAO (2014) World Reference Base for Soil Resources. <https://www.fao.org/3/i3794en/I3794en.pdf> (accessed 06/07/2023)

Fenster, T.L., Oikawa, P.Y. and Lundgren, J.G., 2021. Regenerative Almond Production Systems Improve Soil Health, Biodiversity, and Profit. *Frontiers in Sustainable Food Systems*, p.256.

Finger, R., Swinton, S.M., El Benni, N. and Walter, A., 2019. Precision farming at the nexus of agricultural production and the environment. *Annual Review of Resource Economics*, 11(1), pp.313-335.

Firbank, L.G., Petit, S., Smart, S., Blain, A. and Fuller, R.J., 2008. Assessing the impacts of agricultural intensification on biodiversity: a British perspective. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1492), pp.777-787.

Forman, J., Silverstein, J., Committee on Nutrition, Council on Environmental Health, Bhatia, J.J., Abrams, S.A., Corkins, M.R., de Ferranti, S.D., Golden, N.H., Silverstein, J. and Paulson, J.A., 2012. Organic foods: health and environmental advantages and disadvantages. *Paediatrics*, 130(5), pp.e1406-e1415.

Geels, F.W., 2011. The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental innovation and societal transitions*, 1(1), pp.24-40.

Geoghegan, H. and Leyson, C., 2012. On climate change and cultural geography: farming on the Lizard Peninsula, Cornwall, UK. *Climatic Change*, 113(1), pp.55-66.

Ghosh, J., 2015. Beyond the Millenium Development Goals: A Southern perspective on a global new deal. *Journal of International Development*, 27(3), pp.320-329.

Giddens A. and Sutton P.W., 2017 *Essential Concepts in Sociology 2<sup>nd</sup> Edition*. Polity Press: Cambridge.

Giller, K.E., Hijbeek, R., Andersson, J.A. and Sumberg, J., 2021. Regenerative agriculture: an agronomic perspective. *Outlook on Agriculture*, 50(1), pp.13-25.

Goulson, D., Nicholls, E., Botías, C. and Rotheray, E.L., 2015. Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. *Science*, 347(6229), p.1255957.

- Grant, W., 2010. Policy instruments in the common agricultural policy. *West European Politics*, 33(1), pp.22-38.
- Gregoire, A., 2002. The mental health of farmers. *Occupational Medicine*, 52(8), pp.471-476.
- Greenwood, J.J.D., 2000. Biodiversity and environment. In: Tinker, P.B. (Ed.), *Shades of Green – A Review of UK Farming Systems*. Royal Agricultural Society of England, Stoneleigh Park, pp. 59–72.
- Hák, T., Janoušková, S. and Moldan, B. (2016) Sustainable Development Goals: A need for relevant indicators. *Ecological Indicators* 60 p. 565-573.
- Harvey, F. 2021. UK ministers gain power to allow lower-standard food imports. <https://www.theguardian.com/environment/2021/jan/19/uk-ministers-gain-power-to-allow-lower-standard-food-imports>. (accessed 15/07/2022)
- Helm, D., 2019. *Green and prosperous land: a blueprint for rescuing the British countryside*. HarperCollins UK.
- Henry, R., 2020. Innovations in agriculture and food supply in response to the COVID-19 pandemic. *Molecular plant*, 13(8), p.1095.
- Hennessy, T.C. and Rehman, T., 2007. An investigation into factors affecting the occupational choices of nominated farm heirs in Ireland. *Journal of Agricultural Economics*, 58(1), pp.61-75.
- Hockenfull, J., Main, D.C.J. and Mullan, S., 2019. ‘Would it sell more pork?’ Pig farmers’ perceptions of Real Welfare, the welfare outcome component of their farm assurance scheme. *animal*, 13(12), pp.2864-2875.
- Hole, D.G., Perkins, A.J., Wilson, J.D., Alexander, I.H., Grice, P.V. and Evans, A.D., 2005. Does organic farming benefit biodiversity? *Biological conservation*, 122(1), pp.113-130.
- Horton, H. 2022. Hard-right Tories push to delay environmental land management scheme. <https://www.theguardian.com/environment/2022/may/20/hard-right-tories-push-delay-environmental-land-management-scheme-brexit> (accessed 08/07/2022).
- Hopwood, B., Mellor, M. and O'Brien, G., 2005. Sustainable development: mapping different approaches. *Sustainable development*, 13(1), pp.38-52.
- Howard, A. and Howard, L.E., 1945. Farming and gardening for health or disease. *Farming and gardening for health or disease*.
- Huber M, Rembiałkowska E, Srednicka D, B ´ ugel S, van de Vijver L. 2011. Organic food and impact on human ´ health: assessing the status quo and prospects of research. *Wageningen Journal of Life Sciences* 58(3–4):103–9
- Hull, Z., 2008. Sustainable development: premises, understanding and prospects. *Sustainable Development*, 16(2), pp.73-80.

- Ingram, J. and Kirwan, J., 2011. Matching new entrants and retiring farmers through farm joint ventures: Insights from the Fresh Start Initiative in Cornwall, UK. *Land Use Policy*, 28(4), pp.917-927.
- IPCC. 2019. Climate change and Land. <https://www.ipcc.ch/srccl/> (accessed 9/12/2021)
- Jose, S. and Dollinger, J., 2019. Silvopasture: a sustainable livestock production system. *Agroforestry systems*, 93(1), pp.1-9.
- Kelly, P.W., 1982. Agricultural land--tenure and transfer (No. 1, p. 100pp).
- Kesse-Guyot E, Peneau S, M´ejean C, Szabo de Edelenyi F, Galan P, et al. 2013. Profiles of organic food ´ consumers in a large sample of French adults: results from the Nutrinet-Sante cohort study. ´ *PLOS ONE* 8:e76998
- Kitchen, L. and Marsden, T., 2009. Creating sustainable rural development through stimulating the eco-economy: beyond the eco-economic paradox? *Sociologia ruralis*, 49(3), pp.273-294.
- Krebs, J.R., Wilson, J.D., Bradbury, R.B. and Siriwardena, G.M., 1999. The second silent spring? *Nature*, 400(6745), pp.611-612.
- Kumi, E., Arhin, A.A. and Yeboah, T., 2014. Can post-2015 sustainable development goals survive neoliberalism? A critical examination of the sustainable development–neoliberalism nexus in developing countries. *Environment, development and sustainability*, 16(3), pp.539-554.
- Kummeling I, Thijs C, Huber M, van de Vijver LPL, Snijders BEP, et al. 2008. Consumption of organic foods and risk of atopic disease during the first 2 years of life in the Netherlands. *British Journal of Nutrition* 99:598–605
- LaCanne, C.E. and Lundgren, J.G., 2018. Regenerative agriculture: merging farming and natural resource conservation profitably. *PeerJ*, 6, p.e4428.
- Lal, R., 2021. Soil management for carbon sequestration. *South African Journal of Plant and Soil*, 38(3), pp.231-237.
- Lal, R., 2020. Regenerative agriculture for food and climate. *Journal of soil and water conservation*, 75(5), pp.123A-124A.
- Lang, T. and Heasman, M., 2015. *Food wars: the global battle for mouths, minds and markets*. Routledge.
- Lang, T., 2020. *Feeding Britain: Our food problems and how to fix them*. Penguin UK.
- Lobley, M.; Baker, J.R.; Whitehead, I. Farm succession and retirement: Some international comparisons. *Journal of Agricultural Food Systems. Community Development*. 2010, 1, 49–64.
- Loeb, J. 2019. "Red Tractor farms show drop in antibiotics." *The Veterinary Record* 185:16. 494-494.
- Leonard, B., Kinsella, A., O'Donoghue, C., Farrell, M. and Mahon, M., 2017. Policy drivers of farm succession and inheritance. *Land use policy*, 61, pp.147-159.

- López-Bravo, D.F., Virginio-Filho, E.D.M. and Avelino, J., 2012. Shade is conducive to coffee rust as compared to full sun exposure under standardized fruit load conditions. *Crop Protection*, 38, pp.21-29.
- Lotter, D.W., 2003. Organic agriculture. *Journal of sustainable agriculture*, 21(4), pp.59-128.
- Lu, C., Toepel, K., Irish, R., Fenske, R.A., Barr, D.B. and Bravo, R., 2006. Organic diets significantly lower children's dietary exposure to organophosphorus pesticides. *Environmental health perspectives*, 114(2), pp.260-263.
- Marsden, T. and Sonnino, R., 2008. Rural development and the regional state: Denying multifunctional agriculture in the UK. *Journal of Rural Studies*, 24(4), pp.422-431.
- McGuinness, T. and Garton-Grimwood, G., 2017. Briefing Paper: Migrant Workers in Agriculture. <http://researchbriefings.files.parliament.uk/documents/CBP-7987/CBP-7987.pdf> (accessed 20th July 2018).
- McIntosh, I. and Wright, S., 2019. Exploring what the notion of 'lived experience' offers for social policy analysis. *Journal of Social Policy*, 48(3), pp.449-467.
- Matias, N.G. and Boavida, M.J., 2005. Effects of catchment development on the trophic status of a deep and a shallow reservoir in Portugal. *Lake and Reservoir Management*, 21(3), pp.350-360.
- Mawdsley, J.L., Bardgett, R.D., Merry, R.J., Pain, B.F. and Theodorou, M.K., 1995. Pathogens in livestock waste, their potential for movement through soil and environmental pollution. *Applied soil ecology*, 2(1), pp.1-15.
- Mazzucato, M., 2018. Mission-oriented innovation policies: challenges and opportunities. *Industrial and Corporate Change*, 27(5), pp.803-815.
- Mazzucato, M., 2018a. Mission-oriented research & innovation in the European Union. European Commission.
- Mazzucato, M., 2021. *Mission economy: A moonshot guide to changing capitalism*. Penguin UK.
- Mazzucato, M., Kattel, R. and Ryan-Collins, J., 2020. Challenge-driven innovation policy: towards a new policy toolkit. *Journal of Industry, Competition and Trade*, 20(2), pp.421-437.
- Mazzucato, M. and Penna, C.C., 2016. Beyond market failures: The market creating and shaping roles of state investment banks. *Journal of Economic Policy Reform*, 19(4), pp.305-326.
- Mebratu, D., 1998. Sustainability and sustainable development: historical and conceptual review. *Environmental impact assessment review*, 18(6), pp.493-520.
- Meemken, E.M. and Qaim, M., 2018. Organic agriculture, food security, and the environment. *Annual Review of Resource Economics*, 10, pp.39-63.
- Mohammadi, Z., Ahmadvand, M., Sharifzadeh, M. and Shahbazi, I., 2021. The lived-experience of land-use among Northern Iranian farmers in land risk areas: A phenomenology study. *Land Use Policy*, 108, p.105534.

- Monteiro, C.A., Cannon, G., Levy, R.B., Moubarac, J.C., Louzada, M.L., Rauber, F., Khandpur, N., Cediel, G., Neri, D., Martinez-Steele, E. and Baraldi, L.G., 2019. Ultra-processed foods: what they are and how to identify them. *Public health nutrition*, 22(5), pp.936-941.
- Moss, B., 2008. Water pollution by agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1491), pp.659-666.
- Mullan, S., Wiltshire, P., Cross, K., Main, D.C., Still, K., Crawley, M. and Dowsey, A.W., 2021. National farm assurance scheme demonstrates welfare outcome improvements for sustainable intensification of dairy production. *International Journal of Agricultural Sustainability*, pp.1-18.
- Murray, W.E. and Overton, J.D., 2011. Neoliberalism is dead, long live neoliberalism? Neostructuralism and the international aid regime of the 2000s. *Progress in development studies*, 11(4), pp.307-319.
- Nair, P.R., Nair, V.D., Kumar, B.M. and Showalter, J.M., 2010. Carbon sequestration in agroforestry systems. *Advances in agronomy*, 108, pp.237-307.
- Naseer, M., Persson, T., Righini, I., Stanghellini, C., Maessen, H. and Verheul, M.J., 2021. Bio-economic evaluation of greenhouse designs for seasonal tomato production in Norway. *Biosystems Engineering*, 212, pp.413-430.
- Newton, A. and Mudge, S.M., 2005. Lagoon-sea exchanges, nutrient dynamics and water quality management of the Ria Formosa (Portugal). *Estuarine, coastal and shelf science*, 62(3), pp.405-414.
- NFU. 2022. What you need to know about gene editing in agriculture. <https://www.nfuonline.com/updates-and-information/what-you-need-to-know-about-gene-editing-in-agriculture/> (accessed 21/07/22).
- Organic Research Centre, 2024. "The Organic Market Report 2024". <https://www.organicresearchcentre.com/news-events/news/organic-market-report-2024/> (accessed 25/04/2024).
- Osborne, A., Blake, C., Meredith, D., McNamara, J., Phelan, J. and Cunningham, C., 2014. The lived experience of low back pain among Irish farmers: case studies. *Journal of Agromedicine*, 19(2), pp.181-190.
- Pekkeriet, E.J. and Van Henten, E.J., 2009, June. Current developments of high-tech robotic and mechatronic systems in horticulture and challenges for the future. In *International Symposium on High Technology for Greenhouse Systems: GreenSys2009* 893 (pp. 85-94).
- Pimentel, D., Hepperly, P., Hanson, J., Douds, D. and Seidel, R., 2005. Environmental, energetic, and economic comparisons of organic and conventional farming systems. *Bioscience* 55, 573e582.
- Popkin, B.M., 2001. The nutrition transition and obesity in the developing world. *The Journal of nutrition*, 131(3), pp.871S-873S.

- Poudel, P.B., Poudel, M.R., Gautam, A., Phuyal, S., Tiwari, C.K., Bashyal, N. and Bashyal, S., 2020. COVID-19 and its global impact on food and agriculture. *Journal of Biology and Today's World*, 9(5), pp.221-225.
- Pretty, J.N., Brett, C., Gee, D., Hine, R.E., Mason, C.F., Morison, J.I., Raven, H., Rayment, M.D. and van der Bijl, G., 2000. An assessment of the total external costs of UK agriculture. *Agricultural systems*, 65(2), pp.113-136.
- Rebanks, J., 2020. *English Pastoral: An Inheritance*-The Sunday Times bestseller from the author of *The Shepherd's Life*. Penguin UK.
- Reganold, J.P. and Wachter, J.M., 2016. Organic agriculture in the twenty-first century. *Nature plants*, 2(2), pp.1-8.
- Reid, K., Flowers, P. and Larkin, M., 2005. Exploring lived experience. *The psychologist*.
- Röder, M., 2016. More than food or fuel. Stakeholder perceptions of anaerobic digestion and land use; a case study from the United Kingdom. *Energy Policy*, 97, pp.73-81.
- Rothaermel, F.T., 2001. Complementary assets, strategic alliances, and the incumbent's advantage: an empirical study of industry and firm effects in the biopharmaceutical industry. *Research policy*, 30(8), pp.1235-1251.
- Royal Agricultural Benevolent Institution (2021) *The Big Farming Survey*. <https://rabi.org.uk/wp-content/uploads/2021/10/RABI-Big-Farming-Survey-FINAL-single-pages-No-embargo-APP-min.pdf> (accessed 24/02/2022)
- Rodale, R., 1983. Breaking new ground: The search for a sustainable agriculture. *Futurist*, 17(1), pp.15-20.
- Sachs, J.D., 2012. From millennium development goals to sustainable development goals. *The lancet*, 379(9832), pp.2206-2211.
- Sachs, J.D., Schmidt-Traub, G., Mazzucato, M., Messner, D., Nakicenovic, N. and Rockström, J., 2019. Six transformations to achieve the sustainable development goals. *Nature sustainability*, 2(9), pp.805-814.
- Sapbamrer, R. and Thammachai, A. A Systematic Review of Factors Influencing Farmers' Adoption of Organic Farming. *Sustainability* 2021, 13, 3842.
- Scheyvens, R., Banks, G. and Hughes, E., 2016. The private sector and the SDGs: The need to move beyond 'business as usual'. *Sustainable Development*, 24(6), pp.371-382.
- Seufert, V., Ramankutty, N., & Mayerhofer, T., 2017. What is this thing called organic? How organic farming is codified in regulations. *Food Policy*, 68, 10-20.
- Shepherd, M., Pearce, B., Cormack, B., Philipps, L., Cuttle, S., Bhogal, A., Costigan, P. and Unwin, R., 2003. An assessment of the environmental impacts of organic farming. A review for DEFRA-funded Project OF0405.
- Shortall, S. and Shucksmith, M., 2001. Rural development in practice: issues arising in Scotland and Northern Ireland. *Community development journal*, 36(2), pp.122-133.

- Shucksmith, M. (1993) Farm household behaviour and the transition to post-productivism. *Journal of Agricultural Economics*, 44(3), 466–478.
- Silva, E., Batista, S., Viana, P., Antunes, P., Serôdio, L., Cardoso, A.T. and Cerejeira, M.J., 2006. Pesticides and nitrates in groundwater from oriziculture areas of the ‘Baixo Sado’ region (Portugal). *International Journal of Environmental and Analytical Chemistry*, 86(13), pp.955-972.
- Simkin, S., Hawton, K., Fagg, J. and Malmberg, A., 1998. Stress in farmers: a survey of farmers in England and Wales. *Occupational and environmental medicine*, 55(11), pp.729-734.
- Skinner, J.A., Lewis, K.A., Bardon, K.S., Tucker, P., Catt, J.A. and Chambers, B.J., 1997. An overview of the environmental impact of agriculture in the UK. *Journal of environmental Management*, 50(2), pp.111-128.
- Sikdar, S.K., 2003. Sustainable development and sustainability metrics. *AICHe journal*, 49(8), pp.1928-1932.
- Smith, A., Stirling, A. and Berkhout, F., 2005. The governance of sustainable socio-technical transitions. *Research policy*, 34(10), pp.1491-1510.
- Spaiser, V., Ranganathan, S., Bali Swain, R., Sumpter, D. J.T. (2017) The sustainable development oxymoron: quantifying and modelling the incompatibility of sustainable development goals. *International Journal of Sustainable Development and World Ecology* 24:6 p457-470.
- Steinfeld, H., Gerber, P., Wassenaar, T.D., Castel, V., Rosales, M., Rosales, M. and de Haan, C., 2006. Livestock's long shadow: environmental issues and options. *Food & Agriculture Organisation*.
- Stigter, T.Y., Ribeiro, L. and Dill, A.C., 2008. Building factorial regression models to explain and predict nitrate concentrations in groundwater under agricultural land. *Journal of Hydrology*, 357(1-2), pp.42-56.
- Stoelen, M., Krzysztof, K., Tejada, V.F., Heiberg, N., Balaguer, C. and Korsæth, A., 2015, July. Low-cost robotics for horticulture: A case study on automated sugar pea harvesting. In 10th European Conference on Precision Agriculture (ECPA).
- Stoate, C., Baldi, A., Beja, P., Boatman, N.D., Herzon, I., Van Doorn, A., De Snoo, G.R., Rakosy, L. and Ramwell, C., 2009. Ecological impacts of early 21st century agricultural change in Europe—a review. *Journal of environmental management*, 91(1), pp.22-46.
- Taylor, J.E., Norris, E.N., Howard, W., 1998. Succession Patterns of Farmer and Successor in Canadian Farm Families’. *Rural Sociology*. 63 (4), 553–573.
- Tiwari, M., 2015. Looking Back to Move Forward: The MDGS and the Road to Post-2015: Introduction to *Journal of International Development* Special Issue on Reflections on the Post-2015 Debate. *Journal of International Development*, 27(3), pp.313-319.
- Thow, A.M., Reeve, E., Naseri, T., Martyn, T. and Bollars, C., 2017. Food supply, nutrition and trade policy: reversal of an import ban on turkey tails. *Bulletin of the World Health Organization*, 95(10), p.723.

- Thow, A.M. and Hawkes, C., 2009. The implications of trade liberalization for diet and health: a case study from Central America. *Globalization and health*, 5(1), pp.1-15.
- Toensmeier, E., 2016. *The carbon farming solution: A global toolkit of perennial crops and regenerative agriculture practices for climate change mitigation and food security*. Chelsea Green Publishing.
- Tranter, R.B., Swinbank, A., Jones, P.J., Banks, C.J. and Salter, A.M., 2011. Assessing the potential for the uptake of on-farm anaerobic digestion for energy production in England. *Energy Policy*, 39(5), pp.2424-2430.
- Tuomisto, H.L., Hodge, I.D., Riordan, P., and Macdonald, D.W., 2012. Does organic farming reduce environmental impacts? A meta-analysis of European research. *Journal of environmental management*, 112, pp.309-320.
- Van der Ploeg, J.D., Renting, H., Brunori, G., Knicki, K., Mannion, J., Marsden, T., De Roest, K., Sevilla-Guzmán, E. and Ventura, F., 2000. Rural development: from practices and policies towards theory. *Sociologia Ruralis* Vol 40:4
- Van Henten, E.J., 2004, June. Greenhouse mechanization: state of the art and future perspective. In *International Symposium on Greenhouses, Environmental Controls and In-house Mechanization for Crop Production in the Tropics* 710 (pp. 55-70).
- Volkov, A., Balezentis, T., Morkunas, M. and Streimikiene, D., 2019. Who benefits from CAP? The way the direct payments system impacts socioeconomic sustainability of small farms. *Sustainability*, 11(7), p.2112.
- Vu Le, Q.V., Cowal, S., Jovanovic, G. and Le, D.T., 2021. A Study of Regenerative Farming Practices and Sustainable Coffee of Ethnic Minorities Farmers in the Central Highlands of Vietnam. *Frontiers in Sustainable Food Systems*, p.358.
- Webster, J.P.G., 1997. Assessing the economic consequences of sustainability in agriculture. *Agriculture, ecosystems & environment*, 64(2), pp.95-102.
- Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D. and David, C., 2009. Agroecology as a science, a movement and a practice. A review. *Agronomy for sustainable development*, 29(4), pp.503-515.
- Williams, R. The ongoing farm crisis: Health, mental health and safety issues in Wisconsin. *Rural Mental Health* 2001, 26, 15–17
- Yarwood, R. & Evans, N. (2006) A Lleyrn sweep for local sheep? Breed societies and the geographies of Welsh livestock. *Environment and Planning*, 38(7), 1307–1326.
- Zagata, L. and Sutherland, L.A., 2015. Deconstructing the ‘young farmer problem in Europe’: Towards a research agenda. *Journal of Rural Studies*, 38, pp.39-51.
- Zygmunt, T., 2016. Philosophy of sustainable development, Polish perspective. *Discourse and Communication for Sustainable Education*, 7(2), p.43.



## Appendix 2

### Survey Questions

1. What is your gender?

- Female
- Male

2. What is your age?

3. Are you aware of the UN Sustainable Development Goals?

- Yes
- No

4. Choose 5 goals which you feel are most relevant to the English food system.

- No poverty
- Zero Hunger
- Good Health and Well-Being
- Quality Education
- Gender Equality
- Clean Water and Sanitation
- Affordable and Clean Energy
- Decent Work and Economic Growth
- Industry, Innovation and Infrastructure
- Reduced Inequalities
- Sustainable Cities and Communities
- Responsible consumption and Production
- Climate Action
- Life Below Water
- Life Below Land
- Peace, Justice and Strong Institutions
- Partnerships for the Goals

5. Which of the 17 goals do you feel are most important in your farm/production system?

	Extremely Important	Very Important	Somewhat Important	Not So Important	Not at all Important
No Poverty					
Zero Hunger					
Good health and Well- Being					
Quality Education					
Gender Equality					
Clean Water and Sanitation					
Affordable and Clean Energy					
Decent Work and Economic Growth					
Industry, Innovation and Infrastructure					
Reduced Inequalities					
Sustainable Cities and Communities					
Responsible Consumption					
Climate Action					
Life Below Water					
Life on Land					
Peace, Justice and Strong Institutions					
Partnerships of the Goals					

6. Do you see the SDGs reflected in current Government agricultural policy?

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree



