# Scenarios for UK Food and Nutrition Security in the wake of the COVID-19 Pandemic

Duckett, D., Rivington, M., King, R., Juarez-Bourke, A., Lorenzo-Arribas, A.

# Contents

# Foreword

COVID-19 has provided the most significant disruption to many people's lives since the last World War, and untold distress: both human and economic. On a global basis, over 3m deaths and an economic cost – from lost consumption - of over $5tn [1] in 2020/21. In the UK, over 150000 people have died, and the economic cost is estimated to be over £250bn [2]. After a year of lock-downs, closed hospitality, changing habits and attitudes means we are now in a very different place from where we were in 2019.

COVID-19 created a significant impact on our food system. Panic buying in supermarkets led to forms of rationing in 2020, people struggled sometimes to access retail outlets, buying and cooking habits altered as hospitality closed and availability changed. Food banks struggled to resource foods for those in need, and people shielding or unable to shop were often reliant on neighbours and emergent food networks. The most marginalised were most affected. In the field, labour was less available and we had the "Pick For Britain" Campaign [3]. International supply chains proved largely robust, but some were affected by lack of freight capacity. The food system thus underwent a significant shock, and also perhaps, a "wake up call" to focus on the need to "build back better" – where better included more sustainable and more resilient.

The last decade has seen increasing calls for a transformation of the food system [4] from many directions: to tackle poor dietary health, biodiversity loss or climate change. However, the food system is a complex system, and complex systems only tend to persist if they are resilient to periodic disruptions. Many voiced the opinion in 2020 that the shock from COVID-19 might sufficiently perturb the food system enough to erode its resilience, allowing the potential for it to be reconstructed in new ways: transformed to deliver better outcomes.

Our starting point in this report is to look ahead, from the depths of COVID-19's disruptions, to explore how our food system might develop. Will we build back "better", taking the opportunities for change, or will we build back "fast" to ensure a rapid recovery? What decisions would need to be made now, and how might they constrain us in the future? To do this, we undertook a participatory scenarios exercise, eliciting the input of a range of expert stakeholders.

Scenario exercises are less about predicting the future, more about looking at plausible futures, often in an exploratory "what if?" way and given the uncertainties of today. Such scenarios unlock decision makers from business-as-usual thinking and help explore the consequences of decisions made today on pathways towards alternative futures. The scenarios are to be read as alternative ways that the future may play-out, each giving insights into potential risks and opportunities facing UK food and nutrition security over the next ten years.

**Tim Benton**

Research Director, Emerging Risks; Director, Energy, Environment and Resources Programme, Chatham House

# Contributors

The project team would like to thank the experts who participated in this scenario planning exercise and generously provided their advice and guidance. Particular thanks are due to the project's expert contributors:

**The scenario planners who participated in this exercise are as follows:**

**Barbara Adolph**
International Institute for Environment and Development

**Melf-Hinrich Ehlers**
ETH Zurich (Switzerland)

**Ludivine Petetin**
Cardiff University

**Anna Taylor**
The Food Foundation *

**Nisreen A Alwan**
University of Southampton

**John Ingram**
University of Oxford

**Christian Reynolds**
City, University of London

**Jack Watts**
National Farmers' Union

**David Barling**
University of Hertfordshire

**Leslie Mabon**
Scottish Association for Marine Science

**Angelina Sanderson Bellamy**
Cardiff University

**Michael Winter**
University of Exeter*

**Jenny Brunton**
National Farmers Union of Scotland *

**José Muñoz-Rojas**
MED-University of Évora (Portugal)

**Bhavani Shankar**
Institute for Sustainable Food University of Sheffield

**Jimmy Buchan**
Scottish Seafood Association*

**Richard Newton**
Institute of Aquaculture, University of Stirling

**Pete Smith**
University of Aberdeen

* Gave an interview but were unable to attend a workshop

# Research Team

**The research team who facilitated this exercise are as follows:**

**Dominic Duckett**
The James Hutton Institute

**Alba Juarez Bourke**
The James Hutton Institute

**Richard King**
Chatham House

**Maliha Muzammil**
Chatham House

**Mike Rivington**
The James Hutton Institute

**Charlotte Watts**
Chatham House

## Caveat

The nature of this exercise has been to co-construct future visions and the ideas and the following scenarios and recommendations are a composite summary rather than necessarily matters of consensus between all our experts. The report aims to represent the diversity of views that were captured and furthermore, the contributors have had the opportunity to approve this report prior to publication.

# Introduction

The COVID-19 pandemic continues to pose a major shock to both UK and global Food and Nutrition Security (FNS) and the full impacts yet contain many unknowns. What we already know is that the pandemic is impacting the four pillars of food and nutrition security (FNS): access, availability, utilisation, and stability [5]. Ongoing health and economic shocks are buffeting both UK and global food systems, adding to the 'perfect storm' of societal threats from climate change, biodiversity loss and ecosystem degradation, at a time of rising nationalism and signs of a breakdown in international collaboration [6]. In the UK, the situation is further complicated due to Brexit. This report is part of a wider project assessing the ongoing impact of COVID-19 on the UK food system. It examines how our system is responding and the potential cascading effects to UK Food and Nutrition Security.

This report presents a Scenario Planning exercise that has examined current trends and evaluated plausible, future developments to support policy responses. Allowing that the future is inherently unknowable, using scenarios can help to inform contingency planning. This foresight exercise develops four scenarios for alternative UK agricultural land use, land management and supply chain relationships to better understand the consequences for Food and Nutrition Security and long-term environmental sustainability, both in the UK and overseas. We include consideration of the range of societal dimensions represented in Figure 1.

# Our Scenario Planning process

No one knows what will happen. The future is inherently uncertain. However, we can look at both past events and the current situation with some degree of clarity, identifying themes and constructing patterns that can act as guides to the future, albeit imperfect ones. Scenario Planning is a methodology developed to consider a range of plausible outcomes, based on what we do know about the past and present. It harnesses human creativity and imagination to make flexible plans now; plans that are robust enough and sufficiently flexible to deal with unpredictable developments.

There are many ways to conduct scenario planning. These range from highly quantitative approaches to more qualitative, participatory approaches. One taxonomy differentiates between: predictive scenarios at the quantitative end of the scale, seeking to model what will happen; exploratory scenarios offering insights into what may happen; and normative scenarios setting out what should happen [7]. It is worth noting however that all forms of scenario planning are subject to normative influences and that these three forms are not generally mutually exclusive. That said, our project has adopted an 'exploratory' scenario development approach. Exploratory scenarios are often deployed to stimulate creative thinking or to gain insight into the cascading effects of social, economic, and environmental drivers [8]. Scenarios are crafted to form plausible accounts of what the future might look like by considering how known drivers of change will potentially operate over time. A strong qualitative element shapes the entire exercise with contributors encouraged to think 'outside the box'.

Participants were recruited by the project team following strict ethical guidelines and respecting the research values practiced by all three collaborating research organisations. Our mutual values include a commitment to equality, diversity, and inclusivity. The scenario planners acknowledged above are all experts in areas relevant to Food and Nutrition Security including health, agriculture, aquaculture and food systems. The research team invited them to work with our bespoke, structured technique to develop four scenarios, considering key drivers of change and plausible impacts they could have on the UK's food and nutrition security (see Fig.1).

Our process was developed to fully comply with the COVID-19 lockdown measures in force during 2020. Restrictions led us to develop a virtual scenario planning approach. Interviews and workshops took place between September and November 2020.

Exploratory scenario planning typically asks a focal question containing a time horizon. We chose 2030 as our horizon in order to get a strategic view looking beyond current operational concerns but staying within policy cycles and avoiding the science fiction associated with distant futures. We asked our scenario planners the following question:

## What will FNS look like in the UK in 2030 given changes to the food system following the emergence of the Covid 19 pandemic?

The scenario planners were interviewed individually and asked to consider Food and Nutrition Security in the UK in light of the COVID-19 pandemic, looking towards a 2030 time horizon. Six overarching drivers of change were determined by the research team to focus interview sessions in a semi-structured manner (Figure 1.). Drivers of change are forces that will shape the future environment. The six preselected overarching drivers are a condensed set of drivers derived from the Cascades approach [9]. Interviewees were invited to articulate specific challenges and opportunities in each of the six categories forming key drivers of change for our focal question.

No one knows how or which drivers will influence events given that the future is inherently uncertain. However, scenario planning works by exploring different assumptions about how drivers of change may operate. These assumptions frame our four different scenarios. Participants were invited to consider threats and opportunities, and winners and losers over the next decade, guided by these drivers of change. Interview recordings were analysed, and specific internal and external drivers of change identified as most critical by the participants were derived from the six overarching drivers.

| Demographics | Economy | Public Health | Institutions & Governance | Technology | Ecology & Climate |
|---|---|---|---|---|---|
| UK rural depletion - Workforce & migrant labour - Global population & food systems | Supply chain logistics - Agricultural sector - Food sector | Post pandemic system - Impact on diet - FNS | Policy environment - Political power - International trade | Agriculture 2.0 - Socio-technical dimension | Climate Emergency - Agricultural adaptation - Zero carbon transitions |

**Figure 1. Six Overarching Drivers of Change with examples of key drivers of change relevant to Food and Nutrition Security which were sent to participants prior to interview to prompt discussion.**

A matrix (or morphological box) was developed respecting the information provided (See Figure 2). The box contains four external driving forces and five internal driving forces (column 1). External drivers are global or macroeconomic influences outside the system boundaries of the area of enquiry, (in our case the UK food system) that nevertheless may have a strong influence on the system. Internal driving forces are parameters more narrowly associated with the immediate focus of interest, that can be more directly influenced by some or all of the actors involved in the UK food system.

Columns two to six in the matrix represent a series of assumptions regarding each driver of change developed to stimulate plausible scenario narratives and are also based on the aggregated interview data. Assumptions can be thought of as 'what if' questions or conditions that, if true, will have implications for the system in question.

| Assumptions | Plausible positive | | BAU assumption | | Plausible negative |
|---|---|---|---|---|---|
| External Drivers | | | | | |
| International Trade | Laissez Faire trade policy – growing exports and imports | UK and elsewhere more self-sufficient in food | UK Food Sector returns to pre-COVID levels as international trade rebounds | Laissez Faire trade policy – balance of trade in food significantly shifted to imports | BREXIT Double Whammy – declining global food trade, declining share for UK |
| COVID | | | COVID effects continue to be felt but 2021 vaccine ends new transmissions | Vaccination stalls, further lockdowns, long COVID and mental health legacy | |
| Climate Emergency / Green Deal | Green recovery with greater supply-chain-long sustainability | COVID dividend – less air travel, lower consumption in long recession | Pent-up demand underpins rapid revival of air travel and general consumption | COVID interruption – recovery and growth higher priority than environment | |
| Inequality | Higher NHS investment | COVID exacerbated food inequality persists - growing numbers of food insecure | Pre-COVID food inequality returns, COVID unemployment short-lived | Fragmented regional FNS outcomes with greater devolution | Deep COVID recession - up to 5 million unemployed |
| Internal drivers | | | | | |
| Food Standards | Higher quality and sustainability standards -  higher regulatory barriers | Deregulation in 'open' free market | No clear policy direction – diverse arrangements between silos and devolved regions | Lower UK food standards under WTO and other new trade agreements | Lower environmental standards under WTO and other new trade agreements |
| Food Sector labour mkt | Higher pay and improved conditions - higher food prices | Legacy Working-From-Home arrangements and changes to UK hospitality | Seasonal labour sourced beyond EU – no structural change | Labour saving technological innovation environment | Anti-migrant politics exacerbates labour crisis for domestic food system |
| Food Values (revaluation) | Increased demand for healthy foods – nutrition and provenance increasingly valued | Generational shift to environmentally friendly food | Current food values prevail | Competition on price shapes UK food system – 'race to the bottom' | Unchecked carbon footprint of food system exacerbates Climate Emergency |
| Food supply chain structure | Stronger demand supporting local/ regional shops, farms, processors | JiT vulnerability tackled with more state support for a more resilient domestic sector | Globalisation, JiT, economies of scale and competition continue consolidation story | Innovation – longer shelf life, improved forecasting, lower waste – more consolidation | Long supply chains, high carbon footprint, lack of transparency |
| Diets | Healthier consumption based on more diverse local food systems | Transition away from red meat – build back healthier boost for horticulture | Short-lived consumption decrease – return to pre COVID base line | Transition away from imports – more UK fish, meat, horticulture | Widening 2-tier system - food insecure V more affluent consumers |

**Figure 2. Matrix of assumptions, internal and external drivers**

The matrix contains two-four assumptions for each driver of change. The assumptions are tentatively organised from left to right from plausible positive assumptions through a business-as-usual (BAU) assumption to plausible negative assumptions, however, it must be noted that individual assumptions can be positive or negative depending upon how they combine with other assumptions, therefore this hierarchy should not be overstated. By selecting one or more assumptions for each driver of change the research team created six scenario outlines (sometimes called scenario frames). Outlines may be thought of as the scaffolding around which a scenario narrative is constructed. There are a large number of possible outlines or branching alternatives contained within our 9x5 matrix and this method does not require all permutations to be explored in the same way that the two axis method exhaustively develops its more limited four possible combinations [for a fuller discussion see 9]. This morphological approach avoids the strictures of having two overarching drivers and more closely approximates real world complexity than two-axis but creates a larger number of permutations that needs to be managed within time and resource constraints, including the participants' forbearance, that act to restrict the permutations that can be extrapolated [10]. The research team selected six scenario outlines that we judged contained both a high degree of contrast and high internal coherence. At two workshops the scenario planners selected four of these six outlines though a simple voting exercise and elaborated the four scenario narratives that we present in the following pages.

## Reading the scenarios

Exploratory scenarios are not predictions. None of the four scenarios are presented as what the world will be like in 2030. No scenarios are developed to represent a full description or true picture of the future. Rather they constitute a valuable tool to explore complex and uncertain issues by highlighting central elements of possible futures and drawing attention to key factors that will drive future developments [11]. In short, they are synthetic worlds constructed from expert judgements about what may happen. The scenarios are intended to be read as plausible projections about how different futures may play-out, each giving different insights into potential threats and opportunities facing UK food and nutrition security over the coming decade. None is proposed as more likely than another, indeed it is highly likely that elements of each will combine in very different ways and that entirely unforeseen elements will have additional, significant impacts. Nevertheless, the scenarios contain expert insights  and capture some of the dynamics we are likely to see on the horizon.

What follows are the four scenarios we developed. Each contains a brief summary, a detailed narrative and an infographic illustrating the main features.
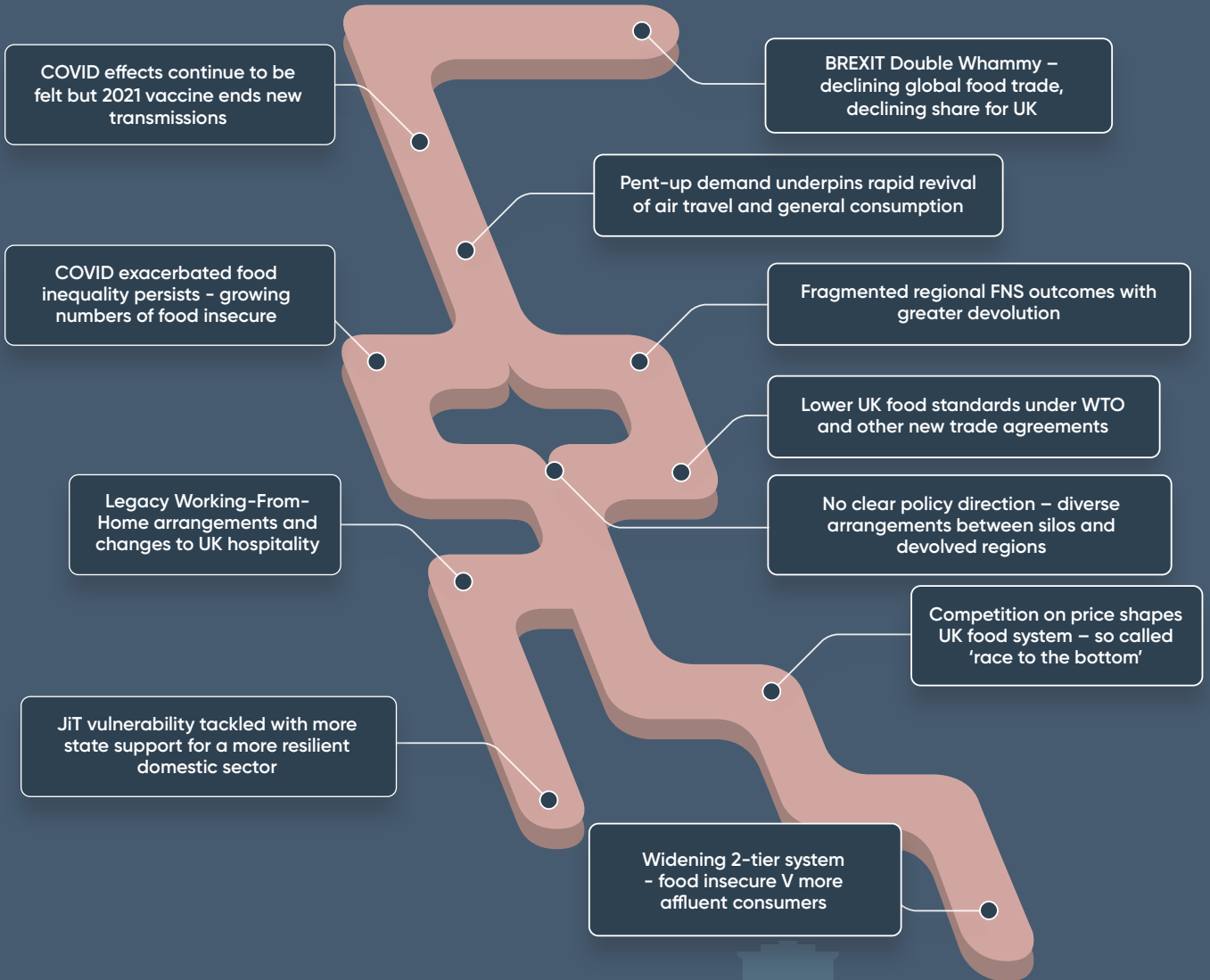
**Assumptions**

**Figure 3. Matrix of Drivers of Change and Assumptions showing four Scenario Outlines**

| | Plausible positive | | BAU assumption | Plausible negative | |
|---|---|---|---|---|---|
| **External Drivers** | | | | | |
| International Trade | Laissez Faire trade policy – growing exports and imports | UK and elsewhere more self-sufficient in food | UK Food Sector returns to pre-COVID levels as international trade rebounds | Laissez Faire trade policy – balance of trade in food significantly shifted to imports | BREXIT Double Whammy – declining global food trade, declining share for UK |
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| **Internal drivers** | | | | | |
| Food Standards | Higher quality and sustainability standards - higher regulatory barriers | Deregulation in 'open' free market | No clear policy direction – diverse arrangements between silos and devolved regions | Lower UK food standards under WTO and other new trade agreements | Lower environmental standards under WTO and other new trade agreements |
| Food Sector labour mkt | Higher pay and improved conditions - higher food prices | Legacy Working-From-Home arrangements and changes to UK hospitality | Seasonal labour sourced beyond EU – no structural change | Labour saving technological innovation environment | Anti-migrant politics exacerbates labour crisis for domestic food system |
| Food Values (revaluation) | Increased demand for healthy foods – nutrition and provenance increasingly valued | Generational shift to environmentally friendly food | Current food values prevail | Competition on price shapes UK food system – 'race to the bottom' | Unchecked carbon footprint of food system exacerbates Climate Emergency |
| Food supply chain structure | Stronger demand supporting local/regional shops, farms, processors | JiT vulnerability tackled with more state support for a more resilient domestic sector | Globalisation, JiT, economies of scale and competition continue consolidation story | Innovation – longer shelf life, improved forecasting, lower waste – more consolidation | Long supply chains, high carbon footprint, lack of transparency |
| Diets | Healthier consumption based on more diverse local food systems | Transition away from red meat – build back healthier boost for horticulture | Short-lived consumption decrease – return to pre COVID base line | Transition away from imports – more UK fish, meat, horticulture | Widening 2-tier system - food insecure V more affluent consumers |

# Scenario 1: **UK Recovery First**

A national recovery at any cost has been achieved against the backdrop of recessionary pressures. Neither a radical green recovery nor any widespread levelling-up have occurred, resulting in higher food prices, negative Food and Nutrition Security outcomes for those on the lowest incomes and mounting societal unrest.

COVID effects continue to be felt but 2021 vaccine ends new transmissions

BREXIT Double Whammy – declining global food trade, declining share for UK

Pent-up demand underpins rapid revival of air travel and general consumption

COVID exacerbated food inequality persists - growing numbers of food insecure

Fragmented regional FNS outcomes with greater devolution

Lower UK food standards under WTO and other new trade agreements

Legacy Working-From-Home arrangements and changes to UK hospitality

No clear policy direction – diverse arrangements between silos and devolved regions

Competition on price shapes UK food system – so called 'race to the bottom'

JiT vulnerability tackled with more state support for a more resilient domestic sector

Widening 2-tier system - food insecure V more affluent consumers

Our first scenario includes the Brexit Double Whammy. This is an economic assumption shared by the first three of our four scenarios, that the combined effects of COVID-19 related fiscal stimuli (for example, the job retention scheme) and the post BREXIT UK international trading environment, have led to a declining UK share of a troubled global market. This has characterized much of the decade leading to 2030. A prolonged recessionary environment shaping **UK Recovery First** has put pressure on the UK food sector that has been partially alleviated through increasing state intervention.

Vaccines, with good efficacy have been available from late 2020 onwards and shown to maintain efficacy against known variants into 2021. However, the unprecedented scale of the inoculation challenge combined with a Long COVID-19 legacy, a mental health crisis exacerbated by lockdown, and a backlog of cancelled NHS operations - even the routine reporting of cancellations was a victim of COVID-19 [12] - all piled pressure on stretched public health services. Herd immunity was not achieved before 2022. Against this, strategic vaccination of at-risk groups first, did allow significant relaxation of pandemic controls from 2021 onwards.

On the environmental front, pandemic dividends from lower overall consumption proved short-lived except for aviation where, despite a partial rebound due to pent-up demand, the business travel market remained weak throughout the decade. This had a negative, knock-on effect for the whole airline industry traditionally dependent on business class revenues (up to 75% of carriers' profits) [13]. Globally, rebounding consumption outweighs environmental benefits from reduced air travel and there is no strong Green Recovery. Indeed, increased pressure has been put upon land for food production in a future where imported food is more expensive, being in shorter supply, than at pre pandemic levels, especially for the UK increasingly subject to friction under WTO rules despite the EU-UK Trade and Cooperation Agreement [14] which has unraveled with reciprocal EU food trade declining. A resultant 'dig for national food production' has a negative effect on biodiversity encouraging continued extension of monocrops and intensification of agriculture. Widespread reliance on environmentally damaging agricultural inputs (pesticides and fertilizers) is unchecked by external drivers as the UK diverges from European Food Standards Authority's jurisdiction. Lowland pasture has made way for cropland in many places. Higher energy prices reflect the failure of an effective Green Recovery to invest in renewable energy and add to a non-discretionary spending squeeze for lower income households.

The new trading environment has resulted in higher overall food prices. The average proportion of income spent on food has risen to ~20%, with even higher burdens on the food insecure. Despite rising prices there is a general decline in food quality as producers seek to maximize volumes to supply an internal market where consumers are increasingly price conscious and margins are thin. In contrast to previous global food shortages, for example 2008 [15, 16] when the UK was relatively well insulated from the crisis, this new decade sees many less affluent consumers turning to more processed, lower quality food although with reduced supply of horticultural produce from Europe, fresh domestic produce has seen modest expansion restricted by seasonality.

Many food items that are still imported from beyond the EU (and this remains a significant proportion of the food consumed) are subject to bilateral trade agreements whereby concessions have been agreed that benefit the trading arrangement as a whole, for example, accepting goods conforming to the producing countries standards even where they are lower than UK standards. State sponsored protectionism, both here and abroad, prevents a general flood of cheap imports but the so-called 'race to the bottom' affects much of our food system.

Although the food sector is impoverished in terms of profit margins and quality standards, it is more resilient to availability shocks. The Prime Minister's 'build, build, build' mantra of 2020 [17] has been translated into publicly funded action strengthening some of the pinch points, such as ending reliance on too few, over-centralized meat processing plants and abattoirs. State support, funded by higher taxes, has responded to the food availability vulnerabilities highlighted during the pandemic by increasing internal storage capacity and improving cold storage facilities to service the changed dynamics of the food system under more interventionist government policies towards strategic investment [see also 18]. Infrastructure improvements are coupled with domestic production subsidies helping UK producers to supply an otherwise weak market to spur economic recovery. The 'Just in Time (JiT)' model has given way, in some strategic areas, to a more planned approach for the national food system, bolstered by longer shelf life for some perishables including, but not limited to, more processed food items. With more reliance on UK harvests alongside increasing severe weather events due to climate change, the state has responded by building additional redundancy into the model, writing off surplus production in good years to avoid boom and bust in key areas and intervening more frequently to ensure the stability of the food system. This has not interrupted the long-standing trend of consolidation in the agricultural sector with financial hardship forcing many out of business while rewarding economies of scale, exacerbated by the race to the bottom for some food items, and resulting in fewer, larger farms.

A dominant theme in this scenario is inequality. A government strategy of concentrating on in-work benefits (e.g., the Job Retention Scheme) and other business focused stimuli has done little for those out of work or in precarious employment. By 2030 a two-tier UK has become pronounced with the growth of food banks and poor nutrition more widespread. Elites enjoy food privileges, albeit at relatively higher prices, including access to imports, while deprived socio-economic groups suffer growing food insecurity and must endure lower quality food and a lack of adequate nutrition. Food and Nutrition Insecurity, having climbed steeply during COVID-19, persisted as the pandemic receded. Policy pledges to level-up disadvantaged parts of the UK remain unfulfilled in this 2030. Instead, existing regional and intersectional inequalities have been magnified. Many poorer consumers work in the food sector on zero hours contracts, for example, in the home delivery sector that has expanded into the space vacated by restaurant and hospitality closures.
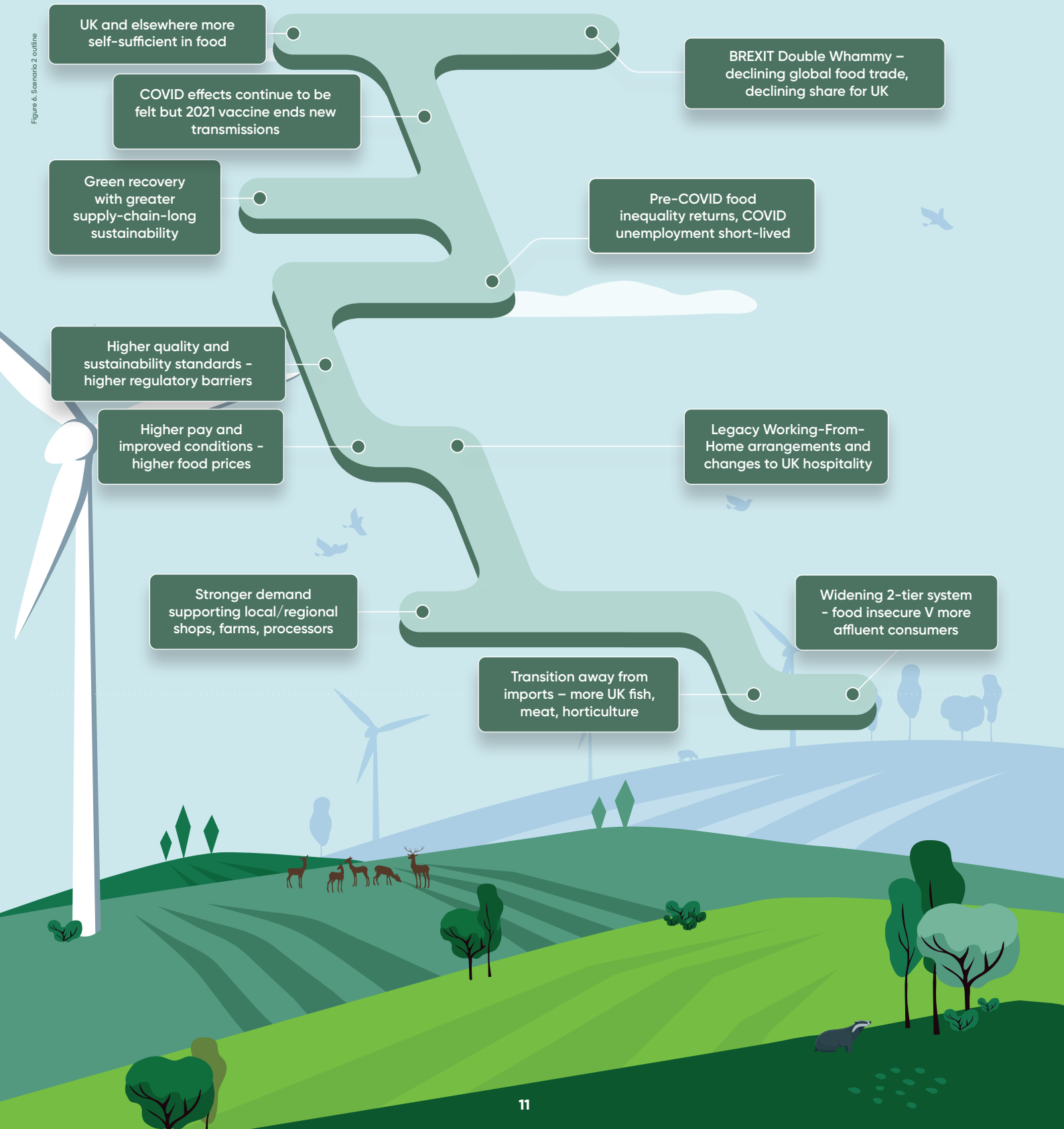
Political tensions are mounting in this scenario with mass demonstrations and rising civil unrest. The populism and xenophobia, already manifest in 2020, have continued to increase with resentment amongst the rising numbers of have nots lending support to anti-science, antiestablishment and nationalist politics. More radical left and right political discourses seek to exploit each hike in food prices.

Devolutionary forces have led to greater UK political fragmentation. The regional divergence of food policy already evident back in 2020 with initiatives such as the National Universal Food Framework in Wales [19] including the establishment of a Future Generations Commissioner, and the Scottish Governments stated policy [20], has become more pronounced. There are greater differences in outcomes from one region to another and a lack of any clear UK food and agriculture strategy.

# Scenario 2: **Green UK First**

A domestic green recovery has achieved environmental improvements within a less globalised, more inward-looking world. Levelling-up has not been achieved and inequality alongside higher food prices has resulted in negative Food and Nutrition Security outcomes for those on low incomes. A two-tier food economy provides more local, greener, and more organic food to the better off while health inequalities and impoverished diets blight the less well off. Hospitality is reshaped around suburban spaces.

Figure 6. Scenario 2 outline

UK and elsewhere more self-sufficient in food

BREXIT Double Whammy – declining global food trade, declining share for UK

COVID effects continue to be felt but 2021 vaccine ends new transmissions

Green recovery with greater supply-chain-long sustainability

Pre-COVID food inequality returns, COVID unemployment short-lived

Higher quality and sustainability standards - higher regulatory barriers

Higher pay and improved conditions - higher food prices

Legacy Working-From-Home arrangements and changes to UK hospitality

Stronger demand supporting local/regional shops, farms, processors

Widening 2-tier system - food insecure V more affluent consumers

Transition away from imports – more UK fish, meat, horticulture

In our second scenario (as in scenario 1 and 3) the effects of the BREXIT Double Whammy are critical. The biggest economic decline in 300 years [21] has been aggravated by a post BREXIT UK trading environment in which friction has led to major rises in food prices. While there has been a modest economic recovery as trade in the decade to 2030 rebounded, the UK emerges with a smaller share of a smaller global market compared with pre COVID-19 levels. **Green UK First** is characterised as a more inward-looking economy with greater focus on its own internal market. The UK is not alone in looking to its own market. In this future, the world's dominant economies, the US and China continue to set the world trade agenda particularly in terms of agricultural production and food systems [22]. 'America First' remained a political constraint throughout the Biden administration, especially for farm and food policy, with Democrats adopting a pragmatically conservative approach to the global food trade, more focussed on building bridges with US farmers and appeasing wider nationalist sentiment. China, for its part, has adopted a similarly belligerent stance hampering prospective international trade deals [23]. UK would-be food exporters have experienced Chinese tariff hurdles similar in scale to those felt back in 2020 by Australia[24]. Inward looking markets have led to higher food prices in the UK as international competition is weaker and demand for certain basic food stuffs greater, a situation reminiscent of 2008.

Where Green UK First differs from UK Recovery First is in its strong green credentials. The major reform of the UK food sector has been strongly shaped by the drive to 'Build Back Greener'. The UK in 2030 has embraced a strong pro-environmental stance maintaining and improving environmental standards as a priority through successive governments. Ambitions for the UK to embody a "global template for delivering net-zero emissions" (Boris Johnson, 18.11.2020), given prominence at COP26, have been realised. Higher prices and increasing margins for producers have allowed the food sector to avoid the so-called 'race to the bottom' in terms of sustainability standards, and the UK is a model of environmentally progressive farming and food production. A profitable food sector has been further stimulated by economic policy to create green jobs with both wages and conditions in many parts of the food sector having improved year on year.

The environmental credentials of the UK's food have not however been matched by any 'build back healthier' progress. Cheap imported food with low nutritional value has been replaced, where imports have declined, by similarly unhealthy domestic products and UK nutritional standards are not the envy of the world as political rhetoric might portray. Cheaper food is often nutritionally poorer with fast food and ultra-processed food suppliers having successfully strengthened their sustainability credentials, for example with greener packaging and more responsible sourcing, while doing little to address the consumption of unhealthy food [25]. As a result, the much vaunted 'levelling-up' aspirations have not materialised. Instead, a two-tier system of food and nutrition secure versus insecure has become even more pronounced. Inequality is stark with the increase in food bank usage ushered in by the pandemic [26] having continued to cast a shadow across all parts of the country. Where the government job retention scheme served to cushion both those in employment and their employers from the most immediate effects of the COVID-19 recession, these measures did little for the growing ranks of the unemployed and vulnerable communities who faced increased pressures through higher food prices. Piecemeal changes in Universal Credit have effected little change and while tackling the Climate Emergency has benefitted all, the absence of effective levelling-up has seen UK FNS sink to new lows.

COVID-19 itself has been defeated long before 2030. Vaccines have been available since the winter of 2020 and effective, rapid distribution silenced government critics with high efficacy. Nevertheless, the strain put on the NHS by cancelled treatments during the pandemic [12], a significant challenge around 'long Covid', and a mental health crisis exacerbated by the social distancing of lockdown, are all set against new austerity hardships. The squeeze, felt by all public services, has not left public health in a strong position to deal with the consequences of deteriorating dietary outcomes. Obesity and type 2 diabetes, albeit largely affecting the bottom tier of this two-tier society, have been on the rise throughout the decade and show no signs of abatement . The majority of the population with more discretionary spending available, ) including those whose working conditions have improved in parts of the food sector, enjoy greater food security. Those at the margins of society however receive minimal support with the Exchequer persisting in offsetting only the worst effects of food poverty through modest benefit changes.
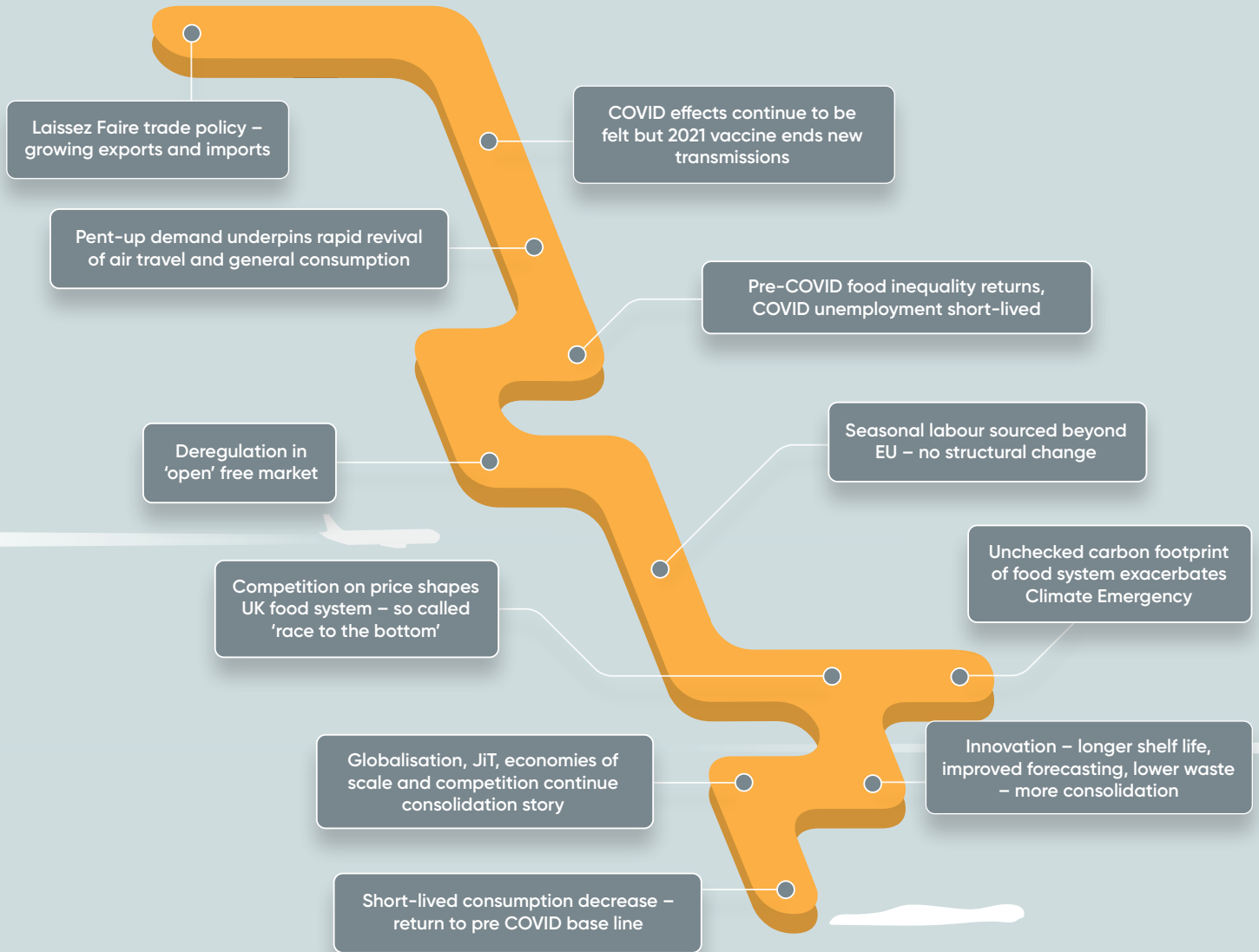
Meanwhile in the food system a revolution has occurred. Consumers, excepting the bottom tier, support local food producers, shorter supply chains and local retailers. Public appetite for sustainable agriculture and sustainable lifestyles more generally has led to a growth in food with local provenance and high environmental certification standards at the expense of less green alternatives, for example, organic. UK fish and meat enjoy a larger share of the domestic market while a relative increase in UK horticulture has filled the void left by lost imports cutting food miles and the carbon footprint of fresh produce. Replacing imports with domestic produce and shortening supply chains is a clear environmental win supported by policy and the long term trend towards more flexitarian, lower meat diets has continued [27]. Undertakings made at COP26, with the UK at the forefront not just in terms of hosting the conference in Glasgow but in terms of the scale of its green ambition, set the scene for concerted action and the food sector can reflect on a watershed moment. But as stated earlier, this does not amount to any systemic dietary improvement as environment is prioritised over nutrition [25].

Finally, there has been a radical reshape of the hospitality sector. Devastation to bars, restaurants and cafes during the pandemic has changed the hospitality landscape profoundly. With remote working increasingly a new norm, many high streets and city centre food catering businesses have not reopened. Chains with a model of heavy footfall catering to office workers, particularly those located in pre-COVID-19 business districts have all but disappeared. Demand has shifted to the suburbs where home-workers, neighbours and flat mates increasingly socialise around food. A business model able to cater for a residential clientele including home deliveries has continued to prosper with large corporates dominating the space. This reshaping of eating and drinking patterns particularly around home workers has led to a steep decline in hospitality businesses unable to adapt to the changed market.

# Scenario 3: **Back to Basics**

Economic recovery has been achieved within this, the most prosperous of our post BREXIT scenarios, featuring a return to globalisation and buoyant international trade. The return to the pre pandemic baseline has been an uphill struggle and neither Green Recovery nor levelling-up have markedly reshaped this unsustainable and unequal future.

Figure 8. Scenario 4 outline

Laissez Faire trade policy – growing exports and imports

COVID effects continue to be felt but 2021 vaccine ends new transmissions

Pent-up demand underpins rapid revival of air travel and general consumption

Pre-COVID food inequality returns, COVID unemployment short-lived

Deregulation in 'open' free market

Seasonal labour sourced beyond EU – no structural change

Competition on price shapes UK food system – so called 'race to the bottom'

Unchecked carbon footprint of food system exacerbates Climate Emergency

Globalisation, JiT, economies of scale and competition continue consolidation story

Innovation – longer shelf life, improved forecasting, lower waste – more consolidation

Short-lived consumption decrease – return to pre COVID base line

This 2030 scenario is framed by the most buoyant international trading environment of our four scenarios with the UK 'open for business'. Fears around the nation's ability to thrive in a post BREXIT world have either proved unfounded or been overcome especially in relation to trade volumes, and the wider world has not closed its doors in response to the COVID-19 recession. The post Trumpian US has reembraced its role as the senior partner in more cooperative structures from the World Health Organization to the Paris Accord (superseded by the new Glasgow Accord after COP26), leading to continuing globalization and the spread of neoliberal economics. There is rapprochement between the US and China starting under the Biden presidency and Chinese growing middle classes enjoy diverse imported foods. A competitive global food supply chain thrives in an increasingly deregulated space and the UK has a healthy share of global food businesses succeeding in the 'free market' and outside 'the Single Market'.

The big negative effect on FNS in **Back to Basics** stems from the growing social inequality linked to deregulation whereby competition on price has shaped a 'race to the bottom' in food standards. There is neither a strong regulatory mechanism to protect the quality of our food nor is there a Green Recovery driving environmental standards upwards. In order to pursue food trade more actively beyond the EU, Britain has relaxed its food standards and environmental regulations despite the political rhetoric back in 2020 and initial hopes around the EU-UK Trade and Cooperation Agreement [14], that sought to dispel prospects of unfettered food trade deals. The upside is that the recession was shallower than in our other scenarios and unemployment rapidly returned to pre-COVID-19 levels.

An explicit dynamic realized within Back to Basics was that a return to business as usual or the pre-COVID-19 baseline was a stern challenge. Simply getting back to where we were in the face of post pandemic recessionary pressures was no easy road and the notion of 'building back better' has turned out to be empty political rhetoric for the majority of UK citizens. Even without any new public health shocks, administering the vaccine at the population level was an expensive and grueling undertaking testing the NHS to its limits. Long Covid, a mental health crisis, virus mutations, vaccine supply issues and a plethora of cascading impacts have derailed political efforts to build back better. Similarly, restoring consumption including resurrecting air travel and repairing the hospitality sector to pre COVID-19 levels has been an uphill battle. Recovery at all costs has sidelined both levelling-up and Green Recovery with fiscal support primarily going to businesses and to 'back to work' measures across the economy generally irrespective of broader social or environmental reconstruction objectives. Consequently, this 2030 while financially sound for the short term, has failed to implement recovery measures that embrace a more sustainable

future. Domestic fossil fuel subsidies have continued to rise with food production patterns largely unreformed. There has been a systemic mismatch between the actual recovery pursued by successive UK governments and the promises made at Glasgow 2021, COP26 around SDG12 which has seen Britain's reputation on climate action sullied.
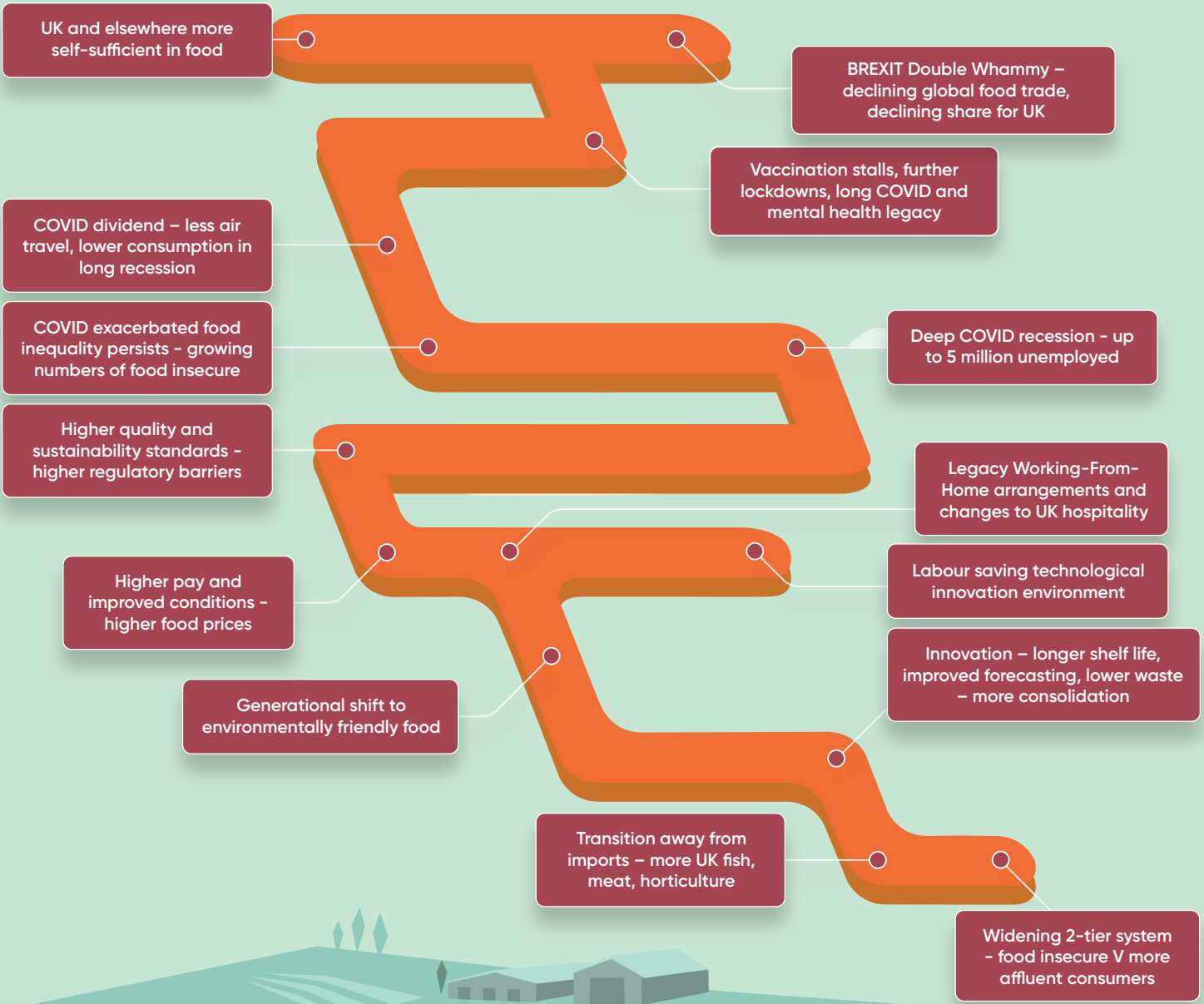
Technology has supported significant innovation in the UK food system. Food stuffs have a longer shelf life; blockchain transactions have improved traceability; demand forecasting is more accurate; productivity is rising; and all the aforementioned lead to waste reduction. Technologically driven improvements act to offset some of the unsustainable increases in fossil fuel use and increasing domestic consumption, but it is a case of slowing rather than arresting climate change. Advances in genomics have also contributed to greater productivity in this market driven future. Freed from the constraints of the European Union's more precautionary approach and allowing themselves room to maneuver inside the EU-UK Trade and Cooperation Agreement, the UK has developed new crops and improved livestock using techniques derived from Crispr-Cas9 technology and has effectively carried domestic public opinion, characterized as embattled by hardships and rather resigned to technological change, along with them. These advances are largely consequences of competition which has also led to greater consolidation in the food sector. Independence from European environmental regulation has also led to divergence in approaches to pesticides, herbicides and fertilizers with more freedom for UK farmers to make individual choices and with the government allowing this to happen. However, certain genomic advances, that make goods unsaleable to the Single Market and to other jurisdictions where a precautionary policy towards GMOs exists, are avoided by UK producers who wish to export into these channels, thereby limiting uptake. In some ways the wider food system of the UK in 2030 resembles the UK aquaculture sector in 2020 with a few large multinationals investing heavily in technology to drive down costs and increase volumes as part of an international supply chain. There is little room for artisanal or local models which occupy a small niche. Greater consolidation and a squeeze on smaller scale producers has led to decreases in agricultural use of less productive, more marginal land including uplands and intensification of lowland and prime agricultural holdings.

Diets in the UK continue to be shaped by market competition and global commodities rather than reformed by any intervention either building back healthier or building back greener. The result is more of a return to pre COVID-19 baselines with continuing diet related health crises and no evident national dietary improvement.

# Scenario 4: **Best of British**

The UK has responded to greater protectionism by investing in UK agriculture putting quality at the centre but without any effective levelling-up, resulting in negative Food and Nutrition Security outcomes for those on low incomes set against higher quality produce for many others. Innovation and technology have helped the food sector to recover and prosper and there has been continuing consolidation resulting in larger farms and food businesses.

UK and elsewhere more self-sufficient in food

BREXIT Double Whammy – declining global food trade, declining share for UK

Vaccination stalls, further lockdowns, long COVID and mental health legacy

COVID dividend – less air travel, lower consumption in long recession

COVID exacerbated food inequality persists - growing numbers of food insecure

Deep COVID recession - up to 5 million unemployed

Higher quality and sustainability standards - higher regulatory barriers

Legacy Working-From-Home arrangements and changes to UK hospitality

Higher pay and improved conditions - higher food prices

Labour saving technological innovation environment

Innovation – longer shelf life, improved forecasting, lower waste – more consolidation

Generational shift to environmentally friendly food

Transition away from imports – more UK fish, meat, horticulture

Widening 2-tier system - food insecure V more affluent consumers

Our next scenario is set in a post COVID-19 world that has become a more inward-looking space in terms of Global Trade, a feature shared with Green UK First. The political rhetoric of greater self-sufficiency, already resonating in early 2020, from Washington's 'America First' mantra to Beijing's more bullish proclamations about prioritizing China's internal market, has culminated in net reductions in food imports in many countries including the UK. Domestic food self-sufficiency remains an unrealistic aspiration in the absence of extreme system reconfiguration but there has been a sizeable rebalancing of the UK food system away from import/export and towards supplying the domestic market with UK sourced produce. The contrast in **Best of British** over Green UK First is that a focus on quality has been paramount with the superiority of domestic foodstuffs, alongside a more general, national celebration of all things British, having helped to drive national pandemic recovery.

Higher standards and more transparent provenance have led to genuine improvements in domestic produce both in terms of environmental credentials and nutritional value. Food is greener and diets are healthier. Food items that we cannot produce have not disappeared from shelves although consumer preferences have shifted away from imports with a high carbon footprint or those deemed less wholesome. A darker side to the growing insularity is rising nationalism. Foreigners are less welcome with border control and immigration policy increasingly prey to right wing xenophobia.

Rising food standards have been actively supported through policy [28] fulfilling the political rhetoric of 2020/21 around maintaining the highest food standards and avoiding a race to the bottom post BREXIT. In many areas, there are higher regulatory barriers than before. Improvements have been helped by a more inward-looking focus on the domestic food system, greater protectionism from the vagaries of WTO, and public support for a national agricultural sector. Food prices have seen a rise of up to 4% (UKICE 2020) from pre COVID-19 levels partly resulting from departure from the EU single market. This has assisted the sector to survive the worst effects of recession at the expense of heightened food poverty at the margins of society.

Best of British takes place against the backdrop of a BREXIT Double Whammy (reduced international trade, particularly for food stuffs, alongside economic damage caused by a COVID-19 recession). The net effect has been a dramatic reshaping of the macro economy. Tariffs and quotas have weakened the penetration of imports in areas where the UK can produce goods, boosting the domestic market despite a declining UK share of global trade. The self-sufficiency drive and the BREXIT Double Whammy are self-reinforcing. They have created opportunities for the food and agricultural sector where it has been agile enough to adapt and have penalised some businesses whose dependence on international trade has been inflexible. The caveat is that there remains a considerable volume of international food trade and business as usual characterises many food system actors.

Unlike the previous two scenarios, in Best of British the direct effects of the global pandemic persisted for longer challenging public health systems around the world deep into this new decade. Despite the rapid development of several viable vaccines, achieving herd immunity in the UK as elsewhere was a herculean struggle and further lockdown measures continued to be applied beyond 2021. Difficulties were compounded: Mass immunization was an unprecedented logistical operation; Manufacture and distribution issues hampered supplies; virus mutation produced a succession of 'new variants' complicating any return to business as usual; anti-vax sentiment obstructed health services in their efforts to reach all

groups in the UK. A legacy of other health conditions that had been neglected during the COVID-19 crisis, including a mental health crisis aggravated by social distancing measures, further compromised the ability of the National Health Service, in parallel with international counterparts, to defeat COVID-19 rapidly.

The environment has enjoyed some perverse benefits through the pandemic with global consumption experiencing severe recessionary effects including the near collapse of international aviation. As the global recession lasted well into this period, and with aviation failing to regain lost volumes, strides towards carbon reduction targets were taken including a decrease in food miles commensurate with trade rebalancing. Gains have also included improvements to air quality in UK cities. However, this pyrrhic victory does not amount to a full-blown Green Recovery. The need to produce more food has outweighed more radical greening of the agricultural landscape with a premium on production hampering rewilding and more radical landscape reimagining. Some limited reduction in grazing has mainly been achieved through small increases in forestry.

An improved domestic foodscape however has not been universally beneficial. A UK economy, gripped by recession, has continued to see the numbers of food insecure citizens rising. Food banks have catered for evermore clients as the fault lines in British society that COVID-19 had exposed have grown ever wider. Measures to protect jobs have done little for those whose jobs were ultimately lost anyway. Hospitality in particular saw savage reductions in numbers employed. The failure to vaccinate comprehensively quickly enough suppressed the demand for public socialising. Recessionary gloom, and reduced personal circumstances led many to draw in their horns and tighten their belts. A working from home culture persisted reducing the footfall for town and city centre bars, restaurants, and cafes. Many closed businesses remained closed. The deep COVID-19 recession envisaged in Best of British saw unemployment soaring past 5 million with little in the way of effective levelling-up to prevent increasing regional inequality in the UK.

Those employed in the food sector have seen improved pay and conditions despite high unemployment. This has been achieved as the shrinking workforce has professionalised due to labour saving technologies and innovation such as robotics and as the requirements for high standards has shaped a more skilled workforce. Rationalisation and automation of this sector has also been driven by a decline in seasonal and migrant labour post BREXIT fuelled by anti-immigration sentiment and never adequately substituted from the British labour pool in which neither aptitude nor enthusiasm for low skilled, low wage work have been sufficiently available. A trial recruitment drive in 2020 under the banner 'Feed the Nation' [3] exposed the mismatch between unemployed Britons and farm labour requirements with the size of the pre COVID-19 workforce remaining a high-water.

Food in general has benefited from an attitudinal change in the UK that owes much to a generational shift in attitudes. The under 30s, when they have sufficient resources, (which not all do in this unequal space), demand high quality food with credible environmental provenance including preferences for local, seasonal, organic, vegetarian and vegan food. Those with disposable income increasingly want to know where food comes from, how it has been produced, how nutritious it is and what environmental impact it has. People take pride in UK produce with its high standards both in terms of animal welfare and sustainability. This contributes to modest improvements in sustainability and progress on climate action but falls short of pledges made back at the COP26.

Technology has forged ahead in the years leading to 2030. The supply chain has utilised both technological and management innovation to boost efficiencies. Products have longer shelf life through better packaging, storage, and distribution systems. More accurate demand forecasting further reduces waste throughout the value stream. Productivity improvements mitigate some of the adverse effects of both higher labour costs and improved standards. On the negative side, the UK's accentuated, just-in-time, isolationist, and lean supply chain approach means greater vulnerability to episodic disruptions from climate shocks. Empty supermarket shelves are commonplace. Technological progress has required greater investment and this in turn has accelerated consolidation in the food sector. The UK aquaculture sector in 2020 presents a useful parallel demonstrating how research and development can shape a market with a few, larger players investing strategically and achieving economies of scale alongside quality improvements.

Innovations missing out on the revolution in **Best of British** include genetic advances in food. In an environment of shrinking exports, the UK domestic market is not sufficiently large to justify the innovation costs without strong UK consumer buy-in, and under this scenario most consumers favour sustainability and nutrition over productivity gains, plus there is heightened anti science sentiment similar to UK Recovery First. Lacking breakthrough environmental or nutritional credentials that are commercially viable, advanced genomics have played a negligible role. Indeed savvy, green UK consumers are inclined to stigmatise existing GMO food imports from countries seen as operating under lower standards. Therefore, while gene editing including CRISPR is permitted  and there is a more flexible regulatory approach outside the jurisdiction of the European Court of Justice, in practice the market drivers for advanced genomics are increasingly weak within an inward-looking UK domestic market exemplified by the market for advanced meat alternatives which remains niche.

For the nation's diets, the partial transition away from imports has led to higher proportions of UK fish and meat being consumed alongside greater quantities of home-produced horticultural foods. The reality for many, however, is one of unequal access to nutritious food with heightened inequality producing a two-tier society. Food poverty, at greater than pre COVID-19 levels, coexists alongside higher quality and healthier food for the more affluent majority.

# Interpreting our scenarios

## How scenarios are useful

Scenarios typically promote a range of actions that are flexible enough to respond to an emergent and uncertain future. It is not possible to represent an exhaustive range of future possibilities in a complex socio-technical system such as the UK food system. Unanticipated factors or 'unknown unknowns' will shape the future beyond anyone's ability to foresee. Even the factors that we think we understand well, will doubtless combine in unexpected ways and have cascading effects that we have not planned for. However, what we can do is to use both our creative faculties and expertise to think through 'what if' scenarios, considering plausible assumptions in a limited range of contrasting permutations. The future will not, we concede, resemble any of the four scenarios too closely, but it very well may contain elements captured by all or some of our four scenarios, in which case we will have achieved our aim in promoting strategic thinking for a better future. We may even be able to change mode from surprise - 'what happened?' - to anticipation - 'what can we do about it?'

Scenario Planning has added value when it facilitates considering the same strategy under different scenarios in a process known as Windtunnelling [29]. For example, an economic package focussed on in-work benefits might be highly effective in defending jobs in short term crisis, yet less effective in tackling food insecurity in a future with a deep, long-lasting recession featuring high unemployment. The following section attempts to present the key ideas that the scenario planners articulated individually during interviews and collectively as they developed four scenarios in scenario planning workshops and considered cascading effects within and between scenarios.

## Implications for UK Food and Nutrition Security

Our four scenarios describe plausible futures for the UK food system with a particular focus on food and nutrition security or FNS. The FNS concept is one developed by the United Nations Food and Agriculture Organisation (FAO) and rests on four conceptual pillars, namely Access, Availability, Utilisation and Stability [5]. The following sections draw our strategic recommendations and considerations regarding these four pillars.

## Availability

Underpinning FNS is the basic requirement that sufficient food must exist in the first place. Those of our scenario planners participating in this exercise with expertise in agriculture identified challenges around greening the food system while simultaneously ensuring the delivery of public goods in terms of sufficient food stocks. The restructuring of production systems to reduce greenhouse gases, partly by improving the carbon footprint of livestock, particularly in the uplands, restoring peatland, expanding afforestation, and going hard towards net zero targets, requires a corresponding effort in rebalancing the food system in terms of rewarding environmentally sustainable activities that deliver food. This balancing act already appeared precarious in the face of emergent post-Brexit trade relations. UK agriculture needs to find its way under future arrangements with trading partners new and old, and changed labour markets. COVID-19 has potentially exacerbated the problem by diverting political energy away from wider health and environmental goals. We already see potential for 'recovery tunnel vision' around the UK's constitutional questions with politicians, notably Scottish Nationalists, under pressure to place Covid Recovery ahead of long-standing policy commitments and aspirations to separatism. While political prioritisation of this kind is inevitable, allowing climate change mitigation and domestic production support arrangements to slip down the agenda is fraught with danger.

For example, as water use efficiency in food trade has been worsening for decades an estimated 76% of the water currently utilised in the UK fruit and vegetable supply chain is not from the UK with sources including water-scarce countries [30]. **UK Recovery First'** and **Back to Basics** attempt to capture the imminent danger of losing focus on environmental goals by imagining futures in which a Green Recovery turned out to be hollow rhetoric. In terms of the supply chain, a degree of resilience has been evidenced throughout the pandemic with only sporadic and limited sectoral disruption. Empty supermarket shelves at the onset of the crisis were promptly restocked as the system adjusted. However, certain weaknesses in the supply chain have become apparent. **UK Recovery First** proposes strategic strengthening of vulnerable points within a system that has become too centralised and reliant on long supply chains with some of its weak links exposed. Our multidisciplinary experts recognised that sustainability practices must be supply-chain long and that we need to invest in technology that improves data management and data linkages throughout the whole supply chain.

**To ensure Availability our research recommends:**

- To keep climate change and a Green Recovery front and centre of the political agenda Covid-19 must not divert political thinking away from environmental goals or delay pro-environmental and climate change mitigation policies. The forthcoming COP26 in Glasgow is highlighted as a lens to sharpen that focus.

- Greater investment in research and development is required to better understand supply chains and their adaptability to shocks, particularly the central parts of supply chains (food processing and distribution).

- There is a need for improved national planning of production, processing, and distribution. Actively consider more processing sites (for example, abattoirs) more storage sites and better data management.

- Technology can be harnessed to improve data management along the supply chain, for example, to improve forecasting, to decrease food waste, to increase resilience, to increase soil fertility.

- Encourage short supply chains - support revitalisation of local food production and local supply chains.

- Educate consumers about the seasonality of food to better fit demand to what is available domestically.

- Improvements require coordination with industry and investment in infrastructure.

## Access

This pillar of FNS addresses the FAO concern that while food may be produced in sufficient quantities and available for consumption, it cannot deliver food security if it does not reach those who need it. People and food systems require adequate resources to obtain appropriate foods for a nutritious and culturally suitable diet. To this end our scenario planners remarked upon the structural causes underlying people's choices about the food they eat and how the marginalised lack agency to effect change. Radical recommendations were put forward to combat food poverty and the escalation in the use of food banks witnessed through the course of the pandemic (presented as a negative trend in all four scenarios),. Foremost among the ideas to address the root causes of inequality was a proposal to significantly increase the national minimum wage. A more equal society, it was argued, could be constructed with relatively higher wages for the bottom tier of society thereby expanding choices and increasing access to more nutritious diets. It was acknowledged that the high unemployment envisaged in **Best of British** could not be addressed by in-work benefits but that, under other scenario conditions, food and nutrition security could be improved via such measures.

Other key recommendations concerned the need not to underestimate the extent of the health crisis that has been created. In all four scenarios high vaccine efficacy has been projected and a degree of optimism has been taken towards ending the pandemic through public vaccination. Only in **Best of British** is there a setback in terms of a dangerous new variant. However, all four scenarios envisage an ongoing public health crisis deep into the coming decade. Covid-19 has wrought havoc on medical systems and social care, and left a legacy of problems as each scenario imagines in a subtlety different way. A further recommendation is to be alert to and realistic about the scale of the challenges ahead.

So-called 'levelling-up', whereby economically deprived areas of the UK are given a boost relative to more advantaged areas, was greeted with general scepticism throughout this exercise. None of the four scenarios foresee structural changes whereby food and nutrition security for the less well-off is improved or levelled-up in the coming decade. Conversely, a widening gap features in all four scenarios. This rather bleak assessment rests upon a shared view that different forms of recovery all face an uphill battle of one sort or another that will militate against an increase social justice vis a vis the food system. Whether the UK effectively fends off the deep recession featured in **UK Recovery First**, achieves the Green Recovery forecast in **UK Green Recovery First**, manages to secure resilient and high-quality food production envisaged in **Best of British** or bounces back from the multi-layered health crisis set out in **Back to Basics**, all these positive future outcomes problematically aligned with continuing food and nutrition insecurity for the poorest tier of society.

**To ensure Access our research recommends**

- The minimum wage should be significantly uplifted to improve agency amongst the have nots and to facilitate better dietary choices. This would deliver a general levelling-up.

- The pandemic has damaged our society. Our health systems, including social services, require time and resources to repair the damage. Getting back to where we were will take more than vaccines. Prioritise health services!

- Strengthen the social security System to address food and nutrition insecurity.

- Strengthen the emergency food relief system.

- Give greater support to the third sector including voluntary organisations tackling food poverty.

## Utilisation

Food must be prepared and consumed appropriately based on knowledge of basic nutrition and, food hygiene, alongside practical skills including handling and cooking, and cultural sensitivities. The pandemic has forced changes upon the Utilisation of food in a areas ranging from the disruption to school meal provision experienced by children during lockdown to the lockdown restrictions on food outlets including fast food and restaurants. Perhaps most alarmingly the use of food banks has grown as more people have been unable to purchase food due to changed economic circumstances. A potentially positive outcome regarding nutrition is that disruptions have led to an increase in home cooking.

Our scenarios variously reimagined the future foodscape as one in which a lower tier of UK society continue to experience food and nutrition insecurity. Positive dietary trends are anticipated, notably continuing flexitarianism in **UK Green Recovery First** and a generational shift in preferences towards local, seasonal, organic, vegetarian, and vegan food in **Best of British**, but in all four scenarios, the less well-off continue to struggle through lack of agency. Various ideas emerged throughout the exercise whereby education, information campaigns and economic incentives could be deployed to nudge or reshape social attitudes to nutrition. Our planners also highlighted food waste throughout the food system and recommended technology investment, specifically around both shelf-life (see **UK Recovery First**, **Best of British** and **Back to Basics**) and demand forecasting (see **Best of British**) to improve the Utilisation of food stocks.

## To improve Utilisation our research recommends

- Promoting a culture shift, whereby locally produced high quality food is more valued, through techniques of persuasion, nudging, taxation, and standard setting.

- Educate the population, and children in particular, about food provenance, seasonality and nutrition.

- Provide resources to protect support systems upon which people on lower incomes depend for information and support, for example, voluntary organisations addressing food and nutrition poverty.

- Support technology and innovation to improve shelf life and demand forecasting.

- Improve the nutritional quality of food served in schools, hospitals.

- Promote local food initiatives, for example, urban agriculture, allotments, community gardens

- Promote sustainable protein including red meat, UK seafood and other aquaculture to UK consumers. Currently much of this nutritious food source is exported due to lack of domestic demand.

## Stability

For the food system to be a dependable delivery mechanism for public goods in terms of healthy, high quality affordable diets in the face of future shocks it needs to be safeguarded against the vagaries of international trade in a sustainable way. Current fears around declining UK food standards in the wake of a comprehensive new deal with the US are realised in **UK Recovery First** and avoided in **Best of British**. Much discussion centred around land use. **Green Recovery First** showed the potential for Green Recovery without an improved food scape. Conversely, **Best of British** depicted a future in which more localised, more diversified production and consumption has been achieved within a more parochial food system transitioning away from imports towards self-sufficiency, yet without significant environmental gains.

Technological fixes are not viewed as a silver bullet to food and nutrition security. More advanced technological food systems, such as the UK system, faces challenges that seem more connected to inequity than to technological shortcomings. Nevertheless, our planners saw technology as a part of the solution provided applications are directed towards appropriate goals. For example, technology can be directed towards reducing the environmental impact of water usage and increasing the use of renewable energy sources.

Reflecting on those plausible divergent outcomes containing undesirable trade-offs, our planners recommend that:

## Improving Stability requires:

Response strategies to the pandemic impacts on the food system need to avoid worsening food and nutrition security by falling into the cheap food paradigm whereby market efficiencies (for example higher yields) fail to take account of health and environment externalities to the detriment of people on low incomes. Specifically:

- Future trade deals that would lower food quality and/or environmental standards need to be avoided.

- Food production needs to be factored into wider environmental protection arrangements and radical rethinking of the UK food system in a greener world is urgently required, for example, protecting soil health.

- Small scale, artisanal food production can play a greater role – as demonstrated during the pandemic - but needs strategic support and entails a shift in consumption patterns.

- Genetic advances can improve breeding and farming techniques. Robotics and precision farming can play a role in reshaping the food system. Technology can improve production – but not exclusively around higher yields and higher fish catches, but towards sustainability and nutrition if Food and Nutrition Security are to be enhanced.

- Horizon Scanning, Strategic Foresight and Scenario Planning can play a greater role in managing future disruption.

## Closing remarks

This Scenario Planning exercise recognised that the current crisis has presented the nation with a unique opportunity to re-evaluate the food system and to ask fundamental questions about what sort of food system we want in the future. Anticipating future possibilities can act as a springboard for interventions now that can shape the future so that the more undesirable features of our scenarios never materialise. We have also learned, in extremis, about the inherent adaptability of norms and values to undergo rapid change. New norms quickly established themselves during the pandemic from wearing masks and social distancing to changed shopping and eating habits. This gave our scenario planners hope that radical change to ensure better food and nutrition security in the coming decade is an achievable endeavour and one deserving of our utmost efforts.

# Epilogue

*The year is 2043 and the world is very different from when an influential report on plausible scenarios of the UK's food and nutrition security was published in 2021. The COVID-19 pandemic of 2020-21 taught the world about the importance of understanding Nature and how to better work with it to develop the Human Society. The pandemic showed us the need for foresight, contingency planning, and the importance of the need for rapid adaptation. Due to the lessons learned from the pandemic the global food system has undergone radical transformational change, with both vibrant global trade and localised community-oriented food systems based on sustainable and resilient food production, processing and retail supply chains demonstrating flexibility. This transformation has resulted in both an improved diet and a near eradication of access inequalities and vastly reduced the number of those who go hungry. Agriculture has undergone the second Green Revolution to achieve sustainable multifunctional use of land, at the same time playing a key role in climate change mitigation. Marine protection and conservation has resulted in replenished marine biodiversity and healthy fish stocks. Collectively the collaborative partnerships between governments, the private sector and the public has resulted in healthy, fully functional ecosystems that continue to maintain our 'life support' ecosystem services. Life is good, society and Nature are secure.*

We can but hope... *This Utopian scenario is plausible. Unfortunately, the same can be said for the opposite extreme: The year is 2043, there are very large inequalities in food access, agriculture has intensified leading to environmental degradation whilst the climate continues to warm. Society failed to learn from the lessons of the COVID-19 pandemic, and continued with unsustainable practices and a food system vulnerable to shocks due to poor resilience...*

There are few things we can be certain about regarding what the future will bring and what conditions will be like. Some things are more predictable than others. For example, the climate science community has for many years argued that the climate is easier to predict than the complex interacting human dimensions of (illogical) behaviour, economies, politics and policies and how these may shape our pathway to the future.

What is certain is that food and nutrition, along with water, will remain the bedrock of human survival. Future cascading threats from climate change, biodiversity loss and ecosystem degradation, set against a background of an increasingly affluent and growing population are predictable. The four plausible scenarios presented in this report all make clear that regardless of how society, economies, policies (and politics) develop, and how our environment responds, the production, acquisition and utilisation of nutritious food will need to remain a central part of everyone's lives. In the Utopian scenario above, a key word is foresight: the scenario planning exercise and scenarios generated play an important role in developing the 'science of foresight'. Our ability to envisage how the future may unfold is essential to avoid risks and build on opportunities. It allows us to step into the future and lock back 'with the benefit of hindsight'. Indeed, as the environmental and economic pressures grow, preparation for the future will require an improved ability to foresee issues and develop solutions in advance. Scenario planning is a powerful tool to scope risks and opportunities. With such research tools, along with modelling projections, future generations cannot look back and complain "we were not forewarned" and current generations cannot argue that we did not have the means to explore the future.

It is hard to write a true epilogue for things yet to happen: which, if any, of these four synthetic futures is most prescient (they are after all, predicated on plausibility rather than likelihood). We do however have the opportunity to choose the pathways that take us towards particular, preferred scenarios and divert us away from undesirable ones.



**Mike Rivington**

Principal Investigator of the UK Food and Nutrition Security During and After the COVID-19 pandemic project, The James Hutton Institute

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## For further information please contact:

Mike Rivington

✉ mike.rivington@hutton.ac.uk

📍 The James Hutton Institute,
Craigiebuckler, Aberdeen
AB15 8QH Scotland

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