Transforming UK Food Systems (TUKFS) Programme

Interim Impact Evaluation Annex

09 June 2025

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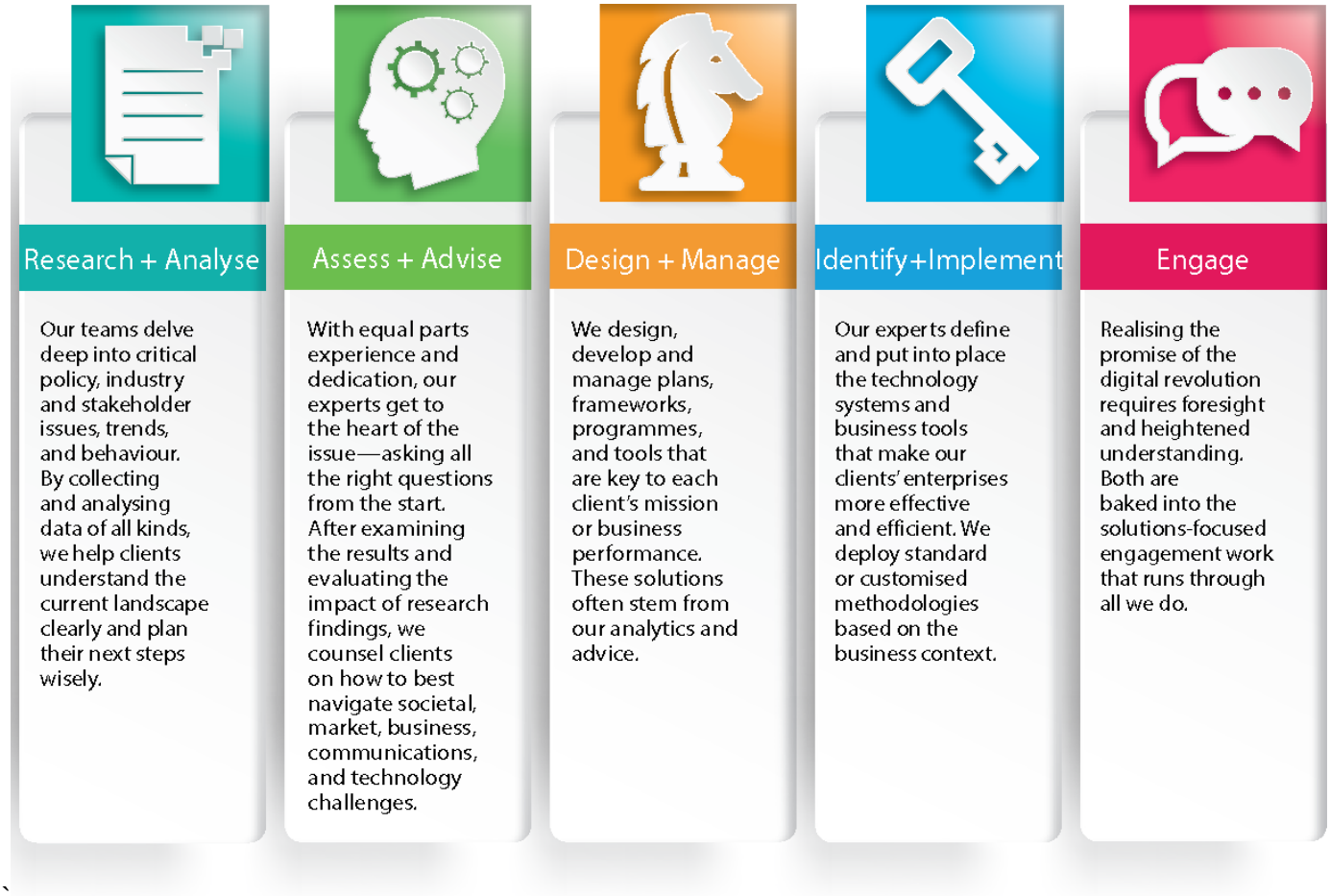

Transforming UK Food Systems (TUKFS) Programme

Interim Impact Evaluation Annex

A report submitted by ICF Consulting Services Limited
in association with

Technopolis

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Annex 1 Methodology

This note presents the methodology for the interim phase of the evaluation of the Transforming UK Food Systems (TUKFS) programme. The methodology builds on the evaluation framework submitted in September 2022 and presents our reflections following the process and baseline report submitted in July 2023.

The overall objectives of this evaluation of the TUKFS programme remain as set out in the ITT, i.e. to examine:

- The effectiveness of taking a food systems approach and how well this has been normalised within academia and stakeholder organisations.
- The effectiveness of an interdisciplinary, cross-stakeholder approach to generate new knowledge relevant to multiple stakeholders.
- How effectively the knowledge generated has informed policy and practice to help improve health and sustainability outcomes.
- The extent to which the programme has contributed to wider social and economic impact.
- The extent to which the programme has contributed to progress towards improved health and environmental outcomes, alongside an indication of the potential economic value of the longer-term impacts.

The approach is informed by the programme theory of change (ToC) and requirements for the impact and Value for Money (VFM) assessment in the study terms of reference.

This note presents:

- The description of the data collection and analytical methods used for the interim evaluation
- The intervention logic and accompanying narrative ToC for the programme

A1.1 Evaluation considerations

The evaluation team has completed the baseline phase of the evaluation. The baseline set a point of reference for assessment of changes that occur following the implementation of the TUKFS programme. The findings were structured around the impact pathways defined in the programme theory of change, describing the situation before the TUKFS programme started for each of the expected impacts. The report also included initial findings informed by early results for the TUKFS programme based on observations of changes compared to the baseline.

The impact evaluation design provides for two additional waves of research and analysis, each leading to a report. The interim phase has built on the work completed during the evaluation. There will then be a final wave of research, scheduled for the second half of 2025, reporting in early 2026.

This note refers to the interim phase of the evaluation. The interim phase will provide feedback on the progress of the programme, allows us to identify and address any potential issues or challenges early on, and provide an opportunity for learning and improvement.

The impact evaluation has been designed following a series of considerations:

- The evaluation is theory-based, exploring, through structured enquiry, whether the TUKFS programme theory is working as envisaged.
- The approach is informed by contribution analysis. It has examined links between the TUKFS programme and observations related to outputs and anticipated outcomes.

  - This evaluation phases captured data on the progress of the activities, outputs, and outcomes of the programme to establish and test the causal links between programme-related activities and outputs / outcomes associated with these. It has also considered contextual factors and external influences, as well as how those outcomes influenced wider and longer-term impacts.

- The interim phase of the evaluation has focused on capturing programme-level outputs, outcomes and impacts relating to new knowledge on the 'food system approach' and food system transformation, and not project level changes or impacts.

A1.2 Data collection: interim phase

The interim research phase involved mixed-methods research. The data collection methods were desk research; surveys: two follow up surveys of project participants and lead applicants of unsuccessful projects, and, and one initial survey of CDT students (all students from all cohorts); eight longitudinal case studies; semi-structured interviews with project participants, the CDT managing institutions, wider stakeholders and the programme management team; a social media analysis, a network analysis and analysis of the ResearchFish data collected so far. These methods are discussed in more detail below.

A1.2.1 Desk research

Data provided by project participants on their 'food system transformation' activities, outputs and (where available) impacts, working within the templates established at the baseline stage. The data has helped to facilitate the tracking of the evolution of the projects, including whether they have diverted from their original work plans and theories of change. Inputs were:

- Project data collected: through reporting to UKRI via ResearchFish; collected at the TUKFS Annual Grant Holders Meeting in November 2023; and from other sources such as presentations and workshops (e.g. programme seminar series).
- Review of activities supported from the Programme Director's budget.
- CDT-funded student data and any research/other outputs attributable to the programme.
- Policy and other secondary data relevant to TUKFS programme.

A1.2.2 Surveys

The interim research phase has included two online surveys, both administered by ICF's survey team using a Qualtrics survey platform:

- a follow up survey for project participants (leading on from the survey delivered during process and baseline evaluation);
- a new survey of the CDT students (all cohorts).

All surveys were tested thoroughly to ensure that they are understandable, as brief as possible, and that all functions and routing are correct.

The response rate to last year's survey of project participants was very low, largely due to its launch close to the award date for Call 2 projects. The survey design was simplified, and the surveys shortened to reduce burdens. Participation was encouraged with follow-up emails. Consultations with the project leads and partners at the Annual Meeting indicated that the response rate would improve in this wave. As we had built relationships with the project participants already, we emailed the survey directly (not via UKRI) and worked on a closer follow-up of response rates. The target response rates are 40% to 60% for

successful applicants including partners, though CDT students tend to be a harder to reach group.

The project participant survey was routed based on the stakeholder type. Different questions were presented to Principal Investigators (PIs), academic partners and food business organisations (FBs), civil society organisations (CSOs) and policy partners. The CDT student survey was sent to the individual students and gathered information on their previous experience researching food systems, their expectations, and ambitions for their training, and, for those more advanced in the programme, about their placements and ambitions after the training.

A1.2.3 Longitudinal case studies

The evaluation team has drafted eight longitudinal case studies. The case studies followed different themes that align with the research impact pathways:

Table A1.1 Summary of case studies developed mapped against impact pathways

Skills and capacity for food systems research in the UK	Business practices	Government policy	Community/citizen behaviour
CS1: Increased UK capacity and capability in food systems research	CS3: Introduction of new healthier and environmentally friendly products to the UK market	CS5: Transforming public distribution channels to be healthier and more sustainable	CS7: Citizens are empowered to have more agency over their diet
CS2: Co-production methods lead to relevant food systems knowledge	CS4: Changes in business practices help transform food systems	CS6: Food systems approaches to implement new policy frameworks/strategies at different levels (national, regional and local)	CS8: Citizen voices lead transformations in food systems locally

All Call 1, Call 2 and Call 3 projects are included across the themed case studies. Each case study uses evidence from a selected number of projects (between 3 and 6). Call 1 projects are each included in a minimum of 3 case studies and Call 2 and Call 3 projects are each included in at least 1 case study. This approach ensures that evidence from a range of projects is included across the themed case studies. It also provides an opportunity to explore relevant outcomes of the Call 1 consortia projects across multiple impact pathways.

The purpose of the case studies is to explore how the programme contributed to realising outcomes from the different project activities. Purposeful sampling will be used to select specific outcomes realised that are relevant to each case study theme. The context and mechanism that led to a specific outcome on policy influence or transformational effects are explored in the case studies. The projects selected for each case study during the purposive sampling process were generally those that demonstrated impact and would likely be able to provide evidence that related to the case study theme. Each project has a different approach and focus. The case studies demonstrate a selection of the

The case studies were informed by a combination of desk research (academic research, grey literature, and news media), their ResearchFish contributions, and stakeholder consultation (workshops, interviews, and survey data).

The case studies fed into the contribution analysis by building a set of hypotheses, testing the extent to which the programme contributed to the observed outcomes and considering other external contributing factors.

A1.2.4 Supplementary interviews

The team conducted several supplementary individual and group interviews to obtain insights on programme-level activities, outputs, impacts, and outstanding programme-related process questions not covered in process evaluation report. We conducted 45 interviews. The interviews included:

- The TUKFS programme management team including the TUKFS knowledge broker.
- The CDT management team.
- All project leads and a range of partners from the projects (policy stakeholders, community researchers, FB partners, CSOs).
- Early career researchers.
- External food systems stakeholders.

A1.2.5 Social media, network, and ResearchFish data

A1.2.5.1 Social media data

Social media listening is the monitoring of content on various social media platforms for discussions regarding related keywords, topics, campaigns, events, and industries. Social media listening tools facilitate the derivations of these data (including engagement indicators and raw text), which allow for analyses to gain further insights that inform projects. We used the Talkwalker tool, which allows access to 2 years of historical data. Using natural language processing techniques, we tracked and analysed audience content to communications campaigns, events, and topics across multiple countries and languages. Reactions were captured through engagement metrics, including liking and content sharing. Other insights, such as sentiment scores, can be calculated from textual data, as well as other factors including gender, location, and age range, to better understand the audience profile.

We used a set of predefined keywords to collect Twitter/X posts (excluding retweets) worldwide from November 2021 – March 2024. The evaluation team already collected the data relevant to the period November 2021 – November 2023 (to account for the two-year horizon limit of Talkwalker).

The social media analysis provided insights on, *inter alia*, the topics addressed by the programme that have gained the most traction and/or had the most impact. We also collected data posted by food systems programmes in the EU to compare with the performance of the TUKFS programme.

A1.2.5.2 Network data

We have conducted a network analysis to understand patterns on connectivity between stakeholders within the TUKFS network. Network analysis is an interdisciplinary enterprise that focuses on inter-relationships using statistical techniques. Within network analyses, indicators of centrality can be used to assign rankings to nodes within a graph corresponding to their network position. The centrality measures helped to identify stakeholders that have the highest number of ties to other stakeholders, are the most pivotal members in relation to the network's connectivity and are most influential.

The network analysis has explored how the number of partnerships has grown from 2021 to 2023. This shows how the number of stakeholders within the network has increased over the duration of the programme. This helps to indicate whether new partnerships have been formed throughout the programme.

The data gathered via the survey has also supported the understanding of partnership and network growth. The survey provided information on whether partnerships are:

- New collaborations (not occurred in the 10 years preceding the grant year);
- Reactivated partnerships (that not occurred in the 4 years preceding the grant year, but that had existed in the 10 years before); and
- Recurring partnerships (those that occurred in the 4 years preceding the grant year.

A1.2.5.3 ResearchFish data:

We conducted the same analysis that we ran in October 2023 in summer 2024 and this analysis will be repeated in summer 2025. The small number of data points received in 2023 was linked to the timing of ResearchFish submissions and project maturity. As expected, more projects provided a return in March 2024. It is expected that the data submitted in March 2025 will provide further detail. The March 2026 submissions may be the richest of all especially if projects completing in 2025 will be encouraged to submit this information one year after completion. However, they will not be available before the early summer and will not be included in the final impact evaluation. Nevertheless, we expect to see an increase in the number of projects providing a ResearchFish submission and an increase in the share of reports that include data on the full extent of TUKFS-relevant outcomes as projects mature.

The evaluation team prepared and shared a ResearchFish guidance note to PIs. The aim was to encourage all funded projects to complete ResearchFish in a similar way. This allowed us to analyse the data and be able to compare across projects.

In practice, most of the ResearchFish fields require respondents to select one or more types of output or outcome and the resulting 'categorical' data tend not to have any numerical value and invite no explanatory or qualitative content. This results in the team being able to calculate that 12 projects have reported 400 engagement activities, but not able to compute the number / type of people engaged (without making assumptions). It also does not allow us to understand the qualitative impact of those activities on the people engaged. We expect that the guidance shared will support projects to report in a way that helps us analyse the quantitative and qualitative aspects of the data. We have supplemented the ResearchFish data with our additional primary research.

A1.2.5.4 Publication data (for Bibliometrics) – planned for next year

This analysis is not included in the interim report as it requires a minimum number of publications for the analysis to be meaningful. The bibliometric analysis will be included in the final report at the end of the TUKFS programme funding. During the research phase for the final report, the study team, together with ScienceMetrix, will conduct a bibliometric analysis on publication data from TUKFS programme.

The data required for this analysis will come from:

- Publications by TUKFS funded activities (from ResearchFish outputs).
- Prior (and parallel) publications by supported researchers (agriculture and overall).
- UKRI publications on agriculture.
- UK and EU publications on agriculture.
- Publications from a set of similar projects (from GtR or Cordis – H2020) could also be added as an additional benchmark (provided that the projects are identified by the partners and that they have enough publications indexed in Scopus).

A1.2.6 Analysis and synthesis: interim phase

The evaluation used a range of analytical methods to formulate clearly justified and reasoned responses to all evaluation questions. It assessed all remaining gaps and uncertainties in the data, and clearly identify them alongside the findings. The findings were elaborated with reference to the ToC and the updated evaluation frameworks developed for the study (see Figure A2.1). Finally, all the evidence was triangulated to arrive to final conclusions and early recommendations.

Following the analysis, the team triangulated and synthesised the quantitative and qualitative evidence and findings using three techniques presented in the box below. This process facilitated answering the study questions and reporting the findings along thematic lines and into a Draft Final Report.

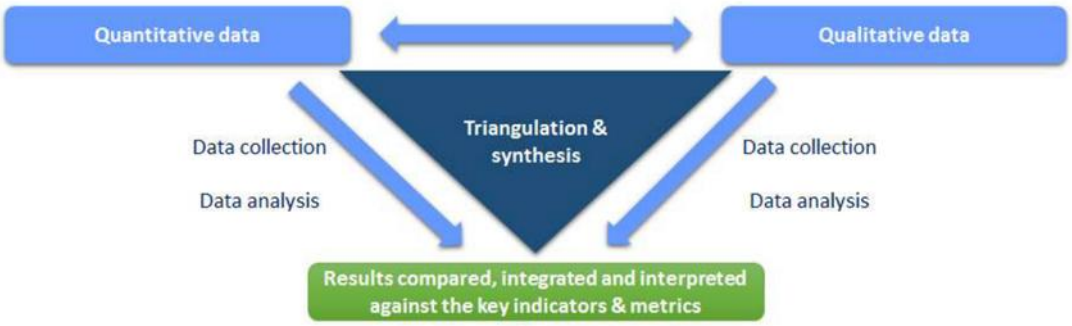
Box 1.1 Analysis and synthesis using triangulation techniques

Our proposed approach to evidence gathering involves three aspects of triangulation:

- **Data triangulation** – we propose to gather data at different times, by different methods and from different individuals.
- **Researcher triangulation** – we propose to gather information using different researchers (joined-up through regular team briefing/de-briefing sessions and standard research protocols).
- **Methodological triangulation** – we propose to gather and use a combination of quantitative research and qualitative research evidence.

This approach is represented in Figure A1.1. It helped to ensure that the evidence base is adequately explained, and the conclusions qualified as and where appropriate. This helped to provide transparency that will enable decisionmakers to judge what weight to put on the conclusions.

Figure A1.1 Synthesis will be used to support conclusions and findings



We organised an internal brainstorming session to discuss the evidence collected, analysed, and triangulated. The internal session allowed for a collective reflection on the final conclusions of the study. Results from the triangulation led to the production of a synthesis, in which we will assess the overall strength of the evidence for each finding and draw conclusions.

Each report will aim to provide a clear, concise, and comprehensive documentation of the study work. They provide UKRI and project stakeholders with relevant and evidence-based information on study findings and conclusions on the evaluation questions. A PowerPoint presentation based on the Draft Final Interim Report will be submitted to URKI and discussed in a subsequent meeting. This meeting will provide an opportunity to gather feedback on the main findings and conclusions of the study and suggestions for improvement. Following on from this meeting and comments on the Draft Final Report, the study team will produce a Final Report which addresses written comments and comments made during the meeting.

Annex 2 The programme Theory of Change

This section provides an intervention logic and accompanying narrative ToC for the programme. These are informed by interactions with the funded projects and discussions with UKRI, and provide an explanation of how the programme is expected to generate the target outcomes and impacts. The ToC and intervention logic presented here are a second iteration, updating that previously presented in the Evaluation Framework report. The revisions are informed by analysis of the data collected during this first research phase. Both will continue to be revised and refined as the evaluation progresses, with updated versions being presented in each successive report.

A2.1 Impacts and impact pathways

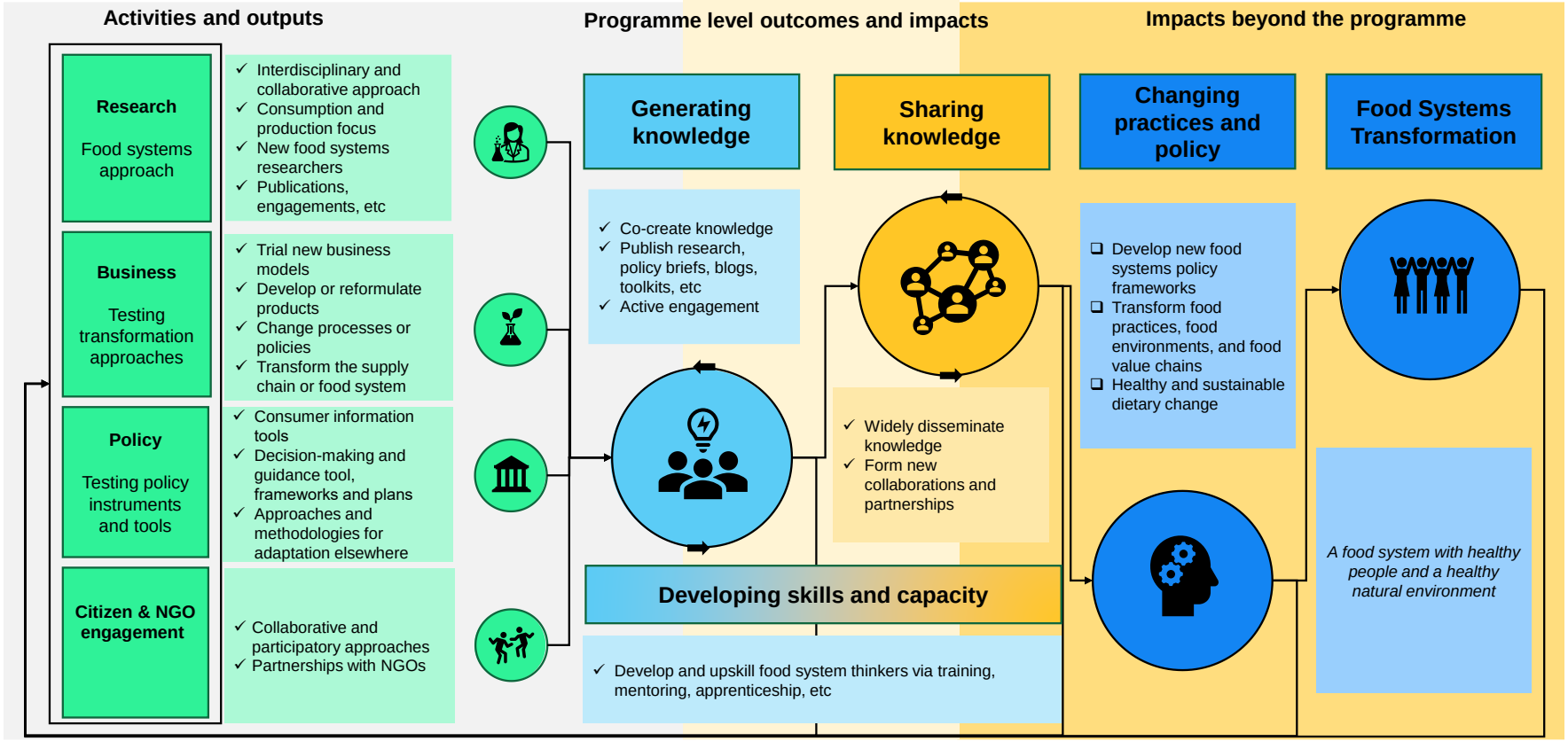
Figure A2.1 provides an intervention logic for the TUKFS programme, showing how the programme activities are expected to lead to impacts. This figure is a simplified representation: not all aspects of the programme are included. It does not specify every outcome of each individual funded activity. It focuses on the key outcomes and impacts of the programme as a whole. The first three columns (inputs, activities and outputs) are colour-coded to the different funding inputs (red boxes for the CDT, blue for the research calls, and amber for the Programme Director/coordination fund). The programme is expected to have direct impacts in four main areas:

- **Skills and capacity for food systems research in the UK** TUFKS is predominantly a research programme (rather than a research and development or innovation programme), in which projects are led by academic research staff. This will be a large area of impact. It includes the development of new knowledge and data related to specific interventions, as well as to food systems research more generally. Impacts relate to research produced by academics, but also to skills learned by academics, FBs and policymakers involved in the funded projects.
- **FBs** FBs refer to businesses directly involved in the funded projects (these may vary in type and size and be distributed across the food chain, from farm to retail), and other FBs that would also engage with the research developed by the funded projects. In some instances, the term may also include representative organisations (e.g., the British Retail Consortium), support organisations (e.g., consultancies), non-food infrastructure businesses (e.g., transport, IT and logistics), and quality-assurance/certification bodies. The type and nature of these businesses will depend on the projects funded and what parts of the food system they address.
- **Government policy**. Anticipated changes relate to policy at all levels – from local to national – and across different parts of government. The biggest impact on policy is likely to be through policymakers' involvement in the funded projects.
- **Community/citizen behaviour**. Transformation of communities (beyond specific stakeholders) is another anticipated impact. The programme aims to encourage citizens to take an active part in transforming their local communities to create healthier and more sustainable food environments. The changes to policy and practice should change public awareness and consumption patterns.

Although these impacts are considered separately in the evaluation, they are likely to impact on one another. For example, changes in policy may encourage FB behaviour change. This may be due to an increase in public awareness. These interactions are also represented in the model.

The text below provides a narrative explanation of the mechanisms by which impacts are expected to arise, as well as the external factors likely to affect those impacts.

Figure A2.1 Programme's Theory of Change



Key assumptions

Generating knowledge	New knowledge is created and skills developed by interdisciplinary partnerships on how to transform the food system, across the sector (from production to consumption)
Sharing knowledge	The knowledge products created and skills developed are suitable for all stakeholders working in the food system: policy, business, citizens
Changing practices and policy	Food system stakeholders use the knowledge products created and skills developed and help transform the food system (leading to long term behaviour change across business, policy, research and citizens)

A2.1.2 Impacts on skills and the capacity for food systems research

All of the projects, CDT PhDs and the Programme Director's budget are generating new knowledge. Some have aspects of intervention evaluation, whereas others are designing toolkits for using food system approaches. By both generating new knowledge and involving a range of stakeholders in the production of knowledge, the TUKFS programme is expected to have an impact on skills and the capacity for food systems research.

More specifically, the programme should result in:

- **A trained cohort of food system researchers** leading the way on tackling health and sustainability challenges worldwide. This includes training new researchers, as well as supporting established researchers in further adopting, developing and embedding food systems approaches. The development of this trained cohort is expected to continue beyond the programme, as funded researchers bring these new skills to their teaching and to new funding opportunities.
- **New networks and partnerships**, helping to develop a food systems community with legacy. These new networks should stem partly from the funded projects, by introducing researchers from different disciplines, FBs and policymakers to new ways of working together. New networks and partnerships should also come out of the Programme Director's budget's provision of cross-project support, and the Programme's work to engage with stakeholders beyond the funded projects. These partnerships and networks should provide a strengthened capacity for interdisciplinary research. This should support future coordination and collaboration on food systems research across stakeholders, including interdisciplinary work, although this will depend on whether these partnerships have been effective and the availability of future funding. New networks and partnerships can also help to improve understanding between stakeholders: even if stakeholders do not continue to work in an interdisciplinary way, they may take forward a new perspective on the challenges faced by other stakeholders, disciplines and policy areas.
- **An increased uptake of food systems approaches across stakeholders** (including academics, FBs and policymakers), regardless of whether they continue their partnerships. Projects are engaging in co-production and co-design methods, exposing all stakeholders to new approaches. However, for this to happen, there is a need for a joint understanding of what a food systems approach involves and this needs to be clear to all stakeholders involved in the funded projects. There also needs to be an understanding and evidence that this approach is successful and effective.
- **The development of a strong grounding of evidence for food systems research**. This includes work done through the Programme Director's budget to produce a synthesis of the knowledge being produced from the funded portfolio, leading in part to a blueprint or vision for a transformed UK food system. This should involve both academic and non-academic- outputs to ensure that knowledge is accessible to all relevant stakeholders, and should build on existing work published in the UK and internationally. The value of this evidence for food systems research depends in part on the programme being a trusted voice on food systems research.

- **The UK being recognised as world-leading in food systems research**. This will depend on the quality and quantity of the results, as well as the extent to which evidence produced by the projects is visible internationally (e.g. where results are published, whether they are presented at conferences, and whether they receive media coverage). For CDT participants, impact will depend largely on career trajectories after the programme, and the demand for these skills in academia, government and business.

A2.1.3 Impact on FBs

The funded projects will pilot or establish new approaches and research used by FB partners in those projects. This is expected to lead to changes in practice in the food value chain and food environments resulting in a healthier, more affordable and more sustainable food supply. Projects will test transformations in different stages of development. Some of their innovations will be ready to be commercialised, while others will be in the early design stages. Potential impacts on FBs fall into the following main categories:

- **Partner FBs trialling** new business models, products, processes or policies to address key food-policy challenges. This includes, for example: new models of food procurement and environmentally sustainable menus for schools or universities; hybrid business models such as food hubs or social enterprises; training FBs in new skills, techniques and approaches (e.g. regenerative farming); trialling solutions with business partners that could support a more resilient and sustainable supply chain; introducing a healthy and sustainable ingredient or food product into the supply chain; and gathering data to provide reliable and comparable information to consumers.
- **Generating new ways of working in FBs**, beyond the specific elements trialled through projects. By collaborating with researchers and policymakers within the funded projects and through CDT placements, FBs will be exposed to food systems approaches and new ways of thinking. For some interventions, work undertaken will be across the supply chain, which may also expose FBs to new ways of collaborating with each other. Experience with the funded projects and CDT placements may also encourage businesses to collaborate with academics or policymakers to address future challenges.
- **Generating knowledge products and tools used by businesses**. In addition to trialling new models, products, processes or policies within the timeline of the funded projects, projects will also lead to standalone products and tools. These should improve the evidence available to FBs and improve their approaches to decision-making in the future. In some instances, this may be through directly applicable tools; in others, it may be through showcasing successful new ways to do business (data gathering on new business approaches tested). In both cases, this can help to de-risk business investment, either by reducing the level of investment needed to develop future products or by showing that such products are technically feasible and offer benefits.
- **Knowledge transfer targeting FBs that are not directly part of the funded projects**. To have the desired impact, the knowledge products and tools generated by the funded products should be shared beyond the partner FBs. This is expected to be done by the funded projects themselves, as well as through the Programme Director's budget to some extent. To facilitate this, the outputs need to be understandable, future-proofed and relevant to the needs and capabilities of FBs. They should ensure that businesses remain profitable, as

most businesses will not change practices unless their business models and current economic and trade situations allow it.

A2.1.4 Impact on government policy

Funded projects are expected to encourage new policy frameworks that make it easier for people to access affordable, attractive, healthy and sustainable diets. Most of the projects will engage with policymakers at a local or regional level (rather than at national level), with the expectation that knowledge is transferrable to other areas or regions, or may be scaled up. The intended outcome of this work is that policymakers (at local and national level) are aware of and make use of the TUKFS research outputs, and begin to adopt a food systems approach to policymaking. The intended long-term impact will be to stimulate evidence-based policymaking that supports resilient and sustainable food systems and an affordable healthy diet for all consumers, including lower-income communities.

Potential impacts on policymakers fall into the following categories:

- **Developing new policies using a food systems approach**. Many of the funded projects are expected to contribute towards changes in policy, such as designing new policies and governance mechanisms at local or regional level (e.g. the Food Systems Council for Yorkshire). In some instances, they may not enact policy change directly, but may help to put food policy issues on the agenda.
- **Generating new ways of working for policymakers**. This includes encouraging collaboration: strengthening local relationships across government areas (e.g. health, food, agriculture and environment) and with other stakeholders (businesses, CSOs and academics). It also includes influencing policymakers to think more systematically about food-related challenges. Tying these two elements together, programme outputs should help to create networks within policy based on a food systems approach. This may also mean bringing in new policy areas that also have relevance to food, such as economic development and spatial planning, and developing mechanisms that effectively negotiate trade-offs between food and other competing policy areas.
- **Generating new knowledge products and tools used by policymakers**. Expected outputs for policymakers include policy briefs (or similar narratives) based on the results of funded-project outputs and evaluations of ongoing policy interventions to build and share learnings. Considering the focus of many of the funded projects on the regional or local level, much of this will focus on what works for regional food systems transformation. The programme is also expected to lead to a new set of risk metrics for internalising the environmental and social externalities of food production.
- **Sharing knowledge and participating in the policy conversation**. To have the desired impact, the outputs of the TUKFS programme should also be shared with policymakers not directly involved in outputs. This means sharing knowledge products and tools through platforms such as the Food Policy Impact Network and engaging with policymakers at all levels. This also means ensuring that evidence generated by the programme is shared with ongoing policy consultations (e.g. the Environment, Food and Rural Affairs Committee Inquiry into Food Security) or is otherwise made available at relevant points in the policy cycle. One element of the programme will involve mapping the CSOs influencing UK food policy to develop effective impact strategies. This should ultimately help to encourage policymakers and FBs to make use of the research outputs.

A2.1.5 Impact on community/citizen behaviour

Another potential impact pathway of the programme will be that communities/citizens take a more active part in transforming their local communities to create healthier and more sustainable food environments. These impacts fall into two categories:

- **Community engagement directly with funded projects**. Some of the funded projects involve participatory approaches, engaging community members directly to drive the necessary change. This includes, for example, training community-led researchers and working with schools and students to transform school meals.
- **Knowledge generation and dissemination**. Sharing knowledge and evidence produced with communities, citizens and CSOs that have not been engaged with the funded projects should help to broaden the impact of evidence generated. Knowledge is generated and disseminated through community researchers, community networks and creative outputs.

A2.1.6 Impact on public awareness/public consumption patterns

Changes in public policy and business practice are expected to help create healthier and more sustainable food environments. These improved food environments, along with increased public awareness, will – over the longer term – contribute to positive changes in health and sustainability in the UK. Because many of the funded projects look at local interventions, part of expanding that impact is ensuring that the evidence and outputs from this work allow interventions to be adopted by others or scaled up to a national level. Potential impacts in this area fall into the following categories:

- **Interventions piloted by funded projects may help to improve access to and awareness of healthy and sustainable food**. This includes, for example, interventions aimed at making changes in public procurement and improving the quality of school meals. These types of interventions may have impacts directly within the lifetime of the funded projects, but they may also have longer-term indirect impacts. For example, improving school meals and reducing inequalities in health and diet quality early in life can help to catalyse change more broadly.
- **Increased public awareness of dietary health and the environmental sustainability of food.** For some elements of the programme, findings should be disseminated not only among researchers, FBs, policymakers and CSOs, but also the wider public.

A2.2 External factors

Each of these impact pathways is subject to external factors that are likely to impact the UK food system independently and may alter the conditions under which the programme operates. The evaluation team will consider the programme's potential impacts described above, within the overall context of the food system. Particularly any potential impacts beyond the funded projects. These factors could be framed through the same categories as those outlined as food systems drivers in the Mapping the UK Food System report produced for the TUKFS programme.[1] These include:

[1] https://www.eci.ox.ac.uk/research/food/downloads/Mapping-the-UK-food-system-digital.pdf.

- **Economic factors** are likely to impact not only consumers and their purchasing choices, but also business margins and how FBs choose to allocate resources and engage with the programme. It will also influence changes in policy. The economic climate has changed significantly since the programme started, due to the increased cost of fuel, rising inflation, and the resulting cost-of-living crisis. These impacts have been compounded by Brexit, recent regulatory changes, and supply chain disruptions.[2] This could affect the progress of some of the originally planned interventions. For example, some projects mentioned that businesses could be less willing to engage in certain types of interventions, or with the projects overall. In addition, most of the expected impacts described by the projects only consider the local/national level. The UK relies on imports, so changes in the global food system could have an impact on the success of the programme, through changes in trade relations or impacts on multinational businesses having a ripple effect on UK businesses. In future phases of the evaluation, we will incorporate international elements to the assessment, depending on the extent to which the funded activities and the programme address these issues.
- **Social factors**, such as changing demographics and consumption trends. A particular concern for some of the projects, due to changing economic factors, is the increase in families living with food insecurity and rising food inequalities. The projects working with low-income communities have highlighted how changes in economic factors have increased the challenges that these communities face when trying to access a healthy and nutritious diet. This could have implications for findings, having a lower level of community engagement (due to communities having other priorities to focus on), or to the type of solutions identified (as they would reflect a particularly challenging context). Another factor that could impact the success of some of the projects, particularly six of the 16 projects working with a single food product, is changes in public perceptions of specific products (e.g. pulses, meat or shrimp).
- **Policy and regulation factors**, such as changes to policy or regulation, as well as to government. The extent of the programme's success will be limited or enabled by the degree of political support for change at either national or local level. The food system links social, health, economic, environmental, and political dimensions. Any changes in these areas could impact the success of the programme. The policy changes could be agricultural, health, environment or workplace related, spanning multiple departments and agencies, and not always aligned. Ongoing changes in trade policy would also have an impact.

  Some of the policies that could influence impacts are:

  - The National Food Strategy and other food strategies (e.g. the Northern Ireland Food Strategy, Food Standards Scotland's Strategic Plan, and Scotland's Good Food Nation), or local ones, such as the Birmingham Food System Strategy.
  - Health-focused policies, such as Childhood Obesity: A Plan for Action, the EatWell Guide goals, the Tackling Obesity strategy, and the reformulation policy for salt reduction.
  - Environment-focused interventions such as the Environmental Land Management scheme; the 25-Year Environment Plan and environmental

[2] Garnett, P., Doherty, B. and Heron, T., (2020). 'Vulnerability of the United Kingdom's food supply chains exposed by COVID-19'. Nature Food, 1(6), pp.315-318.

targets (e.g. reducing greenhouse gases and reaching carbon net-zero by 2050); and the English Aquaculture Strategy: Seafood 2040.

  - Economic-focused policies and commitments.
  - Alignment to wider policies such as the National Planning Policy Framework.

- **Technology factors**, such as moves towards digitalisation, changes in logistics and supply chain technologies, or the development of agricultural technologies. A small number of projects are working with feasibility studies, and technological changes could impact them.
- **Environmental factors**, such as droughts, heatwaves or other extreme weather events can have significant impacts on primary producers, which cascade across the food supply chain. Increased frequencies of extreme climatic events can massively influence the outcomes of the programme, either in terms of changing farming practices, disrupting the supply of certain foods or increasing the costs of food in general.

Each of these factors has the potential to contribute positively to the programme objectives or to become a barrier to their achievement. They are also interrelated, and one factor may exacerbate another; for example, the cost-of-living crisis may lead to national policy changes. They may change the motivations and ability for businesses, policymakers and the general public to adopt changes in behaviour within the food system, including those that stem from the programme's outputs.

Annex 3 Summary of TUKFS funded activities

A3.1 Composition of programme activities

Table A3.1 summarises the applications and funded projects in calls 1–3, the call for funding the CDT, and details of the studies funded so far via the Programme Director's budget.

Table A3.1 Activities funded by the TUKFS programme

Activity	Funded activities	Summary
Call 1: large multi consortia projects	4 x £6m. Up to 5 years academic and PSRE led consortia	43 proposals received at outline stage, leading to 13 applications, and 4 funded projects.
Call 2: Collaborative research and development	11 projects from £300k to £1.9m, 2–3 years' duration, academic PSRE led consortia	The 152 proposals received at EoI stage (149 eligible) led to 34 full applications and ultimately to 11 funded projects. The three major topics for this call were: ■ transforming food environments; ■ sustainable nutrition across the food system; and ■ food imports and domestic production.
Call 3: Interdisciplinary project	1 project, £680k, 2 years	Eight applications were received, and one project was funded. This call funded an interdisciplinary research project to model the suite of factors that influence food imports to the UK market, and the associated interventions that could be implemented to transform the UK food system to improve the dietary health of UK citizens and the health of the environment.
CDT	CDT cohort 1, 2 and 3, £5m (to one consortium running the CDT)	The CDT is funding 59 studentships (Cohort 1 includes 15 students, cohort 2 16 students, and cohort 3 28 students). The students are selected using a blind method that limits the impact of unconscious biases during the early selection process. Female students substantially outnumbered males in the first cohort.
Ad hoc studies	Six research paper outputs	Studies were initially funded on an ad hoc basis but will now be supported from two separate funds: a Project Synergy Fund and a Flexibility Fund. The intent is to fund several projects each year to assist in achieving impact and ensure synergy across the portfolio.
Synergy Fund	Up to £25k open to collaborations between academics participating in the TUKFS programme. Must include participants from at least 2 funded projects	Funded three projects in 2022 and five in 2023
Flexibility Fund	Up to £10k, led by an academic or named stakeholder organisation involved in a the TUKFS project	Funded one project

Activity	Funded activities	Summary
Other knowledge exchange activities	9 SIGs Two annual meetings organised A knowledge exchange fellow and broker engaged	■ A bottom up process to set up special interest groups (SIGs) among project participants. It created 9 SIGs, some related to specific production-side elements of the food system (e.g. regenerative agriculture or urban agriculture) and others to methodological approaches relevant to multiple the TUKFS projects (e.g. participatory action research or supply chain analysis). There is also an Early Career Researchers (ECR) SIG. ■ Annual meeting for TUKFS programme participants. It includes space to share and transfer knowledge (such as training in food systems thinking), and an opportunity for projects to identify synergies. ■ A knowledge exchange fellow and a broker fellow who led on activities to incentivise knowledge exchange and coordination between programme activities, as well as external stakeholders.

Further detail on these activities is presented below

A3.2 Research projects

This subsection includes a description of the approach taken by Call 1, Call 2 and Call 3 funded projects to address UK food systems challenges, based on an initial review and engagement with the projects.[3]

The call 1 projects are similar in terms of value (£6m). Call 2 funded projects vary more in scale, as measured by funded value. The smallest project award was £306,853 and the largest £2,006,492. The focus or topic of interest varied considerably across all projects, as did the geographical focus (national, urban or local), location (across the UK), types and number of partners engaged with, and area of the food system targeted (for example, focusing on one product, such as beans or shrimp; on a business model, such as social enterprises; or on an area of the supply chain, such as food distribution). The diversity of topics and associated academic disciplines means that specific impacts and associated pathways will vary significantly. Table A3.2 summarises the portfolio of funded projects.

Table A3.2 Funded projects – summary characterisation

Call	Project	Project summary based on the food system perspective	Award amount
1	FixOurFood	Regenerative farming, improving social/environmental impact of business, school food procurement in Yorkshire	£6,027,067
1	Mandala	Urban food system transformation in Birmingham	£6,148,083
1	FoodSEqual	Healthy & sustainable food for disadvantaged communities	£6,146,439
1	H3	Regenerative farming, novel growing technologies, micronutrient deficiency and fibre consumption, consumer behaviour and retailer practices	£6,144,271

[3] Annex 3 includes the deep dives done by each project team to provide further information.

Call	Project	Project summary based on the food system perspective	Award amount
2	Sneak	Transformation of catering menus to support healthier/more sustainable consumer choices	£344,065
2	RtP	Developing routes to market for UK grown pulses (faba beans)	£2,027,638
2	Blue economy	Integrating sustainable shrimp production on terrestrial UK farms	£1,965,718
2	P2P	Converting grass into edible food components and understanding consumer acceptance/readiness for this	£2,006,492
2	SEFS	The role of social enterprises in food systems transformation	£306,853
2	Culture Meat	Potential opportunities for farmers from cultured meat	£523,355
2	TRADE	Understanding the impacts of potential changes to livestock systems	£677,396
2	BeanMeals	Understanding how to increase consumption of UK grown beans (navy beans) to improve health and environmental outcomes	£1,784,966
2	Hi-Fi	Development of a new high fibre white bread loaf using domestically produced wheat and modelling UK wheat supply chain	£1,579,451
2	SusHealth	Developing a combined measure of nutritive value and environmental impact; assessing options for improving affordability of healthy sustainable food	£887,362
2	FioFood	Understanding challenges specific to food insecure people living with obesity and how changes in the food system and retail sector can support them	£1,619,481
3	Transition to HSDs	Developing fiscal and trade policy measures based on a transition to healthy and sustainable diets in the UK	£696,804

A3.2.2 Geographical focus

In terms of geographical focus, 14 of the 16 projects focus on England, 3 of which also cover Scotland, and 1 focuses on Northern Ireland and 1 has a UK wide focus. Food systems are explored at different levels, from local to regional and national:

- Seven projects have a **national** focus, testing new products or approaches that could be applied at a national level. Some of these projects do conduct research at a regional or local level.
- Six projects focus on **urban** environments in the UK, bringing together commercial companies, city councils and CSOs to explore issues specific to cities. Three of them focus on a single city each and the other three on multiple cities, expecting to draw comparable lessons from the different types of urban environments explored. Three of the national focused projects are conducting research in one or two cities as well.
- Four projects have a **regional** focus, testing innovations in the food system in a specific area of the UK. They explore issues that affect the area's citizens and businesses, and how local government impacts policy processes. Two of the national focused projects conduct research regionally.

All 16 projects intend to capture lessons from their focus areas that can be scaled up to national level or identify lessons that are relevant for other geographical areas in the UK. One project aims to have an impact at global level.

A3.2.3 Partnerships

All funded projects include named partners in their applications ('named partners'); types of partners that they will identify and engage with as the project evolves ('identified partners'); and stakeholders that they want to engage with but not necessarily as partners ('project stakeholders'). The network analysis (in Annex 3) provides an update on the partners identified by projects.

All projects have identified industry partners and academic partners beyond the PI's university. 15 projects identified CSOs, and 11 organisations also identified industry associations. 9 projects identified local government partners and 14 identified national government partners.

A3.2.4 Area of the food system targeted

The funded projects use a variety of approaches to transform the food system, with some focusing on specific or multiple elements of the supply chain, and others considering the supply chain as a whole. Some engage with efforts to change consumer behaviour, and some focus on the processing and manufacturing of food products, while others explore different business models within the food system.

Of the 16 funded projects at the time of the study, 7 intend to influence the consumption of a specific food group. Of these, 4 involve the introduction of a new food product to market (pulse enhanced foods, sustainable shrimp, cultured meat, and grass as an ingredient); and 3 aim to expand consumption of an existing product (grain, UK grown beans, and livestock products). Another 3 projects are researching consumer behaviour, exploring changes to catering menus, nutritional information and making healthier products easily accessible to consumers.

The remaining 6 projects aim to change the entire system, starting either from a consumer perspective or a supply perspective. While 2 of these explore community based research to find innovations and make improvements to the food system, the other 4 aim to transform the supply of specific healthier products.

A3.2.5 Expected outputs and outcomes

The projects will aim to co-generate knowledge with their partners, producing different types of knowledge products targeted to different audiences, such as journal articles, best practices, policy briefs, events and social media content. They will also create and test new products and processes and collaborate with policymakers at local and national level to develop new strategies, policies and programmes.

All of the funded projects aim to have a high impact on the environment, and a high or medium impact on health and research/skills; 13 aim to have a high or medium impact on businesses; 12 aim to have a high or medium impact on consumers; 12 aim to have an impact on policy; 11 aim to have a high or medium social impact; and 10 aim to have a high or medium economic impact. CDT

Three cohorts of doctoral researchers have been appointed. Cohort 1 started in October 2021, cohort 2 started in September 2022 and cohort 3 started in September 2023.

Five research priorities and topics (called 'kernels') for the doctoral researchers to choose from were identified by 50 associate partners that collaborate with the CDT, from business (e.g. Unilever; Techion and Nestlé), government (e.g. Department for Health and Social Care) and civil society (e.g. Brighton and Hove Food Partnership), as well as the nine partner universities. The research priorities and specific topics were selected to address specific stakeholder needs.

The topics are linked to academic institutions, food businesses and associations/CSOs that will support the research and provide a placement for the students. Researchers generally selected topics from two research priorities. Based on this selection, each doctoral researcher will work on one topic that relates to social sciences and one that relates to natural sciences. During their studies, they will be affiliated with at least one university, and work in partnership with other stakeholders (associate partners) as part of their research.

The PhD research projects target various aspects of the sustainable food system framework.[4] Some focus on the drivers of consumption and production, exploring sociocultural factors that may influence individual consumption, as well how the environment and food system infrastructure impact the wider food system. Others focus on the food supply chain, consumer behaviour, and diets, exploring how these are linked to nutrition and health outcomes, and considering wider impacts.

A3.3 Programme Director activities

The programme has launched two funds to support the projects: the Flexibility Fund, intended to fund time critical activities that have direct routes to programme level impact; and the Annual Synergy Fund, to support cross programme activities that add value to the funded portfolio, foster cross project collaboration, drive impact, build capacity and encourage linkages with related investments. The programme has also completed a series of activities to support knowledge exchange, coordination and engagement between projects, and between the projects and other external stakeholders.

The TUKFS programme has funded several ad hoc external studies (see composition analysis in Section 1 above), which have developed high level representations of food systems and assessed those developed by others to inform the allocation of funding for the programme. The studies highlight the challenges that need to be addressed, and the need for funding targeting coordinated and holistic approaches.

[4] https://www.fao.org/3/ca9731en/ca9731en.pdf.

Annex 4 Case Studies

A4.1 Case Study Approach

A4.1.1 Introduction to the case studies

The evaluation team has written eight case studies. Each case study focuses on the progress made by the projects towards the expected outcomes and impacts as defined in the theory of change (ToC). The case studies follow different themes that align with the research impact pathways. The studies are iterative, and they will be updated as more evidence becomes available next year.

Each case study uses evidence from a selected number of projects (between 3 and 6), ensuring all funded projects (Call 1, Call 2 and Call 3) are represented. Table A4.1 includes the titles of the eight case studies organised by impact pathway. The table also outlines which projects were included in each case study.

Table A4.1 Projects represented by each case study

Impact pathway	Case study title	Projects represented
Skills and capacity for food systems research in the UK	CS1: Increased UK capacity and capability in food systems research	Call 1: H3, FixOurFood, FoodSEqual, Mandala Call 2: FioFood, SNEAK
Skills and capacity for food systems research in the UK	CS2: Co-production methods lead to relevant food systems knowledge	Call 1: Mandala, FixOurFood Call 2: BeanMeals, SEFS Synergy project: Co-production
Food business operators (FBOs)	CS3: Introduction of new healthier and environmentally friendly products to the UK market	Call 2: BeanMeals, Hi-Fi Bread, Pasture to Plate, Raising the Pulse, UK Sustainable King Prawn Project
Food business operators (FBOs)	CS4: Changes in business practices help transform food systems	Call 1: H3, FixOurFood, Mandala Call 2: Cultured Meat, FioFood, UK Sustainable King Prawn
Government policy	CS5: Transforming public distribution channels to be healthier and more sustainable	Call 1: FixOurFood, Mandala Call 2: BeanMeals, Raising the Pulse, SNEAK
Government policy	CS6: Food system approaches to implement new policy frameworks/strategies at different levels (national, regional and local)	Call 1: Mandala, FixOurFood, H3 Call 2: TRADE Call 3: Transition to HSDs
Community/citizen behaviour	CS7: Citizens are empowered to have more agency over their diet	Call 1: FoodSEqual, FixOurFood Call 2: FioFood, Raising the Pulse, SusHealth
Community/citizen behaviour	CS8: Citizen voices lead transformations in food systems locally	Call 1: FoodSEqual Call 2: BeanMeals, SEFS

Each of the case studies has been developed on the basis of desk research, combined interviews with key project stakeholders, including project leads and project partners from academia, the private sector, policymakers, CSOs, community researchers and others. The evidence for the case studies was collected between April and July 2024. The case studies are not evaluations of the projects, but rather a summary of key features and achievements to exemplify what outputs and outcomes look like. The list of people interviewed to inform each case studies is shown in Table A4.2.

Table A4.2 List of interviews conducted to inform case studies, by project

Call	Projects	Stakeholders interviewed for the case studies as project partners
1	FixOurFood	6 interviews: PI; academic; 2 policymakers (national and regional); 2 CSOs (national)
1	Mandala	4 interviews: PI; FBO (national retailer); policymaker; CSO
1	FoodSEqual	8 interviews and a workshop: PI; 4 academics; CSO (local); 2 community researchers; attended a half day workshop
1	H3	6 interviews: PI; 2 FBOs (local producers); 3 CSO (national)
2	SNEAK	2 interviews: PI; FBO (local retailer)
2	Raising the Pulse	2 interviews: PI; FBO (local retailer)
2	UK Sustainable King Prawn	3 interviews: PI; academic; FBO (local producer)
2	Pasture to Plate	3 interviews: PI; academic; FBO (national inputs/research)
2	SEFS	5 interviews: PI; academic; 3 CSO (regional and local)
2	Cultured Meat	3 interviews: PI; policymaker (national); 1 FBO (national inputs/research)
2	TRADE	3 interviews: PI; 2 academics
2	BeanMeals	4 interviews: PI; 2 policymakers (local); 1 CSO (regional)
2	SusHealth	1 interview: PI
2	FioFood	3 interviews: PI; academic; FBO (local producer)
2	Hi-Fi Bread	1 interview and 1 workshop: PI; attended a one day workshop (conversations with a range of partners)
3	Transition to HSDs	3 interviews: PI; 2 academics

Each case study follows a standard structure and looks to address a series of questions that are relevant to the TUKFS programme impact evaluation. Each case study starts by exploring the thematical focus of the case. Then, it discusses the activities, outputs and outcomes achieved by the different projects. The case studies then finish by exploring what is expected to be seen in the final report and by the final evaluation.

A4.2 CS1: Increased UK capacity and capability in food systems research

This case study explores how six TUKFS funded projects are contributing towards increasing high quality leading research on food systems transformation (capacity) and supporting the growth and development of people (increase capability). The case study uses evidence collected from the TUKFS funded projects to explain the evidence towards increasing capacity and capability in food systems research.

All TUKFS funded projects will contribute to building capacity and capability in food systems research. This case study only uses evidence from six of them: H3, FixOurFood, FoodSEqual, Mandala, FioFood and SNEAK.

The case study discusses how projects are including PhDs or early career researchers (ECRs) in their activities to increase their capabilities. It also showcases the research methods projects are employing that can contribute to generating food systems research. The case study focuses on the role of the TUKFS funded projects and not on the Centre for Doctoral Training (CDT)[5]. The contributions of the CDT are presented in the main body of the interim impact report.

A4.2.1 Context

The TUKFS programme is predominantly a research programme, so all projects are, to varying extents, increasing capacity and capability in food systems research in the ways previously mentioned. The six projects explored for this case study provide a particular view of how the TUKFS programme is contributing to:

- Increased capability by training and supporting food systems researchers within the projects to enhance capability and develop a pipeline of skilled people able to apply critical interdisciplinary systems thinking to the food system.
- Increased capacity by implementing research methods traditionally applied for other disciplines towards generating high quality research and knowledge on UK food systems transformation.

The TUKFS programme brings together leading researchers from multiple disciplines, universities and economic sectors. While the methodologies are not innovative, the programme amounts to a large volume of research activity that is being pursued in a way that is not typical for food research in academia or industry. It is the first time that these disciplines and partners have worked together towards food systems transformation at this scale. Projects are posing questions and gathering evidence in atypical ways linking nutrition with health, agronomy, sustainability, economics, and so on.

Further, the TUKFS programme has encouraged projects to involve doctoral students and ECRs, which is contributing to the UK's broader food systems research capacity and talent pipeline. The TUKFS programme's training and capacity building activities involving PhD students and ECRs are building the next generation of experts in food systems research, which should help sustain the UK's international standing in this research field. Similarly, broad academic and public engagement and knowledge exchange activities are necessary to ensure that the research outputs are accessible to wide audiences, thereby raising awareness and building capacity and capability outside of the projects' immediate circle.

[5] The CDT was funded to expand the pipeline of trained food systems researchers available to UK science and, to a lesser extent, other sectors.

Table A4.3 summarises the projects' main objectives and activities in relation to their research methods, policies for researcher development, and development of capacity and capability in the broader food system.

Table A4.3 Project summaries

Project	Summary	People (capability)	Methods (capacity)
H3	Aims to promote technological innovation in primary production to improve the quality of food produced in the UK, while minimising its environmental impact.	Actively includes ECRs in its dissemination plans, training them on how to apply for grants and further funding, and holding regular open meetings with other food systems stakeholders.	Quantifies and contextualises the barriers and potential impacts of adopting regenerative agriculture and peri urban horticulture practices using a life cycle assessment and in depth interviews with relevant stakeholder groups.
FixOurFood	Seeks to develop and implement innovative interventions across healthy eating, hybrid food economies and farming, ultimately driving a broader shift toward regenerative food systems in Yorkshire and beyond, with insights feeding into national and international policy.	Co funding interdisciplinary doctoral studies, encouraging ECRs to present findings at international conferences, and providing researchers with media training to maximise the project's reach.	Research questions co-created with food system actors, trialling and modelling of the potential impacts of regenerative agriculture practices, as well as surveys and workshops guided by the Three Horizons method.
FoodSEqual	Aims to empower citizens in culturally diverse, disadvantaged communities by giving them greater choice and control over the food they consume.	Training researchers on translating knowledge, and training community researchers to focus on local food systems transformation.	Participatory and action research process, involving communities with other stakeholders, to co-create interventions towards a more inclusive food system.
Mandala	Aims to explore how to transform a local food system by mapping and designing interventions with a range of partners.	Actively engaging with a number of ECRs and PhDs encouraging them to drive research and disseminate findings	It is mapping a local food system to identify key levers for transformation. It then designs and evaluates selected interventions to drive that food system transformation.
SNEAK	Tests whether changes in menus can generate a reduction in the carbon footprint of meals; their sugar, fat and salt content; and be implemented without compromising food acceptability and without consumers being aware that changes have been made (i.e. 'sneaking').	n/a	Testing an innovative model based on theoretical concepts of competition and behavioural psychology in a real life setting

A4.2.2 Findings

The following sub sections reflect on how the projects are training and supporting their food systems researchers and developing research capability and capacity in the broader food

system. Embedded in these findings are also the different approaches that the projects are using to carry out their research and build capacity, all of which are interdisciplinary and collaborative, although the methods used differ. While many projects are implementing traditional and conventional research methods that are typically practiced in academic environments, some of those selected for this case study showcase alternative ways of engaging in food systems research.

A4.2.2.1 Training and supporting food systems researchers within projects

PhD and postdoctoral training programmes

Projects are increasing food systems research capacity by funding (or co-funding) PhD students' involvement in the research, which is aligned with their own theses. These PhD students are in addition to the students supported through the UK Food Systems CDT. The H3 project, for instance, is funding two PhD students, one of whom is undertaking a hybrid farm feasibility assessment, while the other is researching the health impacts of biofortification. Mandala and FixOurFood are each funding five PhD students, some of whom are involved in developing local and regional food strategies. In the case of FixOurFood, one former research assistant is now also pursuing a PhD. In addition to gaining skills on the project, the co-funded doctoral students are supervised by different departments of the university faculty to ensure interdisciplinarity in their research.

Mentorship and collaboration

In addition to supporting the formal education of future researchers through their PhDs, projects are also actively building capability through more informal routes, including giving ECRs the opportunity to lead smaller WPs under the supervision of more experienced researchers. While this kind of 'learning by doing' is common in academic practice, the additional mentorship of less experienced researchers has attracted positive feedback. These support mechanisms are expected to allow ECRs to advance their careers, which is vital to ensuring the legacy of the projects – and, by extension, the programme – in building capacity and capability for food systems research. Across the TUKFS projects selected for this case study, the evaluation team identified 183 individual academics, of which 52 (28%) can be considered ECRs[6].

Projects such as H3 are including ECRs in their dissemination plans to ensure that their contributions are being recognised in publications. They are also providing training and support on how to access grant funding and make small grant applications via the programme's Synergy Fund, and other sources. Other examples include: an ECR who worked on H3's WP1 has secured a Biotechnology and Biological Sciences Research Council (BBSRC) Discovery Fellowship to undertake further research into plant microbiomes to improve pest resilience; a postdoc on WP2 is now a Co-Investigator on a BBSRC project on hydroponic media; and two other postdocs involved in WP3 have moved on to new academic positions in similar fields, in France and Finland. There is also evidence of ECRs on the FioFood project helping to draft future grant applications, although there is not yet any information on the outcome of those:

> *We are drafting some grant applications. I really enjoyed that. That was […] exciting to prepare. I would like to do a few more this year.* – ECR (FioFood)

Moreover, ECRs on the FioFood project have been given opportunities to be first authors on publications, and to lead on various WPs:

[6] This figure is based on a review of existing documentation and responses, provided by project leads and coordinators, to a question in the participants' survey on the number of ECRs involved in the project.

> *There are ECRs in every WP covering every methodology who have gained so much; it's not just the links; it's learning new methodologies. There's so much stuff that the ECRs have gained in every discipline.* – Project Lead (FioFood)

The ECRs in this project are active in promoting collaborations and building a network within the TUKFS programme. For example, they organised an online workshop with other ECRs in the TUKFS network to discuss the dissemination of co-produced research on food systems. The workshop explored the barriers to and facilitators of knowledge mobilisation among ECRs, identifying key facilitators such as access to training, experienced mentors and established academic networks. One ECR said that mentorship and support opportunities more generally were crucial to advancing their career:

> *I feel like a researcher now, which is that 'something' I think you need to have if you want to go any further in this career; you need to believe in your own work but also know that that's come from working in a team environment with people who give you that support to feel like that.* – ECR (FioFood)

Hands on experience working directly with industry

FioFood's close links with a large food retailer has allowed its ECRs to gain critical skills by working with industry data and enjoying a more direct connection to industry, which is not always within reach for ECRs in academic environments:

> *As an ECR, you never think you're going to work with some bigwig [organisation]. The opportunity of being able to work alongside someone like that and understand outside of the academic perspective what it's like from an industry sense is something which I find fascinating. It's something which, for my own career development, has opened my eyes to other opportunities outside academia.* – ECR (FioFood)

On top of the connections with industry, the project's approach to working with people with lived experience has also greatly enhanced ECRs' research experience. Evidence gathered from interviews with the ECRs suggests that this is one of the most valuable aspects of their engagement with the project (and programme), and has made them keen to carry a systems approach forward to future projects:

> *This is all real world research. We are out in the field, we are talking to real people, we are focusing on knowledge exchange. It is really important that ECRs are developing these skills and can then go on to work and support other projects, start to progress their own careers, and ultimately become PIs. And that's one of the things we're doing now, training [one of our ECRs] to write grants.* – Project Lead (FioFood)

A4.2.2.2 Developing research capability and capacity in the broader food system

Building interdisciplinary research networks

The H3 project builds on interdisciplinary work at the Institute for Sustainable Food[7] (at the University of Sheffield), bringing together researchers from varied disciplines using a food systems lens. The project hosts regular open meetings, providing opportunities for relationship building and networking across disciplines and the food system, and leading to collaborations between academic researchers and food system stakeholders:

[7] https://www.sheffield.ac.uk/sustainable-food

> *"This programme has been a wonderful opportunity for me to work directly with researchers in public health. I work in biodiversity conservation, which tackles very similar issues and problems, with many of the same methods. I have learned a huge amount, especially about methods and research ethics. I will always be grateful."* – Academic project partner (H3)

FixOurFood is leading a training element of the TUKFS programme, hosting the Food Systems Training initiative, which has also created opportunities for collaboration and networking. Moreover, at the project's away day, project alumni were invited to share experiences and showcase career opportunities in the food system:

> *We've also got various different people that have been on previous programmes that we ran, who got on to bigger and better things in the food system, to showcase the career opportunities after FixOurFood, to show different routes for the postdocs.* – Project Lead (FixOurFood)

The FixOurFood project has examples of researchers moving at all career levels. Specifically, one of the ECRs on the project became a member of the Public Health Team at York City Council. At a more senior level, one of the project's Co-Investigators has now taken a role as Head of Food Systems at the UN's Food and Agriculture Organisation, and another non academic project partner is now a lobbyist at the Trussell Trust charity, which is working to end the need for food banks in the UK. At yet another level of the career ladder, the FixOurFood team also developed a 'Future of Food' module for York University, which includes food systems approaches. One of the Co-Investigators (WP5 lead) on the H3 project is now also the Co-Director of the newly formed Co Centre for Sustainable Food Systems[8].

Public engagement and knowledge exchange

As a means of influencing broader capacity in food systems thinking, several projects have invested in training on translating research outputs. For example, knowledge exchange and effective communication of research findings have both been important elements of the training activities that the FixOurFood project offers its ECRs. The project's research team has received support and media training to help them translate their own findings more effectively and present them at international conferences:

> *We've encouraged them to take part in presentations, so our PhD researchers as well as our postdocs […]. In terms of getting used to the idea of talking about their work to different audiences, […] they have been very much involved in that. We've encouraged them, supported them in doing that.* – Project Lead (FixOurFood)

The FoodSEqual project supported postdoctoral researchers to translate their work into simple terms. This helped them disseminate findings with programme stakeholders beyond academia. In turn, it has been valuable in helping the postdocs to learn how to work and communicate with non-academic stakeholders.

Implementing different research methods for food systems research and transformation

The projects selected for this case study also showcase an array of methods that will contribute to the development of a strong corpus of evidence on how to transform the UK food system. A common theme across projects that they are addressing problems as interconnected, using principles consistent with the insights from the field of 'systems'

[8] https://www.sheffield.ac.uk/sustainable-food/news/new-co-director-institute-sustainable-food

science, and using a variety of research methods and approaches suitable to address complex problems in systems settings.

Projects are testing different types of interventions, from on farm transformations to innovative products and behavioural change interventions that target a diverse range of consumers. Several projects are gathering evidence and data that will enhance understanding of the food system, the levers that can effect change, and the different pathways to impact. This includes developing new metrics and models to measure the environmental, health, social and economic impacts of the different interventions tested to help drive transformations in the UK food system.

H3 and FixOurFood are testing and modelling the benefits of innovative agricultural techniques, such as regenerative agriculture, hydroponic horticulture, and vertical farming in peri urban settings. Both projects embrace interdisciplinarity at their core, engaging stakeholders across the supply chain – more than would be traditionally included in research activities – and linking communities, industries and academics. A project participant in the FixOurFood project described how the project is taking a food systems approach in the following way:

> *We tackle challenges from environment health to human health including primary production, supply chains and business models, early years and school food. We have developed maps for transformation of the food system through working with multiple stakeholders bringing different perspectives and addressing actions that are synergistic as well as actions that will bring trade offs. We have many new links across different stakeholders, and researchers that are only possible through a systems approach.* Project participant (FixOurFood)

FixOurFood has run a plot trial in Yorkshire to measure and model the impact of different regenerative agriculture systems on soil function, biodiversity, greenhouse gas emissions, crop development, crop disease, pest incidence and yield, during the crop rotation and between years. Similarly, H3 is working on measuring the landscape scale effect of regenerative agriculture and peri urban horticulture, using a life cycle assessment method to evaluate the impact of the innovation and intervention, life cycle costing for economic impact, and social life cycle assessment for social impact.

> *In H3, we are linking methods of food production on farms to the nutritional quality of the food produced, and market choices. One long term goal is to provide evidence that connects regenerative farming to dietary nutrition. Another goal, which has emerged during the project, is to make it possible to score individual farms for their position on a transition towards regenerative agriculture, for purposes of certification, research and policy incentives.* Project participant (H3)

It is also worth noting that both projects have employed qualitative methods in their analytical approach. H3 has carried out in depth interviews to contextualise farmer perspectives on regenerative agriculture, including its emotional appeal, and the environmental and economic and motivations for adopting the practice[9]. Meanwhile, FixOurFood has run a series of workshops and surveys to gain a deeper understanding of the actions needed to transition to a regenerative farming system, guided by the Three Horizons method[10]. Further details on

[9] It led to a publication in the *Journal of Rural Studies*: Beacham, J. D., Jackson, P., Jaworski, C. C., Krzywoszynska, A. and Dicks, L. V., 2023. Contextualising farmer perspectives on regenerative agriculture: A post-productivist future? *Journal of Rural Studies*, Volume 102, 103100, ISSN 0743-0167. Available at: https://doi.org/10.1016/j.jrurstud.2023.103100.

[10] https://fixourfood.org/wp-content/uploads/2022/12/Transforming-to-a-regenerative-farming-system-in-Yorkshire.pdf

the work that these projects have done to trial sustainable agricultural practices can be found in Case Study 4.

The SNEAK project has developed a data pathway to collate information about the nutritional composition and carbon footprint of weekly menus in a university hall of residence canteen, to test whether changes to menus can generate a reduction in the carbon footprint of meals, as well as in their sugar, fat and salt content. An important aim of the project is to determine whether these changes can be implemented without compromising food acceptability, and without consumers being aware (i.e. by 'sneaking' as opposed to 'nudging'). The project's hypothesis is founded on competition theory and behavioural psychology. The research team at SNEAK has now completed an initial modelling of menu swaps, showing that a strategically redesigned menu could tentatively reduce carbon footprint by approximately 32%.

FoodSEqual takes an action based, collaborative approach, focusing on transformation at local level. The project has been active outside of academic environments, bringing together a range of stakeholders to reimagine how 'food policy, food products and food supply chains can be developed'[11]. For example, in Plymouth, the project has worked with community members who have participated in workshops, and community food researchers who have helped design workshops and engagement activities. The project has also engaged with local industry partners, including the Plymouth Fisheries and Seafood Association, and Soul of Discretion, which provide it with raw materials, facilities and expertise. Local school pupils have also been involved in co-designing activities, as has CATERed – a school meal provider. This has led to community groups being established and community based researchers being trained. More details on the outputs and outcomes of this project are reported in Case Study 8.

Co-production is also a central aspect of the FioFood project. The project takes a multi disciplinary, collaborative approach to co-designing retail strategies and supermarket based interventions that are designed to support people living with obesity and food insecurity to purchase healthy and sustainable food. The project has collected and analysed data from people with lived experience, as well as on supermarket transactions (i.e. 'big data'), using data science techniques to understand the healthiness and sustainability of the population's diet at scale. The project has produced a series of policy briefs, summarising preliminary findings and insights on the experience of working with people with lived experience in a food systems context[12].

A4.2.3 Conclusions

The evaluation team has found several ways in which projects are effectively increasing research capacity and capability in food systems research. There is evidence that the programme is producing a range of academic publications and grey literature supporting new insights and knowledge on sustainable farming practices, as well as on the benefits of employing methods that are not always found in academic research (i.e., systems thinking that engages a multitude of stakeholders). Ultimately, this content – if used – can result in up skilling of a generation of researchers and practitioners across sectors. Further analysis (bibliometrics) will be required in the final evaluation to determine where the UK stands internationally in this field.

Likewise, there is sound evidence to suggest that the programme is effectively developing a pipeline of skilled individuals at all levels of the career ladder, from PhDs to ECRs and

[11] Food Systems Equality – Co-production of healthy, sustainable food systems for disadvantaged communities (reading.ac.uk)

[12] https://www.abdn.ac.uk/rowett/research/FioFood/index.php#panel1770

beyond. These researchers are capable of applying critical, interdisciplinary systems thinking to food systems, and are trained in how to translate research findings to increase capacity more broadly. There is already evidence of some of them progressing towards becoming independent researchers by securing grants and other funding.

A4.2.4 Future outcomes

The projects are expected to continue building capacity and capability through their research activities and outputs. The number of outputs produced by the programme is expected to increase as projects continue to trial interventions, collect more data and carry out further analyses. The experience of practising interdisciplinary and collaborative research methods, through multi sector partnerships working from a (food) systems perspective, has been new to many new and established researchers and industrialists alike. This has shed light on the benefits of such integrative approaches, which are, in turn, likely to persuade people that they should consider using this approach in subsequent research or development projects (see, for example, a programme's ECR view on working with people with lived experience reported in 0). The programme has therefore expanded the total number of new and established researchers who are confident in following a systems approach (capability), and who are ready to consider using that approach again in future (capacity).

A4.3 CS2: Co-production methods lead to relevant food systems knowledge

The TUKFS programme ToC assumes that the knowledge generated will be used by stakeholders beyond academia, such as industry, policymakers, CSOs or citizens. The aim is that knowledge generated, especially toolkits or policy briefs, can influence these stakeholders towards behavioural change that will lead to food systems transformations. This case study explores examples of projects that are generating outputs in a way that exposes all stakeholders to food systems research (co-creation) and leading to food systems knowledge and evidence that is useful for a range of stakeholders.

The case study explores the activities the projects engaged to co-produce knowledge, the outputs generated, and the early outcomes observed from the process. This case study uses evidence from six of them: BeanMeals, FixOurFood, H3, Mandala, SEFS, and co-production of research for food systems transformation[13].

A4.3.1 Context

Co-production is a collaborative way of working, with an emphasis on the exchange of diverse forms of knowledge and expertise in 'an equal partnership for equal benefits'[14]. Knowledge that is co-produced will lead to outputs that are useful for, and used by, the food systems community (policymakers, businesses, civil society, etc), and that are perceived as contributing towards transforming the food system. Examples of such knowledge include:

- 'How to transform food systems' toolkits and policy briefs that are disseminated and used by non-academic actors;
- specific outputs that are used to transform food systems more directly;
- a set of methods that could be used anywhere and by anyone to transform food systems.

The theory of the programme is that if academics co-produce knowledge with other stakeholders (business, policy, citizens, etc.), they achieve two things.

- Influencing or changing the behaviour of those stakeholders: as they have more knowledge of the system and power to make changes, there is likely to be an increased uptake of food systems approaches across stakeholders beyond academia.
- The outputs are used by other stakeholders that were not involved in the research projects: this leads to the potential to influence businesses and/or policymakers, especially when toolkits and policy briefs are directed at those stakeholders.

Table A4.4 summarises the key activities that projects have engaged with, and the outputs achieved so far.

[13] Synergy Fund project

[14] As defined by the Synergy project: Co-production of research for food systems transformation – University of Plymouth.

Table A4.4 Project summaries

Project	Co-production methodology	Participants	Outputs produced
BeanMeals	Co-designing workshops with: - 200 schoolchildren (Key Stage 2) attending the Eco Schools Roadshow in Leicester; - Year 5 primary school children at 6 schools in the Leicestershire area; - school chefs and suppliers.	School children Catering suppliers	BeanTopia – a bean based game, designed to show the journey of beans from farm to fork in the food system.
SEFS	A series of activities looking at what social enterprises can do around social and environmental issues and food.	Social enterprises	*Good Practice Guide for Social Enterprises*.
Mandala	Workshops with hospital chefs and NGOs to co-design new menus that are healthier and more sustainable.	Hospital chefs Public procurement	Healthier and more sustainable sample plant based menus.
FixOurFood	Three horizons research to co-create (with stakeholders) metrics to signal progress and drive change towards transformation in the Yorkshire and UK food systems.	Farmers	North Yorkshire Food Strategy to be published in 2024.
H3	Participative mapping with farmers covering 25 farming sites.	Farmers	Regenerative agriculture pilot schemes.
The Synergy Project (Co-production of research for food systems transformation)	Collaborative study across TUKFS projects, consisting of a systematic analysis of project documents, conversations across the TUKFS projects, and organising two interactive workshops to explore and map co-production activities. 'Co-production Oracle' card deck, designed by a specialised facilitator, to support reflection and prompt discussion on key issues related to co-production for food systems transformation.	6 TUKFS projects (BeanMeals, FioFood, FoodSEqual, H3, FixOurFood, and Cultured Meat)	Checklist of practical considerations for researchers, academic institutions and funders engaging in co-produced research. Map of key principles for co-production.

These projects were selected as they exemplify the co-design of usable and accessible outputs to be used outside of purely academic circles. These outputs are expected to lead to changes in policy, business behaviour and procurement. However, at this interim stage, there is limited evidence of this change, and the focus of this case study is therefore on the production of outputs.

Co-production is expected to lead to: the production of high quality outputs (toolkits/policy briefs) that can be used by wider stakeholders to transform the UK food system(s); increased knowledge, skills and capacity to transform food systems for those involved in the co-production process; new methodologies for co-production with diverse actors; and additional benefits to stakeholders involved in co-production, such as confidence, lasting relationships, and the application of recommendations and actions resulting from outputs. However, these outcomes have yet to be realised and will be included in the final evaluation research.

A4.3.2 Findings

The following sub sections reflect on how the projects co-produced research with different stakeholders and the outputs and outcomes it led to.

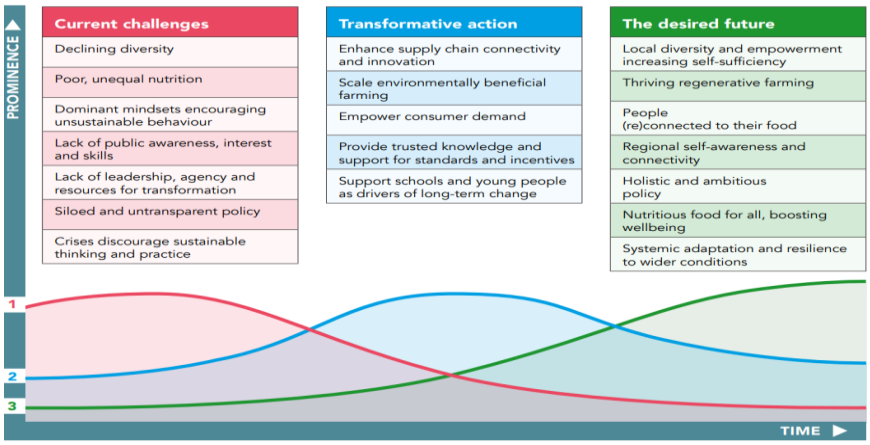
A4.3.2.1 Co-production of usable outputs

A goal of the TUKFS programme is to co-produce knowledge, as it leads to outputs that are more usable for stakeholders. In all cases, running workshops with multiple stakeholders was critical to ensuring that the outputs would reflect a range of views and expertise. These workshops were also used to agree important themes and areas where interventions were needed or would be most fruitful.

A few projects have co-produced knowledge with the private sector, particularly in agriculture. H3 and FixOurFood together engaged with farmers to co-produce knowledge, through two farm cluster groups (covering 25 sites). The aim was to disseminate knowledge of local farming methods and generate new metrics for measuring the impact of phenomena such as soil degradation.

FixOurFood used the 'Three Horizons' future process[15], which helped to capture 1,400 insights from 113 different experts at 55 organisations, through surveys and workshops on current challenges, desired future food systems, and how transformation can be supported. This process produced a map of core findings, as shown in Figure A4.1.

Figure A4.1 FixOurFood findings from the Three Horizons future process



Source: [Three Horizons to support systems change – FixOurFood]

BeanMeals and Mandala worked with local government to generate knowledge related to making changes to procurement systems. In both cases, this involved bringing actors from across the food system together in workshops to highlight 'pinch points' where change is difficult. Both projects tried to generate consensus on where change would be most realistic and fruitful.

The SEFS project co-produced knowledge on how best to intervene in the food system from the perspective of social enterprises. This involved working alongside academics as 'community researchers' recruiting and helping to facilitate local focus groups. It also involved academics working with them to support the development and measurement of their impact on nutrition and sustainability. The nature of this activity varied considerably depending on the priorities and interests of each social enterprise. A report from the Centre for the Understanding of Sustainable Prosperity (CUSP) found that 'the research tasks were

[15] https://fixourfood.org/what-we-do/our-activities/3-horizons-to-support-systems-change/

designed in a way that was familiar for the academics but not necessarily for those working in the SEs [social enterprises]'[16]. The project therefore dedicated time to upskilling social enterprises. CUSP suggests that for 'projects to be truly transdisciplinary, the imbalance in resources between academic institutions and social enterprises needs to be addressed by funders.'

Co-production led to the development of a range of outputs, such as BeanTopia – a bean based game, designed to show the journey of beans from farm to fork in the food system (BeanMeals).

To develop the game, the project engaged with school science leads to align the game with the national curriculum; a psychologist to develop strategies to convert engagement into behaviour change; and 200 schoolchildren (Key Stage 2) at the 'Eco Schools Roadshow' in Leicester, who designed their own bean themed games. These children (aged 9 and 10, and from six schools) also tested game prototypes and were engaged through project partner Food for Life. Co-designing BeanTopia ensured that the game balanced both the need to be informative and influence eating behaviours with the need to be accessible and enjoyable for children (the target audience).

SEFS produced a *Good Practice Guide for Social Enterprises*. It also ran workshops across the UK with its six core social enterprise partners: (Community Transport Glasgow (tackling access to affordable food); Cultivate Powys (local growing and social prescribing); London Early Years Foundation (nursery chef initiative); Selby Trust London (food and community hub); Social Adventures Salford (therapeutic growing and local food hub); and Windmill Hill City Farm Bristol (growing space and community hub), as well as other social enterprises, to identify key themes to include in the *Good Practice Guide*.

Co-producing the guide ensured it reflected the experiences of social enterprises, as well as their collective knowledge, with a focus on the social, environmental and economic aspects of food related social enterprises. The guide also provides practical shared learning from social enterprises on setting up, building partnerships and scaling up. One of the partners involved explained that it would not have been possible to create the guide without input from the social enterprises, which made the output useful. The project also trained employees to become 'community researchers', improving their capacity and capability to contribute robust evidence to the production of the guide[17].

Mandala co-produced healthier and more sustainable sample plant based menus as a key output. The project set up and facilitated two half day workshops, in which chefs from hospitals and other organisations co-designed new menus. This enabled the chefs to share their experience, particularly in developing menus under tight financial constraints. As a result, the project lead described how they were able to co-design a new menu that was 'more plant based, healthier and more sustainable'. However, there is no evidence that the new menus have been rolled out into hospitals.

FixOurFood engaged with farmers and the North Yorkshire Council to co-develop metrics to form part of the North Yorkshire Food Strategy. The project gathered evidence to support the strategy through two National Farmers Union (NFU) farmer workshops and a survey of 142 farmers, giving regional farmers the opportunity to emphasise the factors that impact them most. The project lead confirmed that the evidence was used to develop 'metrics to deliver a new open source codebase containing a quantitative food systems model and a metrics dashboard.'

[16] Exploring social enterprises' engagement in transdisciplinary research: A reflective analysis | By K. Graham, K. Burningham and A. Loukianov (cusp.ac.uk)

[17] Exploring social enterprises' engagement in transdisciplinary research: A reflective analysis | By K. Graham, K. Burningham and A. Loukianov (cusp.ac.uk)

H3 engaged with farmers to co-produce regenerative agriculture pilot schemes. It organised in person, farmer led cluster meetings to introduce the project's aims, learn about farmer interests and concerns, and co-design trial methods. It also ran two workshops to discuss how data should be collected, with a particular focus on collecting data at times that complement agricultural cycles.

A4.3.2.2 Codification of new co-production methods

A Synergy Fund collaborative study, involving a number of TUKFS projects, codified the principles to be followed if effective food systems co-production is to lead to high quality products and meaningful change. It was based on the projects' own experiences of co-producing outputs and research with a range of partners. The researchers working in the Synergy Fund project produced a checklist for co-production[18] and a 'messy map' of the co-production process[19]. These resources are intended to be used by food system stakeholders to co-design future interventions.

The Synergy Project completed a systematic analysis of TUKFS project documents, held a number of conversations and organised two interactive workshops to explore and map co-production activities within six TUKFS projects. The projects also trialled innovative facilitation methods, including using the 'Co-production Oracle' card deck to support reflection and prompt discussion on key issues related to co-production for food systems transformation[20].

A4.3.2.3 Outcomes for those involved in the co-production process

The Synergy Project identified four themes related to the co-production process. Each of the projects achieved changes related to knowledge, power, inclusivity and relationships.

Knowledge

The Synergy Project described knowledge as a fundamental principle of co-production. By involving experts in their field, taking a systematic approach to include a diverse range of perspectives, and using a mix of theoretical and practical experience, the co-production process can lead to increased knowledge among participants and an output that is useful to its targeted audience.

For example, FixOurFood collected 1,400 insights from 113 different experts at 55 organisations, through surveys and workshops about current challenges, desired future food systems, and how transformation can be supported. Mandala brought together hospital chefs with NGOs, other chefs and nutritional experts. SEFS co-produced a *Good Practice Guide* with the six core partner social enterprises, and hosted workshops with many others.

This, in turn, led to an increase in co-production partners' knowledge of the food system and systems thinking, through project leads sharing theory and co-production partners sharing on the ground knowledge and experience. Examples of this include the following.

- Farmers better understanding the priorities of actors involved in the food system, including public procurement. The Mandala project lead described how the project had brought farmers together with public procurement leads to 'show demand' for beans and pulses. They also discussed how to 'understand and work with the missing middle' – the supply chain between farm and schools.

[18] Synergy_Illustrated_Checklist.pdf (plymouth.ac.uk)

[19] Synergy_Messy_Map.pdf (plymouth.ac.uk)

[20] Synergy project: Co-production of research for food systems transformation – University of Plymouth

- Improved knowledge of social enterprises' role within food systems transformation. The *Good Practice Guide* produced through SEFS is an example of shared knowledge generation and dissemination[21]. The guide outlines some practices that help to increase social justice through transforming food systems.
- Improved understanding of how interventions to transform the food system can be scaled up effectively, particularly for social enterprises. The SEFS project has produced best practice on how social enterprises can scale up their work efficiently.

As identified in the Synergy Project, co-design for the BeanMeals project provided:

> *the opportunity for the game designer to gather information on children's knowledge of beans and visual representations of parts of the food system. A bank of ideas for illustrations, game narratives and mechanics was created from children's game ideas, and these were used to develop game prototypes and graphics*[22].

Power

Power in co-production included shared decision making, shared responsibility, and increased transparency in the process of generating and disseminating knowledge.

This, in turn, led to the projects treating their co-production partners as equals, with shared decision making power and responsibility. The projects also provided support (including financial) for their partners to engage in co-production, and enabled smaller organisations to increase their capacity and expertise to engage with research. This led, for example, to the following.

- Children and parents feeling empowered to advocate for change in their schools. The BeanMeals project lead described how the co-design of the BeanTopia game, alongside regular communication with parents (including through cooking lessons), has led to increased engagement, buy in and trust between schools and the wider community.
- Farmers feeling empowered to innovate, with the 'safety blanket' of TUKFS programme funding. The FixOurFood project partners described how the programme had provided time and resources that otherwise would not have been available to allow farmers to try new regenerative methods under the pilots.

Inclusivity

Inclusivity in co-production meant the removal or minimisation of barriers to participation, and the recognition of people's strengths.

Most projects described attempts to improve the inclusivity of their co-production. This involved allowing contributors to be involved in the process in a way that suited their strengths and experience. This ranged from giving children freedom to approach co-production in a free and creative way, to using visual landscape prompts to famers to help them identify where in the food system their business operates.

This led to increased engagement by participants (e.g. farmers) with research and academia. In both the H3 and FixOurFood projects, partners described how farmers were increasingly open to engaging with research in a way they had not done previously. It also led to researchers hearing from stakeholders they had not worked with before; academics learning how to engage different actors in research; and participants feeling included in a novel process.

[21] cusp.ac.uk/wp-content/uploads/Good-Practice-Guide-online.pdf

[22] https://www.plymouth.ac.uk/research/synergy/codesigning-a-bean-themed-game-with-school-children

Relationships

The co-production process led to partners working together to identify shared goals and grant opportunities, and building relationships that could continue beyond the project, creating a legacy for partners.

All case study projects described ongoing relationships with and between their co-production partners. As a result, research staff were involved in community projects (e.g. with FixOurFood and Mandala) that led to 'further research ideas'. Partners in SEFS also developed new networks through co-production processes. One of the social enterprises involved in co-developing the *Good Practice Guide* explained that the workshops, networking and opportunity to be 'in the same space' was the 'most beneficial' part of the process.

A4.3.3 Conclusions

As a result of the TUKFS programme, there is emerging evidence of:

- increased uptake of food systems approaches across stakeholders beyond academia;
- the potential to influence businesses and/or governance and policy changes, especially when toolkits and policy briefs are directed at those stakeholders;
- new knowledge generated starting to translate to impacts, such as behaviour change and policy change.

A4.3.4 Future outcomes

There is not yet any evidence of how the use of these outputs has led to change. However, interviews with the projects identified the following.

- BeanTopia is expected to be an educational tool that can be rolled out in schools, alongside a new curriculum focused on beans.
- The *Good Practice Guide for Social Enterprises* is expected to improve the efficiency and effectiveness of social enterprises' interventions in the food system, including providing best practice and practical guides.
- Healthier and more sustainable sample plant based menus are expected to be rolled out in Birmingham hospitals. As a result, food intake in these hospitals is expected to be healthier. Settings in which the organisation has a 'captive audience' present an opportunity to make significant changes to consumption without impinging on citizen's choices.
- The North Yorkshire Food Strategy is expected to develop ideas to support people to plan healthy and affordable meals, and will offer tips on how to minimise the impact of food on the environment.
- Regenerative agriculture pilot schemes are expected to identify a toolkit of measures that local farmers can use to reduce soil degradation and improve yields of vegetables and grains.
- The Synergy Project is expected to improve knowledge of how to facilitate, support and invest in future co-produced research for food systems transformation. However, there is not yet any evidence that this has been embedded in co-produced projects.

A4.4 CS3: Introduction of new healthier and environmentally friendly products to the UK market

This case study explores the extent to which the TUKFS programme has contributed to changing business practices that lead to the introduction of new, healthier and environmentally friendly products (from a supply and demand led perspective). The assumption is that academics and businesses are working together to introduce new or reformulated products to the UK food system that are healthier and environmentally friendly. This case study will test and explore how they are doing this, and how TUKFS funding has contributed to this outcome.

This case study includes examples from five projects: UK Sustainable King Prawn, Pasture to Plate, HiFi Bread, Raising the Pulse and BeanMeals.

A4.4.1 Context

The research projects showcase examples where they are actively researching, developing and testing new commercial products, either through the incremental improvement of existing products or ingredients, or by working backwards from a newly identified consumer need. The case study identified two pathways by which projects are working on this. Research projects are either:

- **identifying novel food products (technology push model):** growing a healthy and environmentally friendly crop in the UK and working with the supply chain to ensure it reaches consumers (processing, transport, procurement, retail).
- **identifying products that consumers want and working backwards (demand pull model):** starting with product characteristics identified by consumers and working with the supply chain to ensure that the product is available in the form (taste, price, retail) that consumers demand.

The case study explores how the industry academia collaborations in the research projects are contributing to the new or improved products or production processes, while ensuring that healthy diet and/or environmental sustainability are considered.

The evaluation identified 5 out of the 16 TUKFS projects with an element of product innovation on which demonstratable progress has been made. Several other TUKFS projects include an aspect of product innovation, but either progress has been slow, or it was not a primary focus. Examples include the Cultured Meat project, where the development of the product is not related to the project's primary objectives; and H3, where the fortification of foods is planned to be explored in the next stage of the project.

A summary of the product/process innovation for each of the selected projects is presented in the Table A4.5 below

Table A4.5 Project summaries

Project name	Summary
UK Sustainable King Prawn	It is redefining the possibilities of farming warm water shrimp (king prawns) in the UK. It aims to introduce a risk free, healthier, and sustainable supply chain for king prawns by using recirculating aquaculture systems (RAS), and by locating these systems alongside farm based renewable energy sources (although the heat inputs are not limited to farms and could include any industry which produces excess heat). The new product is a UK grown king prawn that has the potential to be marketed as a healthy ingredient with reduced 'import' miles, as it is produced locally to UK consumers. The main outcome that the case study is exploring is the technological development and optimisation of shrimp production in terrestrial locations in the UK.

Project name	Summary
Pasture to Plate	It aims to convert grass into nutritious edible ingredients for healthier and more affordable alternative foods, making UK agriculture more resilient and sustainable. P2P is using novel chemical processing methods to extract edible components from grass (e.g. proteins, carbohydrates, vitamins, lipids and fibre), with the aim of producing a mycoprotein and a lipid palm oil substitute. The project has demonstrated both technological progress and the use of consumer research on attitudes to this food product.
HiFi Bread	It is developing a new type of wheat flour that can be used to make white bread with a higher fibre content, at no additional cost to consumers and with minimal disturbance to supply chains. It is combining behavioural consumer research and food technology studies to develop the product, as well as predictive mathematical modelling to inform and guide transformation in the UK's wheat supply chain (making it more resilient in the process). This case study focuses on how the interdisciplinary team of researchers working with the supply chain can use modelling to identify scenarios for future land use, and feed into the product's commercialisation path.
Raising the Pulse	It is creating a new type of bread that will make it easy for people to consume more UK grown pulses, in place of nutritionally inferior and environmentally more harmful components of their diet. RtP is developing this new bread, made with nutrient dense and environmentally sustainable faba beans, in response to the widespread consumption of white bread, particularly among lower socioeconomic groups. This case study focuses on the project's technological demonstration with the entire value chain, and its collaboration with Reading University's catering team to test the product.
BeanMeals	This is a reverse food system project (from 'fork to farm'), focused on promoting healthy diets through bean, lentil and pulse based school meals. It works backwards through all the supporting elements of the supply chain to understand how to make this work. The case study explores how the fork to farm model works.

A4.4.2 Findings

The rest of this sub section summarises the findings. It first maps out the TUKFS projects involving product innovation, and how they are planning to achieve it. It then focuses on early outputs and outcomes such as technological and commercial progress so far. Finally, it explores how the TUKFS programme approach has enabled such contributions.

Figure A4.2 gives an overview of the five projects, which encompass a variety of sectors, ranging from aquaculture and food processing to institutional catering. Two projects include an element of making changes to menus or the way that food is presented (BeanMeals and RtP), going beyond the marketing of the product. The table also describes the innovative element that each project is pursuing, and the indicative route to commercialisation. Some are using existing plants and animals (e.g. UK Sustainable King Prawn and RtP), and others are refining and developing the inputs (e.g. HiFi Bread, BeanMeals and P2P). In some cases, the product is also supporting healthier and more sustainable meals (e.g. BeanMeals and RtP).

There are some commonalities in what the projects are aiming to do. RtP and HiFi Bread both identified the widespread consumption of white bread, particularly by disadvantaged groups, as an opportunity to improve both diets and the sustainability of food production. In contrast to the HiFi Bread project, which is demonstrating and testing novel wheat lines, RtP is addressing the same problem through the inclusion of nutrient dense, environmentally sustainable faba beans. Both projects are essentially working on the development of new flour types for healthier bread.

The P2P and UK Sustainable King Prawn projects are developing new products with the ambition of establishing new industries in the UK. However, the projects' technology readiness and product acceptance are at very different stages. For the UK Sustainable King Prawn project, no modification is made to the shrimp and the technology to produce them in the UK already existed but was very resource intensive. Meanwhile, P2P is at an earlier stage of acceptance and therefore likely to have a much longer development timeframe. Both are interdisciplinary projects involving economists calculating the economic viability of the product and life cycle assessment, on which both are finding positive results.

Figure A4.2 Summary of TUKFS projects involving product innovation outcomes

Project name	Sector	Product type	Innovation	Route(s) to commercialisation
UK Sustainable King Prawn	Aquaculture	British grown king prawn	Developing and optimising production technologies for a new sector.	Formation of a new sector, integrating shrimp growing on farms. Retailer interest from M&S and Sainsbury's.
Pasture to Plate	Agriculture and food processing	Edible food components from converted grass	Novel chemical processing of grass.	Formation of a new sector, producing a UK grown substitute to palm oil and soya protein. Via social enterprise/business.
HiFi Bread	Agriculture and food processing	High fibre wheat variety for white bread	High fibre wheat variety producing white bread.	High fibre flour for bread and other baked goods. ASDA potential for commercialisation.
Raising the Pulse	Agriculture, food processing and catering	Faba bean suitable for milling and use in white bread	Using UK grown beans in flour and mainstreaming pulses as ingredients.	Halls of residence study and campus wide study. Heygates, Waitrose and Hodmedods potential for commercialisation.
BeanMeals	Food processing and catering	Meals using 'Capulet' and 'Godiva' beans	Fork to farm, working backwards from preparation and consumption of a meal.	Working with Leicester City Council and Food for Life.

Source: Project documentation, project websites, and interviews with PIs and partners

A4.4.2.2 Technological progress

Each of the five TUKFS projects is aiming to deliver technological advances that will underpin product innovation (see Figure A4.3). While some are using established food products (e.g. beans in the BeanMeals project and shrimp in the UK Sustainable King Prawn Project), others are experimenting with novel production processes or inputs to develop products in collaboration with research partners such as the Rothamsted Institute, thus working at much lower Technology Readiness Levels (TRLs). From the interview data, the team estimates that all projects have made some progress on this indicator (advancing TRLs).

The UK Sustainable King Prawn project is the only project to have reported progress using TRL scales. The RAS demonstrator has been developed from scall scale prototype (TRL4) to a fully operational prototype (TRL6), hoping to launch a modular commercial scale demonstrator in Spring 2025. The commercial sale of the product itself is anticipated for early Summer 2025 (TRL9). Supporting this, other outputs arising from project activities show how specific technologies have been improved during the project to make production more

efficient and reduce cost, thereby increasing the innovation's economic viability. The project team made some discoveries about the chemical composition of water needed to provide the best conditions for growth, and are working on a sensor for monitoring real time calcium levels in the tanks. This technology is currently at about TRL4, with potential for full commercial application (TRL9).

Figure A4.3 TRL progress of TUKFS projects involving product innovation outcomes

Project name	TRL of product		TRL of production technologies	
	Start	Current	Start	Current
UK Sustainable King Prawn	TRL9	TRL9	TRL4	TRL6-7 (some components at TRL4)
Pasture to Plate	TRL1-2	TRL3	TRL2	TRL6
HiFi Bread	TRL1-2	TRL6	TRL2	TRL6
Raising the Pulse	TRL1-2	TRL6	TRL3	TRL6
BeanMeals	TRL9	TRL9	TRL9	TRL9

Source: Project documentation, project websites and interviews with project PIs and partners

A4.4.2.3 Commercialisation progress

Commercialisation of the products is progressing. One project, RtP, has already released a 'test' product in the form of a limited batch of 600 prototype loaves at the university, and created the messaging for this temporary release period. Figure 1.2 and Figure A4.4 show the current estimated progress made by the projects on this type of outcome.

Figure 1.2 Current estimated and future expected Commercial Readiness Level (CRL) progress of TUKFS projects involving product innovation outcomes

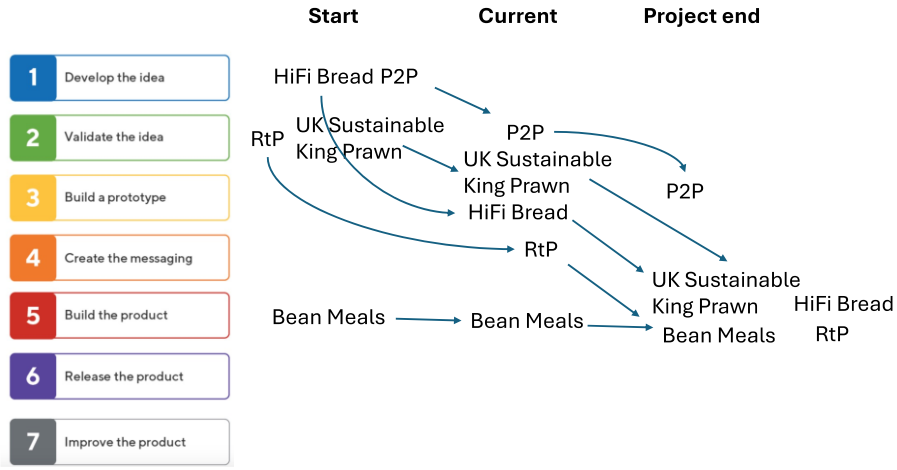


Figure A4.4 Start and current estimated CRL TUKFS projects involving product innovation outcomes, with expected commercialisation timeframe

Project name	CRL[23]	

[23] Adapted from ARPA-E, Appendix B. Accessible from: https://arpa-e.energy.gov/sites/default/files/ARPA-E%2520T2M%2520Plan%2520Template%2520rev.%25204-30

	Start	Current	Expected commercialisation timeframe assuming sufficient follow on funding is secured
UK Sustainable King Prawn	CRL3	CRL6	Commercial sale expected for Summer 2025, hoping to establish an industry within 5 to 10 years.
Pasture to Plate	CRL2	CRL4	Forming a startup at the end of the project, resulting in an industry in 10+ years.
HiFi Bread	CRL2	CRL6	A product on the market in 3 to 5 years.
Raising the Pulse	CRL2	CRL6	A product on the market in 3 to 5 years.
BeanMeals	CRL2	CRL5	A product on the market in 1 to 3 years.

A4.4.2.4 MIDRI and systemic approach to product innovation

Compared to collaborative research and development (R&D) projects funded by Innovate UK, these projects tend to be delivered by larger consortia of multi and interdisciplinary research and innovation (MIDRI) researchers working with industrial partners. This enables projects to draw on the expertise of economists and modellers, bringing in different perspectives than would normally be the case with a more conventional R&D grant.

The TUKFS projects involve research teams working on technology demonstrations in collaboration with industrial partners, complemented by a team of people conducting consumer research, modelling production and undertaking life cycle assessments, as well as thinking about what policy levers could be used to incentivise adoption of the technology. A good example of this is the UK Sustainable King Prawn project, which is not only demonstrating the technology to grow shrimp on terrestrial farms, but also creating demand for its adoption by farmers through conservation incentives that should result in environmental benefits (in addition to not transporting the shrimp over 7,000 miles to the UK).

Figure A4.5 Conclusions

The TUKFS programme demonstrates that involving MIDRI teams and taking a systemic approach to product innovation results in the following:

- Good examples of product innovation: the TUKFS projects that set out to develop innovative new products have made good progress on both their underpinning technological advances and plans for commercialisation. Multi disciplinary and cross sector collaborations supported by TUKFS were central to this progress.
- Projects are demonstrating how businesses can develop new healthy, sustainable and desirable products tailored to different groups in society. To do this they considered the supply and demand aspects of products (including modelling geographical areas that are best suited for production and segmentation of target markets).
- An ambition to transform food systems in the UK and demonstrate the possibility of exporting abroad (given the global nature of food production).
- An ambition not only to develop new products, but to establish entire industries and shape supply chains, in line with the ambition of the programme as a whole.

Projects encountered several common challenges relating to product development.

-14.docx&ved=2ahUKEwi-v8X7hayHAxUlREEAHYRsCG4QFnoECB4QAQ&usg=AOvVaw2dDjqUizc13kH8zh3oyxAi. Alternative CRL definitions include one from Vinnova: https://www.vinnova.se/globalassets/utlysningar/2019-04765/omgangar/innovation-readiness-level-i-inkubatorprogrammet.pdf1158335.pdf?cb=20220121085703.

- There were issues with recruiting study participants post COVID-19, indicating some resistance to participating in studies.
- Weather changes affected the production of faba beans, navy beans and new lines of wheat, as too much rain can reduce yield. However, projects still managed to get sufficient crops for their research requirements.
- It can be difficult to engage large businesses from the food system when investigating new products if the production scale is very low.

A4.4.3 Future outcomes

In terms of further technological development, BeanMeals is the only product innovation project being completed in 2024, so the other four projects will continue to pursue technological advances, as outlined in Figure 1.2. The team expects further progress on this.

Alongside technological development, the four live TUKFS projects are conducting a variety of research and modelling tasks to inform their commercialisation strategies, and are in conversation with industry (either with project partners or, in some cases, potential partners beyond the immediate consortia). There is interest in these products from a variety of major food retailers, such as Sainsbury's and M&S for the UK Sustainable King Prawn project, ASDA for HiFi Bread, and Waitrose for the RtP project.

All projects have at least one route to market (see Figure A4.4) although some plans are more concrete than others – for example, in the case of RtP, where each part of the supply chain has been involved from the outset. Other projects, such as BeanMeals, are yet to convince potential partners from the value chain for successful commercialisation to take place, and there is therefore much more uncertainty about whether and when commercial success may be realised. In the case of the UK Sustainable King Prawn project, the plan is to first engage with producers and farmers, and then focus on engagement with policymakers, to develop incentives for farmers to adopt the technology. From September 2024 onwards, the project's demonstration site will be open to the public and visitors from the responsible seafood summit in St Andrews (Scotland).

In the final phase of the evaluation, the team will approach all commercial partners involved in these projects for interview.

A4.5 CS4: Changes in business practices help transform food systems

This case study explores the extent to which the TUKFS programme has enabled change in business practices to help transform the food system. This means identifying or trialling new business models or ways of transforming existing production/distribution processes to make them more resilient to supply disruptions; and, more generally, influencing the way that businesses think about the food system.

The case study includes examples from six projects: H3, FixOurFood, Mandala, FIO Food, the UK Sustainable King Prawn Project and Cultured Meat.

A4.5.1 Context

An aim of the TUKFS programme is to change the behaviour of actors across the food system. The funded projects are expected to pilot, promote or establish new approaches and research that can be used by food business operator (FBO) partners to make their operations more efficient and sustainable.

These activities and associated outputs are expected to lead to changes in practices in the broader food value chain, ultimately resulting in a healthier, more affordable and sustainable food supply. More broadly, businesses' engagement with projects and exposure to systems thinking are expected to influence the way that they design their own business policies and strategies, as well as future interventions.

This case study therefore focuses on how the programme is driving changes in business behaviour by considering how the projects are:

- trialling new techniques with other food system stakeholders to understand the benefits of sustainable farming practices (e.g. regenerative agriculture, hybrid hydroponic horticulture and recirculating aquaculture systems);
- partnering with private food suppliers to conduct studies on the effects of potential interventions on dietary options;
- influencing businesses' behaviour by exposing them to new ways of working.

Table A4.6 summarises the key activities that projects have engaged with, and the outputs achieved so far.

Table A4.6 Project summaries

Project name	Summary
H3	■ Aims to promote technological innovation in primary production to improve the quality of food produced in the UK, while minimising its environmental impact. ■ Seeks to enable the upscaling of economically and environmentally sustainable horticulture, and demonstrate the potential of regenerative agriculture practices at landscape level.
FixOurFood	■ Aims to develop and implement innovative interventions across healthy eating, hybrid food economies and farming. ■ These efforts are intended to generate scalable solutions, ultimately driving a broader shift towards regenerative food systems in Yorkshire and beyond, with insights feeding into national and international policy.

Project name	Summary
Mandala	■ Aims to catalyse urban food system transformation by focusing on the city of Birmingham as a scalable case study, partnering with food system stakeholders to develop a collaborative change process that can be replicated in other cities. ■ Seeks to ensure the co-production of evidence based solutions to current food system challenges – for example, whether a recipe box subscription can lead to a healthier dietary pattern.
FioFood	■ Aims to support future transformation of the food system by bringing food insecure people who are living with obesity together with other consumers, retailers, policymakers and academics, to understand the key challenges faced by people living with obesity and food insecurity when shopping. ■ The project is influencing how businesses engage with policy and the academic community.
UK Sustainable King Prawn Project	■ Aims to integrate social and natural sciences to redefine the possibilities of farming warm water shrimp (king prawns) in the UK by using recirculation aquaculture systems, and by locating these systems alongside terrestrial, farm based renewable energy sources.
Cultured Meat	■ Aims to assess the potential impact of cultured meat on UK agriculture. The development of cultured meat faces challenges in energy efficiency, cost and public acceptance. ■ The project will explore how cultured meat might influence UK farming and how farmers might engage with this technology, as well as the broader environmental, economic and social impacts of cultured meat in the UK.

A4.5.2 Findings

The following sub sections explore how the projects are working with industry to transform the food system. It explores new techniques so farming can be more sustainable, working with retailers to distribute healthier or more sustainable products and rethinking business strategies towards food systems transformation by finding new pathways to change business behaviour.

A4.5.2.1 New techniques for sustainable farming

Regenerative agriculture

Both H3 and FixOurFood are conducting research into the adoption of regenerative agriculture farming practices, but differ in the scale at which they are being tested. FixOurFood is working with farmers who are testing regenerative agriculture principles on plots within larger fields, which has enabled the project to identify results on improving soil health, reducing the need for chemicals and improving profit margins. Meanwhile, H3 researchers are co-designing regenerative agricultural approaches and using tools to monitor their environmental outcomes and crop productivity. H3 is currently trialling regenerative agriculture with 21 farmers. Initial data analysis at the mid point of a three year monitoring

period has revealed that regenerative practices have led to: (1) a higher number of bird species; (2) a higher number of earthworms; and (3) soil regeneration[24].

The evaluation team conducted a series of interviews with the farmers trialling these methods, which suggested a mixed experience with the trials. One farmer said that more time was needed to understand the benefits fully, and questioned the effectiveness of adding 'cover crops'[25]. The same farmer also noted that their 'farming cluster'[26] was already following most principles of regenerative agriculture, and they therefore did not expect radical change as a result of engaging with the project. However, they were confident that other participating farmers would have acquired more knowledge by the end of the project. This was reflected in an interview with another farmer, who acknowledged that participating farmers were already interested in regenerative agriculture practices, regardless of the project, but noted that having the data from the H3 project was a key benefit. The farmer said that the project may have accelerated this change:

> *It may be something that helped [other farmers] move that year instead of the next year or the year after, but ,ultimately, they would have cracked on with this change anyway. For the change group, I don't know if as much has changed in that sense. We're a fairly actively vocal group, so I think that if there are enough regenerative farmers within the group making the change, even if H3 didn't exist and they decided to carry on doing regenerative, I think there's enough trust and support there for them to have called up one of the guys who's been doing it and say, 'How do I do this right?'* – Participating farmer (H3)

Some of the learnings and changes in practice among participating farmers included: (1) trying agroforestry; (2) changes in the use of livestock to graze down cover crops; (3) the use of 'bio suitable drills'; and (4) hiring a new farm manager. Another strain of work by the H3 project has investigated farmers' motivation for switching from conventional to regenerative agriculture, as well as the barriers preventing that change[27]. The lead researcher is optimistic that the work will influence farming practices more widely:

> *It does seem that, by learning from others, farmers are starting to pick up on and be interested in following that same journey. Farmers trust other farmers, more than they would scientists or government or other stakeholders. And there are some very good farmers in our cluster that have been doing it for some time, so it's a very good peer to peer learning network. Our results back up that work with some evidence.* – Project lead (H3)

FixOurFood is also trialling forms of regenerative farming in Yorkshire and working on understanding what can be learned from them, as well as the contribution they could make to

[24] Mathew Stephen Alexanderson, Hanabeth Luke, David John Lloyd, Regenerative farming as climate action, Journal of Environmental Management, Volume 347, 2023.

[25] A cover crop is a plant that is used primarily to slow erosion, improve soil health, enhance water availability, smother weeds, help control pests and diseases.

[26] A farming cluster is a collaboration of farms in a geographical area.

[27] J Beacham, J. D., Jackson, P., Jaworski, C. C., Krzywoszynska, A., Dicks, L. V., 2023. Contextualising farmer perspectives on regenerative agriculture: A post-productivist future? *Journal of Rural Studies*, Volume 102, 103100, ISSN 0743-0167. Available at: https://doi.org/10.1016/j.jrurstud.2023.103100.

combating climate change if these techniques were scaled up nationally. One of the project's aims is to investigate the limiting environmental, social and economic factors for regenerative farming, and the changes in practices that would enable different farming systems in Yorkshire to be regenerative and financially viable. After one year, preliminary findings from trial plots suggest that regenerative practices are improving soil health, reducing the need for chemicals and improving profit margins. The project's work also extends to food suppliers: it is working with university food producers to encourage them to start sourcing from regenerative farmers, thereby influencing changes further along the food value chain.

Hybrid hydroponic horticulture

H3 is trialling hybrid hydroponic horticulture and has successfully grown hydroponic crops year round in polytunnels, with no artificial heating or lighting, on several farms near Sheffield. However, one of the participating farmers interviewed stated that they did not expect to take up this type of farming in future, because there were no spare resources outside of their dairy business. The farmer was, nevertheless, impressed with the system and the researchers' success in growing crops in winter weather.

Moreover, it was noted that there have been some promising initial conversations about using the site as a learning opportunity for other farmers once H3 is complete. Other benefits reported include: (1) providing access to soil analysis on the partner farm and understanding how to improve the grass quality; (2) understanding that an anaerobic digester would be a beneficial and sustainable addition to the participating farms; and (3) understanding of carbon emissions associated with production of different dairy products.

Recirculating aquaculture systems (RAS)

The UK Sustainable King Prawn project is seeking to maximise the efficiency of the novel, land based production of king prawns via recirculating aquaculture systems on farms using renewable energy and heat sources (i.e. anaerobic digesters). The production process also has built in circularity to ensure sustainability and maximise profit opportunities for farmers who intend to take up the practice. The research team of UK Sustainable King Prawn project is working with an aquaculture company prove the concept, using solar energy to power its operations. The team plans to scale this up to the point that the product can be commercialised, and farmers incentivised to grow prawns and diversify their farming activities.

The project's main business partner praised the benefits of bringing together an interdisciplinary research team to embark on this study:

> *That is what has made this project so unique. It has involved an awful lot of different disciplines. You need all these different experts to answer the questions. We were in the position where knew what the questions were, and we knew how to get the answers, but there was no way we could do that as an industry. Had we not done the project, we may have reached that conclusion 10 years down the line. Presumably by then somebody would have beat us to proving that you can do it here.*
> – FBO partner (UK Sustainable King Prawn Project)

Researchers on the project are also working on demonstrating the profitability of terrestrial shrimp farming in UK farms, to incentivise farmers to take up the practice by developing a business case and financial model for a UK shrimp hatchery. The business case is expected

to be informed by a high resolution model of where shrimp farming is most likely to be adopted as the technology develops, and as prices, costs, subsidies and environmental conditions vary. The aim is to model how each variable affects the costs, revenue, output and profitability of shrimp production relative to other farm activities, thus also assessing the profitability of on farm diversification. The project also has the potential to influence conservation policies at national level, as prawn farms take up less space and are more profitable, meaning land can be left for conservation.

A4.5.2.2 Towards delivering healthier or more sustainable products

The Mandala project is working with a recipe box company to understand whether switching to recipe boxes, instead of conventional food preparation and acquisition practices, would be a healthier and/or more sustainable choice for households. The research team and partner have spent the last six months developing a detailed protocol, getting ethical approval, and signing a collaboration agreement to conduct a randomised controlled trial (RCT). The study team is expected to pilot the RCT in September 2025 and launch the main RCT in spring 2026.

The study is expected to be beneficial for all parties involved, as it creates a better evidence base for interventions that could work for the business partner, accelerate their social impact, and improve their marketing and messaging. Moreover, the study is expected to consolidate the partnership for future collaborations, and the team hopes that the work may influence national food strategies if results show that recipe boxes are a healthier alternative for certain groups.

A4.5.2.3 Rethinking business strategies towards food systems transformation

FioFood is bringing food insecure people living with obesity together with consumers, retailers, policymakers and academics. This process has brought about change in the way that the project's main FBO partner has been using insights from the project's findings to influence its own strategies, and carrying out interventions in its business model informed by evidence from people with lived experience. The project has reportedly enabled the retailer to locate and reach groups that are hard to approach, and to then run insight workshops with food insecure individuals.

The same business was strongly positive about the collaboration more generally, and the interactions with industry, particularly in the way that the research team was prepared to consider industry needs in its plans. The project partner expressed interest in engaging in this new way of working in the future:

> *I think more of those opportunities would be brilliant and I don't think we always necessarily know that they exist. So that would be fantastic, from helping our own teams upscale and to learn from the academic groups in a broader TUKFS sense.* – FBO partner (FioFood)

Also, the retailer's involvement with the FioFood project has enabled it to change the way it engages with policymakers. The organisation also held a parliamentary event and submitted

evidence to an inquiry by the House of Lords' Food, Diet and Obesity Committee as a member of TUKFS research community[28]:

> *The policy piece has probably been the biggest benefit [of the partnership]. Being able to say, here's how we're trying to work to understand what's working and being able to talk to that collaboration has been very powerful. We're probably quite unique as a retailer in being able to do that. For example, with the Lords Committee response, we won't respond as [the organisation], we're going to respond as the consortium because that's a good example of where we're trying to drive change.*
> – FBO partner (FioFood)

> *The same when we're involving MPs. To be able to talk about the lived experience and bring that to life, have a third party do that rather than us is super powerful. We can then complement that with the challenges we face in reality when customers shop in the store. So it's been a very nice way to talk about the challenges and then start to work through. We need to think differently about the solutions. Doing the same isn't going to help drive people towards more sustainable baskets.*
> – FBO partner (FioFood)

In another case, a Cultured Meat business partner leading the cultivated meat production reflected on the benefit of engaging with the programme. The partner valued taking part in the project's focus group activities and conversations with farmers to gather wider views on cultured meat. The business would not otherwise have been part of this dialogue, which has provided a better view of reality on the ground and influenced some of its strategic decisions. The cultured meat technology is currently at TRL7 and is anticipated to progress to TRL9 next year.

A4.5.3 Conclusions

Experience from the TUKFS projects suggests that the programme is driving interventions in business practices to make processes more sustainable and resilient to supply chain disruptions. Projects such as H3 and FixOurFood are leading the way on the transition to sustainable farming practices, namely in their efforts to generate the evidence base on the benefits and barriers to adopting regenerative agriculture practices in the UK. The projects have produced publications on the subject and are engaging directly with farmers. The H3 project is also successfully demonstrating the benefits of hydroponic horticulture, and the UK Sustainable King Prawn project is making tangible progress towards demonstrating the potential benefits (both commercial and environmental) of terrestrial shrimp farming.

There is evidence to suggest that the programme has enabled partnerships between academics and businesses to investigate the potential impacts of dietary changes, which could also help businesses to evolve their business models. There is also evidence to suggest that these partnerships have influenced the way that businesses think when it comes to their own strategies and engaging with policymakers.

[28] Link to the written submission: https://committees.parliament.uk/writtenevidence/130616/pdf/

A4.5.4 Future outcomes

The projects are expected to continue trialling these emerging processes and building the evidence base to support wider changes towards sustainable farming practices. Some project partners suggested that there was some apprehension about embracing this change, but that, if proven successful on trial plots, farmers beyond the projects were likely to take up the practices through peer to peer farmer learning. Publications and other dissemination activities resulting from these studies are expected to continue contributing to the evidence base on regenerative agriculture and hydroponic horticulture.

Research and trials on the optimisation of recirculating aquaculture systems are expected to continue in the short term. However, it will take some time for the practice to be taken up more widely, and any positive impacts on health and sustainability are only likely to materialise in the longer term.

The RCT study is still ongoing, and it is therefore too early to tell what the impact of the study could be. However, as indicated, these sorts of studies can foster and strengthen further academic business partnerships.

A4.6 CS5: Transforming public distribution channels to be healthier and more sustainable

This case study focuses on contributions made towards influencing policymakers to introduce or transform public procurement or other distribution channels to offer healthier and more environmentally friendly products and meals for all. It aims to explore the degree to which the TUKFS programme has contributed, through the lens of influencing policy and policymakers, to: introducing and increasing the number of healthy and environmentally friendly meals distributed in schools, hospitals, etc. (e.g. FixOurFood); supporting the development of local food systems to give more people access to healthy food (e.g. by working directly with local authorities); designing novel framework agreements and procurement policies in local areas; and designing policies that support or enable social enterprises to distribute their products and services.

A4.6.1 Context

Funded projects are expected to encourage new policy frameworks that make it easier for people to access affordable, attractive, healthy and sustainable diets. Most of the projects will engage with policymakers at local or regional level (rather than national), with the expectation that knowledge generated will be transferrable to other areas or regions, or may be scaled up. The intended outcome of this work is that policymakers (at local and national level) are made aware of and use TUKFS programme research outputs, and begin to adopt a food systems approach to policymaking. The intended long term impact will be to stimulate evidence based policymaking that supports resilient and sustainable food systems, and an affordable healthy diet for all consumers, including lower income communities.

The case study projects were selected as they exemplify how the TUKFS programme is testing interventions in how food is distributed to consumers. Table A4.7. gives an overview of the distribution channels with which the projects have engaged.

Table A4.7 Description of projects

Project	Location/level	Procurement channel	Intervention
Mandala	**City:** Birmingham City Council	City level food procurement Hospitals	Conducting evaluations of local government interventions Co-producing city wide food policy
FixOurFood	**Local authority**: North Yorkshire Council and Leeds City Council	School food	Data gathering across 24 schools on the foods eaten by pupils
BeanMeals	**Local authority:** Leicester City Council and Leicestershire County Council (LCC)	School food	Working with schools to introduce healthy ingredients Working with local authorities to establish a shared demand for food system changes
SNEAK	**University:** University of Bristol	University canteen food Hospitals	Changing menus to lead to changes in food choices

A4.6.2 Findings

The sub sections below explore how projects are working via public procurement channels to test food systems interventions, gather evidence and explore the best levers for change in this space.

A4.6.2.1 Public procurement as a 'test bed' for influencing the food system

The projects explored in this case study are testing a range of interventions in various public procurement settings, as shown in Table A4.7. These settings have provided the projects with:

- established and 'captive' audiences for research;
- the ability to influence supply chains and suppliers;
- the ability to provide a large number of consumers with healthier and more sustainable food;
- a trusted interface with consumers.

This case study focuses on schools, university catering, hospitals and local food systems. The interventions are described in turn below.

Schools

The BeanMeals project is working in schools to prove that it is possible to make 'changes to the culture' of school food. As described by the principal investigator, working in schools is an opportunity to work 'not just with the cooks, but the governors, the headteacher, the local authority, with their supply chains and, obviously, the children and their families'. The project's work in schools has led to changes to menu design across the county. The fact that the county council the same supplier to distribute school food across all schools helped deliver the project. As described by a member of LCC's public health team, '*the messages learned from the project have flowed through into what the children are eating in their canteens*'.

FixOurFood has held 24 school observation days, which involve giving presentations to the school assembly, speaking to the catering staff, and taking photographs of meals before and after lunch. Reports are produced and presented to the school governance board, and these will be collated into another report later in the project.

University catering

SNEAK operates in the University of Bristol halls of residence canteens. As a result of calculating and analysing the nutrition of dishes available, university caterers were able to identify dishes that were particularly unhealthy (with a particular focus on salt). As a result, they have replaced some items on their menus with healthier alternatives. The project – which aims to prove the concept of menu swapping to improve nutrition – has led to changes in the canteens' menu cycle. As the head caterer said:

> *They showed us that […], putting unhealthy foods in competition with each other […] the happiness [of consumers] didn't go down. We'd already begun to have quite a big influence on how the menu was balanced and that will continue onwards. Certainly, the way that we look at our menus has entirely changed over the last sort of couple of years working with the team*. – Head caterer

Hospitals

Both SNEAK and Mandala have begun working with local hospitals in Bristol and Birmingham, respectively. Both projects are aiming to change the menus in hospitals so that

they are more locally sourced, healthier (with a particular focus on reducing salt and fats), and include more plant based options.

Mandala is currently working with a children's hospital in Birmingham to devise a new contract with a large international caterer. Early in 2024, they facilitated a workshop with the main team of chefs from the hospital and a number of chefs from other organisations, including NGOs. The aim was to share ideas and skills, and work out how menus might be changed to make them healthier, more sustainable, and more plant based.

Local food systems

Mandala is working with Birmingham City Council to monitor and evaluate a project in a large, council owned wholesale market, where a local NGO has set up a network to redistribute surplus food to other NGOs providing food banks or food pantries around the city. Although the project is in its early stages, learnings from it are expected to support the NGO's business case and help build resilience. Furthermore, Mandala is commissioning work to do some economic modelling of the market, to improve the viability of its business model.

A4.6.2.2 Gathering evidence

Working with food distribution channels has provided the TUKFS programme with: a large sample of consumers for conducting research on how menu changes lead to changes in the food that consumers choose (SNEAK); evaluations of local government interventions in the food system (Mandala); direct, co-designed interventions to introduce new, healthier foods to school menus (BeanMeals); and primary data on the food eaten in schools (FixOurFood). Across all of the projects, this represents a large body of evidence on the following.

- How procurement and distribution are connected. The focus of the BeanMeals project is on 'uncovering' or 'demystifying' the 'missing middle' of the food system, and it is working to analyse and describe the links between procurement processes and production. It is also evaluating the level of demand for legumes in the public sector to present a case for improved supply.
- Consumer views on different food and food choices. SNEAK, FixOurFood and Mandala are all collecting data on consumer choices in universities, schools and hospitals, respectively.
- How local authorities can be used to leverage change. All projects have engaged with procurement departments to understand the barriers to and enablers of changes to procurement processes and catering contracts.

A4.6.2.3 Learnings from work with food distributors

The projects have produced learnings on what needs to be considered when working with various food distributors.

- A range of stakeholders and actors are involved in distribution. Making changes to distribution requires buy in from suppliers, catering staff, governors, consumers and the wider food procurement team(s).
- There are limitations resulting from restricted procurement budgets. A key finding was that increasingly stretched budgets, particularly in schools and hospitals, have limited the scope for interventions in procurement.

A4.6.3 Conclusions

TUKFS projects have introduced interventions that aim to understand and influence the distribution of food, particularly through public procurement. There is emerging evidence around the key actors that can drive change, and the development of methods to create that change. These methods include engaging a wide range of stakeholders and facilitating conversations to identify potential challenges and enablers in effecting change. TUKFS interventions have also led to some on the ground changes to menus in university canteens and hospitals.

A4.6.4 Future outcomes

There is not yet enough evidence to attribute impacts to the programme, but projects are aiming to:

- influence positive changes in diet (improvements to menus in schools and hospitals should lead to an improvement in the diets of children and patients);
- improve education about healthy food (projects have made or intend to make changes to how various actors understand the food system).

A4.7 CS6: Food system approaches to implement new policy frameworks/strategies at different levels (national, regional and local)

This case study focuses on TUKFS projects that have contributed to policy changes at one or more geographical levels: national, regional and/or local. The projects[29] included in the case study are FixOurFood, Mandala, H3, TRADE, and Realigning UK Food Production and Trade for Transition to Healthy and Sustainable Diets.

A4.7.1 Context

The TUKFS programme aims to encourage policymakers to develop new policies that will catalyse healthier and more sustainable food environments. TUKFS projects are achieving this by working with policymakers and getting them to think about and subsequently create new agri food policies.

In the first year of its operation, TUKFS director's budget funded a paper to map 'policy levers' for food system transformation, classifying levers in nine broad categories. The paper explains that policy levers encompass both legislative and voluntary initiatives targeting specific outcomes in the food system. It emphasises the interconnected nature of the food system and the need for various policy levers to achieve multiple goals effectively, as well as the importance of understanding how these levers interact to effect transformative change. All TUKFS projects had access to and were encouraged to read this paper[30].

Understanding the distinctions between local, regional and national levels of governance is critical for analysing how policies and initiatives are developed and implemented.

- **Local/city:** The level of government closest to citizens, where councils or municipalities manage essential community services such as education, housing and social care. It directly addresses local needs by enacting policies and managing resources tailored to specific regions (e.g. evaluating potential city wide interventions and actioning local food strategies)[31].
- **Regional:** The level of government that coordinates and manages policies across a broader area than local government. It handles issues spanning multiple local jurisdictions, including regional economic development, transportation and environmental management[32].
- **National**: This level of government encompasses the central authority in charge of developing and enforcing policies and laws that affect the entire country, addressing national issues such as economic policy, defence and international relations. It also ensures uniform implementation across all regions and localities.

These levels interact in a multi level governance system, sharing responsibilities and sometimes overlapping. Effective policy implementation frequently requires cross level collaboration to address complex issues, which is evident in the TUKFS projects profiled in the following table[33].

[29] These are not the only ones working on similar issues. For more information on the selection of projects for the case studies, please see Annex 1: Methodology.

[30] Food Systems Transformation: What's in the policy toolbox (PDF)

[31] https://www.local.gov.uk/about/what-local-government

[32] https://www.oecd.org/en/publications/regional-governance-in-oecd-countries_4d7c6483-en.html

[33] https://www.oecd-ilibrary.org/docserver/9789264091375-11-en.pdf?expires=1724076089&id=id&accname=guest

Table A4.8 Project summaries

Project	Project background/policy change	Policy change levels and mechanisms	Timeframe for interventions
FixOurFood	Explores and tries to influence existing policies that affect Yorkshire's food system, focusing on those influencing and shaping school food, hybrid economies and farming.	**City level:** Involved in 3 city level food action plans (Sheffield City Council Food Strategy, Bradford Food Partnership and Leeds City Council Food Strategy). **Regional level:** Actively involved in developing the North Yorkshire Food Strategy. **National level**: Engagement with the Department for Environment Food and Rural Affairs (Defra).	**City level:** 2 city level food action plans are in place already (Leeds City Council Food Strategy 2022-2030 and Sheffield City Council Food Strategy 2024-2029 are being actively implemented). **Regional level:** A regional strategy is being developed and will be published in autumn 2024. **National level:** The national modelling timeline is uncertain.
Mandala	Informs Birmingham City Council's food strategy, generating a vision that links local and national policy, and that can deliver sustainable, healthy and affordable food for all, in an economically viable food system.	**City level:** Currently working closely with Birmingham City Council and helped develop the Birmingham Food System Strategy 2022-2030, in consultation with a wide range of citizens, food businesses and other organisations. Implemented interventions in Birmingham, one of which focuses on promoting healthier food options by expanding a social enterprise in Balsall Heath to offer affordable, sustainable and vegetarian meals through a takeaway service.	**City level:** The Birmingham City Food Strategy is already in place (2022-2030). The project is still in the modelling phase (WP5 – Modelling impacts). However, Birmingham City Council's dissolution has reduced the resources available, causing timeline uncertainty and potential delays as new arrangements are made. The timeline for these interventions began in June 2023.
H3	Brings together world class researchers from Sheffield, Leeds, Bristol, Cambridge and City universities to demonstrate the potential for transformational change at different scales.	**City level:** Written policy briefs to support Sheffield's food plan. **National level:** Contributing to written evidence submitted to government enquiries at TUKFS programme level and collaboration on a Synergy Fund project.	**City level:** The policy project on public procurement in Sheffield only started in May 2024. **City and national levels:** H3 is about to launch a series of policy and practice briefs. The first one is nearly ready, and is based on a synergy project examining local food partnerships, and how their experience could be shared and scaled up through the national organisation Sustainable Food Places.
TRADE	Informs the Scottish Parliament, modelling the livestock system and developing transformation pathways with the potential to shape policy and regulations on animal production and consumption in the UK.	**National level:** Interacted with Members of the Scottish Parliament and Scottish Parliament Information Centre (SPICe). Collaborated on a Synergy Fund project.	**National level:** As modelling is taking longer than expected, quite a lot will be delivered after the project is finished in May 2025.
Transition to HSDs	Develops a comprehensive set of policy interventions (including fiscal and trade) to support a transition to healthy and sustainable diets in the UK.	**National level:** Designing new policies to make UK dietary guidelines consider sustainability.	**National level:** The project has only been running for one year, so this outcome has not yet materialised. The timeline for deliverables is uncertain, but the project finishes in July 2025.

&checksum=E8FF49DAD57FC667B88AFC22278CE026#:~:text=A%20multi%2Dlevel%20governance%20framework%20provides%20a%20starting%20point%20for,Hooghe%20and%20Marks%2C%202003)

A4.7.2 Findings

This sub section explores the projects contributions towards changing policy at city, regional and national levels. It describes the activities, outputs and early outcomes achieved already as well as some of the challenges encountered.

A4.7.2.1 City level policy interventions

Collaboration with local government and stakeholders

Three projects take a systems based approach to addressing complex food challenges, considering the interconnected aspects of food production, distribution and consumption. FixOurFood incorporates this viewpoint into its workshops and policy development across multiple councils, encouraging a comprehensive understanding of food system governance. The project collaborated with Sheffield City Council and over 64 stakeholder groups, including additional under represented stakeholders. The project's strategies include local food action plans, prioritising local food procurement (particularly in schools), and reducing food waste. Working at city level and collaborating with the Food Foundation has enabled FixOurFood to discuss findings with the Mandala project, which has learned about governance and structures through its work with Birmingham City Council. In addition, the project's PI regularly attends Council steering committee meetings that are relevant to the food strategy. This long term engagement has not only facilitated reflection and learning, it has also fostered a deeper understanding of policymaking processes and enabled insights from various projects to be integrated:

> *We have basically been right through the process to date with them and now they're looking at various elements of decision making and governance, and how actually applying the policies can work… they've maintained their enthusiasm for working with [Fix Our Food].* – PI

Mandala's work in Birmingham includes mapping actions across the food system and assessing various policy options for improving school meal access in primary schools. The project involved engaging stakeholders, including working with a supermarket chain in Birmingham to increase Healthy Start enrolment through in store initiatives; provide hands on help with online sign up through in store community champions; and provide top up vouchers every time a Healthy Start voucher is used. This initiative aims to boost participation in the Healthy Start programme and demonstrates how private sector involvement can directly contribute to public health goals. Meanwhile, H3 is addressing the entire food system, from production to consumption. The project is working to incorporate biofortified and nutrient enhanced foods, add higher fibre products to school meals, and encourage food manufacturers to reformulate products, ensuring that interventions are comprehensive and interconnected.

Policy influence and development

FixOurFood has used systems thinking approach to create and monitor food action plans in cities in Yorkshire:

> *[…] there's also some of that sort of influence that's happened that people have started to think far more in a systems fashion, which is a really important thing from our perspective […]* – Project coordinator

Mandala's evaluations directly influenced Birmingham's eight year Food System Strategy (2022-2030), which has shaped policies aimed at creating a sustainable and thriving local food environment. H3 contributed to city food plans by developing policy briefs for the West Midlands Combined Authority and other local authorities, including influencing decisions in Leeds and Sheffield.

Ongoing monitoring and evaluation

FixOurFood is monitoring and evaluating food strategies and action plans across Yorkshire. Mandala is evaluating policy options for school meals in Birmingham to ensure that their strategies are effective and evidence based. H3 is evaluating consumer acceptance of new food products and interventions, providing data driven insights that guide ongoing policy development. H3 is also investigating the acceptability and affordability of biofortified products among consumers, as well as the effectiveness of cooking skill interventions.

Throughout the project, Mandala has shared data sources and evidence with Birmingham City Council and created a database mapping proposed actions across the food system:

> *[…] looking at some of the research and evidence and policy things that are happening out there… that's been really useful is [the project team] have been doing a huge amount of mapping just about the food system as a whole, and what types of food businesses. That [type of work] we will never ever have capacity for […]* – Project partner

Outcomes and achievements

The FixOurFood and Mandala projects contributed to developing and implementing comprehensive local food strategies. FixOurFood helped develop the Leeds Food Strategy (2022-2030), Sheffield City Council Food strategy in 2023 and subsequently ShefFood's Local Action Plan (2023-2030). Sheffield's plan, developed in collaboration with approximately 100 organisations, is consistent with the city's 'Fairer, Healthier, Greener' Food Strategy, launched in March 2023. Mandala has also played a key role in developing Birmingham's Food System Strategy (2022-2030) – an eight year plan to create a sustainable, healthy food system in Birmingham. All of the projects were central to their respective cities' visions for transforming local food systems.

FixOurFood incorporated academic research into policy development through the participation of PhD students. For example, one PhD student worked on the Bradford Food Partnership, while another contributed to Leeds City Council's Food Strategy. This integration of academic research helps to bridge the gap between theory and practice, giving students valuable insights and experience.

Challenges

The Mandala project faced several significant challenges while developing and implementing the Birmingham's Food System Strategy. There were internal disagreements about certain aspects of the strategy, which made it difficult to achieve consensus and make progress:

> *The council have already decided what they wanted to do with the food strategy. They've chosen to have a strategy which involves lots of little things, which Mandala think won't make much impact. But the frustration is that we don't think that any of these things individually are going to shift the dial in terms of transforming the food system. The things that got taken out were really low hanging fruit and it comes down to political expediency.* – PI

Furthermore, Mandala's financial resources were impacted by Birmingham City Council's declaration of bankruptcy, which resulted in the withdrawal of funds that had been previously committed for specific interventions. Engaging with commercial stakeholders also proved difficult, impeding efforts to make full use of private sector support and collaboration:

> *Essentially, the people who most enthusiastically got engaged with […] how we should change the food system were all the NGOs. So, […] the end of that was […] a strategy […] that was driven by NGOs and […] kind of failed to engage all the commercial stakeholders […].* – PI

Future interventions and impacts

The H3 project is preparing to release a series of policy and practice briefs to advance food system interventions. The first will focus on findings from the synergy project, which investigates local food partnerships and how their successes can be scaled up through the national organisation Sustainable Food Places. Subsequent briefs are expected to cover topics such as UK horticulture and regenerative agriculture, adding to the wider discussion about sustainable food practices and policy development.

The H3 team recently secured £50,000 grant for public procurement project in Sheffield, which began on 1 May 2024. In collaboration with Manchester's Centre for Local Economic Strategies, this initiative will involve assessing and improving procurement strategies for five or six organisations. The goal will be to make procurement more local and sustainable, and healthier, possibly by connecting these organisations with SMEs in Sheffield to supply food to schools, hospitals, universities and care homes. This project demonstrates a commitment to improving local food supply chains and promoting sustainable procurement practices.

H3 is also developing new risk metrics to internalise the environmental and social costs of food production into food procurement models. This includes developing a multi criterion decision making methodology, and conducting a meta analysis of risk based metrics for the socio environmental effects of food and beverage products consumed in the UK. The project will create a decision support tool that ranks supply locations according to exogenous risks, allowing policymakers to make more informed decisions about sustainable food sourcing and supply chain management.

A4.7.2.2 Regional level policy interventions

FixOurFood is the only project investigated in this case study that has a regional scope. It made a significant contribution to policy development in North Yorkshire. This process has required extensive involvement from the project team and is still evolving, with the focus now shifting to policy implementation support. Motivated by public health goals, the work has also involved national parks, environmental agencies, and various business and public sectors.

FixOurFood has also helped the York and Humber Climate Commission and the York and North Yorkshire Local Enterprise Partnership (LEP) to develop a food strategy, which is still a work in progress. The project contributed to the LEP's carbon negative roadmap, demonstrating a commitment to integrating sustainable food practices into larger regional climate and economic strategies.

FixOurFood plans to expand its impact through various stakeholder engagement and dissemination activities. These include using postcards sent to MPs, submitting evidence to Select Committees and implementing new governance mechanisms, such as Grow Yorkshire and Anchor Institutions. The project is also focusing on creating new PhD studentships and forming a Young Leaders for Change network. Furthermore, the project's findings and recommendations will be disseminated through publications and podcasts, reaching a larger audience.

A4.7.2.3 National level policy interventions

The H3 project is helping to shape national policy by developing a multi criterion decision support tool that ranks supply locations based on exogenous risks. This tool aims to help policymakers make informed decisions about sustainable food sourcing. In addition, H3 is working on a Synergy Fund project to map civil society organisations that influence UK food policy, and to improve research output communication with policymakers, food business operators and the general public.

The FixOurFood team created the FixOurFood Agrifood Calculator, an interactive tool designed to analyse the effects of food system interventions on environmental and land use metrics. This project is open source, allowing public access to the code and contributions from the community.

The TRADE project aims to create an agent based model to assess various animal level interventions in the livestock industry. This includes consulting with industry stakeholders to determine the viability of technologies, their adoption challenges, and their impact on productivity and emissions. The project also includes a Delphi study to help the breeding community reach a consensus on technology use and investment priorities.

The Realigning UK Food Production and Trade for Transition to Healthy and Sustainable Diets project is investigating the policy changes needed to support the transition to healthy and sustainable diets consistent with UK dietary guidelines. The project uses the FAPRI-UK[34] model to model the effects of changing consumption on food production and trade. Its goal is to inform policymakers about the implications of production adjustments, trade measures and free trade agreements for promoting a sustainable food system.

The TRADE project focuses on identifying key barriers to transformation in the livestock industry. Through participatory workshops and surveys, the project created tools to engage stakeholders and understand the industry's complex challenges. Early interactions with policymakers, including discussions with the Scottish Parliament's SPICe committee, demonstrated the project's efforts to connect research and policy.

Outcomes and achievements

Across the projects, significant progress has been made in publishing research that informs and influences national food policy. The H3 project has made a significant contribution with its publication *Sustainable soil management in the United Kingdom: A survey of current practices and how they relate to the principles of regenerative agriculture*, which highlights the various interpretations of sustainable soil management among UK farmers[35]. This study emphasises the importance of future policy and research to account for these diverse practices. Similarly, FixOurFood has created impactful publications on various aspects of food system transformation. Key publications include *Transformations to regenerative food systems: An outline of the FixOurFood project*; *UK government food strategy lacks ambition to achieve transformative food system change*; *Building back normal?*; *An investigation of practice changes in the charitable and on the go food provision sectors during COVID-19*; and a piece in *The Conversation* on the COP 26 global methane pledge[36,37,38,39,40]. TRADE is actively involved in communication and dissemination activities, such as creating infographics and attending events such as Glastonbury Festival, to increase the impact of its findings.

H3 researchers have actively contributed to national policy discussions, as evidenced by their Researchfish data on policy influencing activities. Their involvement includes 11 positions on guidance/advisory committees, 5 contributions to new or improved professional practices, and 11 contributions to national consultations or reviews.

[34] The FAPRI-UK modelling system captures the dynamic interrelationships among the variables affecting supply and demand in the main agricultural sectors of England, Wales, Scotland and Northern Ireland. It was created and is maintained by personnel in Queens University Belfast Agri Food and Biosciences Institute.
[35] https://bsssjournals.onlinelibrary.wiley.com/doi/full/10.1111/sum.12908
[36] https://pubmed.ncbi.nlm.nih.gov/36045085/
[37] https://eprints.whiterose.ac.uk/190037/3/NATFOOD_22060559A_Correspondence%20%28revised%2023%20June%202022%29.pdf
[38] https://www.tandfonline.com/doi/full/10.1080/15487733.2022.2076352
[39] https://theconversation.com/cop26-a-global-methane-pledge-is-great-but-only-if-it-doesnt-distract-us-from-co-cuts-171069

Realigning UK Food Production and Trade for Transition to Healthy and Sustainable Diets has made significant policy changes by submitting written submissions to the UK Parliament. The project's reports are cited by NGOs and government agencies, demonstrating its impact on national policy. Increased clicks on and reads of the project's reports also indicate a growing interest in the research and its policy implications.

Challenges

The TRADE project faces significant challenges in translating qualitative findings into quantitative models, especially when dealing with animal improvement trajectories derived from the Delphi study. While the study offers useful insights, modelling these qualitative estimates (such as radio technology advancements and feed conversion efficiency) has proved difficult. This challenge highlights the larger issue of integrating qualitative research into rigorous quantitative frameworks, which is a common challenge in interdisciplinary research.

Another issue facing the TRADE project is unexpected difficulties in its modelling work. These have extended the project's duration, with many deliverables only expected to be completed after the original grant deadline. The project has also experienced some team changes, with one key team member moving to the private sector in the Netherlands, which has affected the project's progress.

Future interventions and impacts

The H3 project aims to have a long term impact by promoting evidence based policymaking that ensures resilient and sustainable food supply chains. It has a particular emphasis on providing an affordable, healthy diet for all consumers, including low income communities. The project is creating a new set of risk metrics to internalise the environmental and social costs of food production into food procurement. These metrics will be incorporated into a multi criteria decision making methodology, including a meta analysis of the socio environmental impacts of food and beverage products consumed in the UK. The result will be a decision support tool for policymakers, enabling them to rank supply locations based on exogenous risks:

> *In H3, we will provide one of the first datasets on the real impacts of a transition towards regenerative agriculture in English farms from two landscapes on food production, inputs and sustainability (including soil health, biodiversity and greenhouse gas emissions). There is a lot of interest in our data, and we expect our approach to understanding this transition from ecological, agronomic and social science perspectives to shape policy in all devolved UK governments in the future.* – Survey participant

The TRADE project aims to demonstrate value for money by boosting productivity, lowering emissions and potentially improving nutritional outcomes. By modelling these factors, the project hopes to better understand the trade offs and benefits of various interventions in the food production system.

Realigning UK Food Production and Trade for Transition to Healthy and Sustainable Diets is preparing to deliver a key report from its third work package (WP3) to identify critical issues in the food system and propose regulatory solutions. This report, which is part of a larger set of recommendations from all work packages, seeks to convey a consistent message to policymakers. The team is actively looking for opportunities to engage with relevant stakeholders (particularly those within Defra), and there is potential for additional engagement at COP 29 under the consortium's umbrella.

A4.7.3 Conclusions

The TUKFS programme demonstrates that methods focusing on the introduction of new policy frameworks, strategies or narratives at local, regional and national levels can lead to transformation that:

- enhances local food systems;
- bridges academic research and policy development;
- influences national policy through research and advocacy.

A4.7.4 Future outcomes

These projects highlight the value of collaboration among academia, local governments and national policymakers in developing resilient, sustainable and equitable food systems. Their ongoing work, which includes published research as well as direct development of new risk metrics and multi criterion decision support tools, aims to have a greater impact on policy and practice, ensuring that UK food systems continue to evolve in response to new challenges and opportunities.

A4.8 CS7: Citizens are empowered to have more agency over their diet

The case study explores the extent to which the TUKFS programme has contributed to empowering citizens and communities to have more information, access and agency to choose healthier and environmentally friendly products. The case study includes examples from five TUKFS projects including FoodSEqual, FixOurFood, FioFood, Raising the Pulse and SusHealth.

A4.8.1 Context

Changes in public policy and business practice are expected to help create healthier and more sustainable food environments. This case study examines how TUKFS contributes to this shift by empowering citizens and communities to choose healthier and more environmentally friendly products, through improving food environments and increasing public awareness. TUKFS projects can help achieve this aim by introducing interventions and innovation aimed at improving access to such products, improving public awareness of healthy and sustainable food, including citizen voices in decision making and amplifying citizen voices to advocate for positive change.

The case study first explores how interventions have improved access to healthy and sustainable food. It also considers the more immediate term outcomes associated with improved access, including improved wellbeing, increased community connectivity and a willingness to experiment with new healthy foods.

The case study also assesses how educational activities that are offered alongside an access intervention can change citizen behaviours linked to the intervention and broader food related behaviours. It also considers how information based activities and creative forms of engagement can encourage citizens to choose healthier and more sustainable food. Further to this the case study explores how engaging with students and the broader public through engagement activities and events can help to disseminate information more broadly.

Finally, the case study explores how citizen perspectives help to shape the design of interventions and development of products. It also considers how projects have amplified citizen voices within different stakeholder groups which can lead to greater awareness within business and policy spheres of the importance of lived experience contributions. Table A4.9 gives an overview of the distribution channels with which the projects have engaged.

Table A4.9 Project summaries

Project name	Activities
FoodSEqual	■ FreshStreet Intervention providing vouchers to local residents for fresh fruit and vegetables. ■ Educational activities and community events alongside intervention.
FixOurFood	■ Introducing microgreens at a food bank. ■ Conducting research with students on Free School Meals. ■ Creating Planet Pizza game about carbon in food ■ Working on a food system thinking module for students
FioFood	■ Running Patient Public Involvement workshops and other activities to engage with people with lived experiences of obesity. ■ Helping to shape Sainsbury's communication and intervention strategies.

Project name	Activities
Raising the Pulse	■ Halls of residence intervention to increase pulse consumption within a student population. ■ Educational activities for students alongside the intervention
SusHealth	■ Creating a combined nutrition and environmental score and label for menus ■ Testing the impact of the label on consumption within living lab experiment settings.

A4.8.2 Findings

The activities conducted by the selected TUKFS projects contribute to empowering citizens to have more agency over their diets. Projects do this by improving **access** to such products, improving public **awareness** of healthy and sustainable food and **including** citizen voices in decision making and **amplifying** citizen voices to advocate for positive change.

A4.8.2.1 Access

TUKFS projects may have contributed to empowering citizens through expanding access to healthy and sustainable food. TUKFS projects have introduced interventions or conducted activities that improve access to healthy and sustainable foods, such as fresh fruit and vegetables and pulses. These interventions have reduced economic barriers, changed the food environment, altered menus and improved products.

FoodSEqual has improved access to fruit and vegetables via the Fresh Street intervention, which is being trialled in Plymouth and Reading. Fresh Street provides households along selected streets with vouchers to buy fresh fruit and vegetables. In Reading the vouchers can be redeemed at a pop up fruit and vegetable market in a local community hub and in Plymouth residents collect fruit and vegetable boxes from a local pick up point in a community centre. The intervention tackles financial and physical barriers to accessing fruit and vegetables through providing a voucher [reduction in economic barrier] and setting up local provision [food environment change]. The intervention area in Reading is a "*food desert*" (partner interview) so the establishment of a weekly fruit and vegetable stall helps to improve access. Another academic partner explained that some residents "*are really relying on the vouchers now, particularly the cost of living increase as well, to you know that that makes a difference between that whether they can eat or try something new or just eat more fruit and veg*". Early findings suggest that the most important enabler of intervention uptake is the direct financial support (academic partner interview). The provision of vouchers may help to overcome financial barriers that prevent residents from accessing certain fruit and vegetables.

Raising the Pulse (RtP) has improved access to high pulse foods through an intervention introduced in a catered student hall of residence. During a hall of residence study the students were served three weeks of meals with a low pulse offering, three weeks on a high pulse offering (without the students knowing), and three weeks on a high pulse offering (with the students knowing) [menu alterations]. As part of the intervention white bread was replaced with a pulse enriched bread developed in earlier WPs [product development]. FixOurFood also directly influenced supply of fresh produce by providing microgreens and leafy greens to supply to the local community via Spark York and to a local foodbank [food environment change]. At the foodbank these greens helped to supplement ambient goods such as tins and pasta. The vertical farm Grow it York produced the leafy greens locally.

There is emerging evidence that the TUKFS interventions have enabled citizens to experiment with and enjoy new healthy foods, changed purchasing practices, improved citizen wellbeing, and boosted community connectivity. The RtP project received positive feedback from students, with many students not noticing the difference between white bread and pulse-enriched bread (partner interview). Further to this, the FoodSEqual team shared several anecdotes that demonstrate how citizens have been able to experiment with and enjoy a wider variety of fruit and vegetables. Residents have felt more able to try unfamiliar produce (a mum tried avocado for the first time as her children had always wanted to try it), children have been allowed to choose their own produce (a child holding up a dragon fruit asking to try it), and residents have requested certain fruit and vegetables (a church group requesting bitter melon) (academic partner interview). Early findings show that residents are using the stall to buy "*treats*" including more expensive fruits such as berries (academic partner interview). Another academic partner explained that residents have also been sharing food and vouchers and cooking together. This anecdotal evidence shows that the FreshStreet intervention has enabled individuals to change their purchasing practices in a manner that supports the consumption and enjoyment of fresh fruit and vegetables.

The FoodSEqual project team is measuring dietary data and biomarker data as well as collecting qualitative data to understand the impact of the intervention. At this stage it is too early to understand the impact of the intervention on health indicators via the biomarker data. However, there are early qualitative indications that the invention is having a positive impact on residents, an academic partner said "*we're getting comments coming back saying people feel healthier, their skin is better, so at a personal well being level there is definitely an improvement*". There are also broader outcomes beyond food linked to the community led approach taken by FoodSEqual. The academic partner explained that the intervention also helps to improve social connectivity and signposting to other services.

A4.8.2.2 Awareness

TUKFS projects may have contributed to empowering citizens through increasing awareness of healthy and sustainable diets. TUKFS projects have facilitated education and awareness activities alongside interventions, developed information labels, produced creative outputs for public engagement, engaged with student groups and taken part in public dissemination events to increase citizen awareness of healthy and sustainable diets.

Intervention and education

TUKFS projects have combined education and information activities with interventions that improve access to healthy and sustainable food. For example, as part of the Fresh Street intervention FoodSEqual undertook a series of activities that sought to boost awareness and skills within the intervention population, such as cooking lessons and demonstrations, workshops on how to peel fruit and vegetables and recipe sharing (partner interview). The intervention and activities are ongoing, making it too early to determine their impact. However, initial indications show that the activities contribute to community connectivity and shared learning. FixOurFood have also been involved in recipe sharing to support the consumption of the leafy greens provided to the foodbank by giving out a cookbook on how to use microgreens alongside ambient goods, such as tins and pasta.

RtP used multiple methods to inform students involved in the halls of residence intervention about the benefits of eating pulses, including quizzes, peer to peer learning, and information stalls. RtP are planning to assess whether students involved in the halls of residence intervention tolerated or enjoyed the change in menus that provided a pulse enriched diet. The aim is to explore whether the information provided to students around the benefits of pulses led to any change in attitude towards the menu alterations (partner interview). The education and information activities introduced alongside the intervention may help to

change citizen behaviour linked to intervention uptake and engagement as well as broader citizen attitudes towards healthy and sustainable food.

Information Labels

SusHealth have co-created the SusHealth index which provides a combined nutrition and sustainability score. The score will provide citizens with more information on selected menus to support decision making with respect to health and sustainability. The combined score has been tested with students in a Living Lab experiment in Fish City Restaurant across a series of seven sessions. Each meal at the restaurant was rated A-E based on the combined score. Participants either received a normal menu, a menu with SusHealth scores, or a menu with SusHealth scores and a discount (representing 20% VAT removal) for A & B rated meals. The preliminary findings showed that SusHealth labels increased A & B rated meal choices by 11% and the 20% discount further increased A & B meal choices by 18%. Both the information provided via the SusHealth label, and the fiscal incentive were effective, however the fiscal policy would be expensive to implement[41]. The evidence from the Living Lab shows that information provided by TUKFS projects to citizens may help to inform healthier and more sustainable food choices.

Creative forms of engagement

TUKFS projects have produced creative outputs such as videos and games that help engage the public on healthy and sustainable diets. FoodSEqual have used visual engagement methods such as videos and maps to raise awareness around healthy and sustainable diets and the FreshStreet intervention. FioFood have also produced visual engagement methods such as short videos and infographics to communicate with the public. The team have used software, such as Videoscribe, that can help to create "*cartoon style animations which are good to use when you're explaining things to lay audiences or study participants*" (academic partner interview).

FixOurFood and project partner Rethink Food created a classroom activity called 'Planet Pizza' which is "*an investigative resource designed to inspire and empower the next generation to make food choices that are good for people and the planet*"[42]. The game encourages children to create their own pizza whilst considering the carbon emissions linked to each ingredient. A prototype of the game was tested in seven schools in Yorkshire[43]. Subsequently, Rethink Food published the resources online, created a teacher tutorial and shared an online animation so that teachers or students can access the resources for free[44]. In a blog published by ReThink Food one of the academic partners said that Planet Pizza is a "*brilliant and accessible activity that will empower children to engage and think critically about the impact our food choices have on the planet*"[45]. The creative methods used by TUKFS projects are often accessible to a broad audience which may have helped to engage citizens.

Engaging student groups

A number of TUKFS projects have built awareness of healthy and sustainable diets within the student and university population. Table A4.10 shows that four of the projects included in this case study have been involved in engagement activities with undergraduate or

[4141] UKRI Transforming UK Food Systems - Evaluation Team Only Channel [all partners] - 16 April Methods and Results Presentation Living labs - fish city new.pdf - All Documents (sharepoint.com)

[42] Planet Pizza – Rethink Food – Food Education

[43] Planet Pizza - linking food with climate change - Fix Our Food

[44] Planet Pizza – Rethink Food – Food Education

[45] Planet Pizza, coming to a school near you! – Rethink Food – Food Education

postgraduate students. Between these four projects, the engagement activities recorded account for 81% of engagement activities with students listed by all TUKFS projects.

FixOurFood has engaged significantly with students (accounting for 48% of all TUKFS project engagement recorded via ResearchFish). FixOurFood has helped to introduce a new module at the University of York called 'Future of Food' and as part of this students are involved in mapping the food system using tools to identify synergies and estimate trade-offs. This is an interdisciplinary module where students collaborate with peers working across different disciplines to understand food systems[46]. The module may help to engage a broader range of students and may help feed into increased future food systems research capability and capacity (discussed in Case Study 1).

RtP and SusHealth work directly with students on interventions that support improved decision making in line with healthier and more sustainable diets. SusHealth has encouraged students to consider a combined environment and nutrition scores when selecting meals and RtP has encouraged increased pulse consumption.

Table A4.10 Engagement activities where the primary audience is undergraduate or postgraduate students completed by four[47] TUKFS case study projects

	FoodSEqual	FioFood	Raising the Pulse	FixOurFood	Total (4 listed projects)	% of total (across TUKFS)	Total (all TUKFS projects)
A formal working group, expert panel or dialogue		1	4		5	100%	5
A talk or presentation	6		1	15	22	92%	24
Participation in an activity, workshop or similar			2	3	5	45%	11
Participation in an open day or visit at my research institution				2	2	100%	2
Total	**6**	**1**	**7**	**20**	**34**	**81%**	**42**

Source: ResearchFish

Public dissemination events

Several TUKFS projects have been involved in public dissemination activities and events which may help to engage broader audiences on healthy and sustainable diets. FioFood contributed to the Challenge Poverty Week campaign in Aberdeen by hosting a PPI workshop with Aberdeenshire Council to discuss diet inequalities. Thirty one people attended the workshop and discussed challenges related to the cost of living crisis and barriers to purchasing healthy food. FioFood has engaged with the public through publishing regular newsletters and presenting at conferences. These activities have led to an increase in

[46] Future of food (ESA00001I) 2024-25 - Module catalogue, Student home, University of York

[47] SusHealth did not record any engagement activities with the students through ResearchFish

requests about participation or involvement in the project and reports from the audience that the activity led to a change in views, opinions or behaviours. FixOurFood engaged with members of the public at the Great Yorkshire Show using a demonstration version of a vertical farm as well as a virtual and augmented reality version. RtP have disseminated findings through Reading Community Festival in order to raise awareness about pulse consumption.

Table A4.11 Engagement activities where the primary audience is the public completed by four[48] TUKFS projects selected for this case study.

	FoodSEqual	FioFood	Raising the Pulse	FixOurFood	Total (4 projects)	% of total (all projects)	Total (all TUKFS projects)
A broadcast e.g. TV/radio/film/podcast (other than news/press)	9	2		13	24	77%	31
A formal working group, expert panel or dialogue					0	0%	1
A magazine, newsletter or online publication		6		1	7	88%	8
A press release, press conference or response to a media enquiry/interview	1	6	5	7	19	83%	23
A talk or presentation	1	4	2	22	29	88%	33
Engagement focused website, blog or social media channel	6	2		4	12	80%	15
Participation in an activity, workshop or similar	4	3	1	8	16	84%	19
Participation in an open day or visit at my research institution		1			1	100%	1
Grand Total	**21**	**24**	**8**	**55**	**108**	**82%**	**131**

Source: ResearchFish

A4.8.2.3 Inclusion and amplification

TUKFS projects have included and amplified citizen voices and perspectives of those with lived experiences among business and policy stakeholders. Within the business sphere, citizen perspectives have helped to shape the interventions and products. Citizen

[48] SusHealth did not record any engagement activities with the public through ResearchFish

perspectives have also helped to influence policy and inform local food system strategies. Citizens are empowered through inclusion in the research process and citizen voices are amplified via co-production and co-design methods (discussed in Case Study 8).

Working with FBOs

TUKFS projects have sought to understand and include the perspectives of citizens when designing **interventions** and strategies to promote healthy and sustainable dietary change alongside business stakeholders. For example, SusHealth have engaged citizens in the design of the SusHealth labels used to communicate a combined environmental and nutritional score. This included a pilot survey conducted with 20 individuals which asked participants a series of questions to assess which label design was preferred by participants. SusHealth is going to conduct a larger nationally representative survey which will ask participants a similar set of questions. FioFood also collected data via a survey on the perceived most and least helpful interventions for supermarkets to increase sustainable food and healthy food purchasing, according to people living with obesity[49]. FioFood have workshops

Citizens have also been involved in shaping the **communication strategies** around interventions. For example, the FioFood project hosted Patient and Public Involvement (PPI) where individuals with lived experience of obesity can share their experiences and perspectives of shopping in a retail environment. Individuals provided feedback on Sainsbury's "*communications and marketing materials of the real world interventions*" and Sainsbury's have used this feedback to inform future communication strategies (academic partner interview). Similarly, RtP engaged citizens in the design of communication strategies that will be used when the halls of residence intervention on pulses is extended to a campus wide intervention.

TUKFS projects have also included citizen perspectives when designing new **products** with business stakeholders. For example, RtP conducted focus groups with more than 50 consumers to understand motivations and preferences related to the consumption of pulses and pulse based products. RtP are also using focus groups and consumer studies to understand potentially desirable product attributes which will inform product innovation and development. This may help ensure that the product meets consumer expectations and matches consumer preferences.

TUKFS projects have also amplified citizen voices with business partners which may influence business **beliefs, attitudes and practices**. FioFood have amplified voices and perspectives of those with lived experience of obesity and low income within the retail sector. FioFood explained that they understand the impact of the project "*through the systems lens*" and one impact of the project is around "*beliefs and attitudes*" about reducing obesity and improving diets (academic partner interview). The project partner at Sainsbury's explained that conducting research that includes individuals with lived experience is "*a fairly new concept for us*" as insight work is generally based on typical Sainsbury's customers rather than specific groups. They explained generally people with low income and people living with obesity are groups "*that we would struggle to reach out to otherwise, on our own, so it's been extremely valuable in that sense*" (industry partner interview). The findings are being shared with the Sainsbury's insight team to expand impact across the business.

Working with policymakers

TUKFS projects have included and amplified citizen perspectives within the policy sphere. FixOurFood alongside the Food Foundation supported a group of secondary school children

49 https://www.abdn.ac.uk/rowett/documents/Policy%20Brief%20on%20supermarket%20interventions_FIO%20Food.pdf

as young researchers to undertake research in their schools on whether the allowance provided to children on Free School Meals (FSM) is enough for them to purchase sustainable and healthy food whilst at school[50]. The project was a result of conversations with the Food Foundation's Young Food Ambassadors who highlighted challenges linked to the FSM allowance, affordability and limited healthy options in schools. The project involved 42 students from ages 11 to 15 across 7 schools in Yorkshire. The study found that the allowance was not sufficient and provided a set of recommendations to the government. A study report was presented by the young researchers to the Parliament in 2023[51]. "*The collaborative initiative empowered young people to test the limits of the Free School Meal system*" and served as a catalyst for future dialogues on the FSM allowance[52]. FioFood have provided individuals with lived experience a pathway to influence policy. Sainsbury's highlighted the importance of being able to "*talk about the lived experience and bring that to life*" alongside the commercial perspective when talking with MPs and influencing policy (business partner interview).

A4.8.3 Conclusions

TUKFS projects introduced interventions that improve access to healthy and sustainable food, such as fresh fruit and vegetables and pulses. There is emerging anecdotal evidence that improving access leads to improved wellbeing, community connectivity and a willingness to experiment with new healthy foods. Further evidence is being collected on the impact of these interventions from a health outcomes perspective. The education activities provided in parallel to the fiscal and physical interventions can help to improve community connectivity and develop skills.

The information and education activities provided by TUKFS projects may have helped empower citizens to engage with food systems issues and make healthier and more sustainable food choices.

TUKFS projects have made citizen perspectives central to the design of interventions and development of products. TUKFS projects amplified the voices of citizens to ensure citizen perspectives are considered by business, policy and research stakeholders. This may help to ensure citizens voices are considered by a wide range of food systems stakeholders and included in interventions, policies and research projects beyond the TUKFS programme.

A4.8.4 Future outcomes

A number of TUKFS projects are planning work that builds on existing initiatives, expands the reach of existing interventions in order to increase the impact of the project or embeds existing interventions in the community in order to establish longevity of impact beyond the timeframe of the funding. For example, FixOurFood is planning the next stage of work after the FSM project which could involve the co-design of an initiative which would be piloted in schools[53]. RtP and SusHealth are also planning extensions of existing interventions. RtP plans to move from a halls of residence to a campus wide study on pulse consumption. Sushealth is still considering partnerships for other living lab tests particularly to target other contexts and demographic groups. FoodSEqual is working towards ensuring sustainability and longevity of interventions that improve access to healthy and sustainable food. In Reading, the FreshStreet team are meeting with the council to source additional funding so

[50] TFF_FSM Allowance_Report_FINAL.pdf (foodfoundation.org.uk)

[51] Citizen Scientists Present Free School Meal Allowance Findings to MPs at Parliament Event - Fix Our Food

[52] Citizen Scientists Present Free School Meal Allowance Findings to MPs at Parliament Event - Fix Our Food

[53] UKRI Transforming UK Food Systems - Evaluation Team Only Channel [all partners] - FixOurFood Review of end of year 3 goals.pdf - All Documents (sharepoint.com)

that the intervention can continue. One academic partner suggested that in the future customers may become volunteers which could be empowering (partner interview).

The projects aim to amplify the voices of those with lived experience amongst a wider group of business stakeholders. For example, FioFood created a video for supermarket managers to watch which focuses on those with lived experience of obesity whilst in a supermarket. This video is planned to be released later this year and aims to change attitudes and beliefs within a wider group of industry employees. The RtP partners are sharing learnings with a buying network of university caterers which could amplify the impact of the project and increase access to pulse rich foods across other universities. The project partner is putting together a toolkit on easy to implement best practices for colleagues across the public sector.

The programme may also support the continued inclusion of lived experience voices in future research. TUKFS projects have shown the value of lived experience voices in food systems research whilst supporting and developing capacity for food systems research through Early Career Researchers (ECRs). ECRs have had the opportunity to work on projects that include citizen voices and lived experience perspectives and so these approaches and the knowledge developed by ECRs can be carried through into future research projects. Through the PPI (Patient and Public Involvement) workshops FioFood embedded the voice of those with lived experience into the experiences of ECRs working on the project. One ECR said "*I've never been on a project where PPI has been so big and that's something which, as an ECR, I will take forward to my next projects being like 'I don't want to be on a project which doesn't have the voice of the lived experience'*".

A4.9 CS8: Citizen voices lead transformations in food systems locally

The case study focuses on the funded projects involving co-production methods that engage community members directly to drive food systems transformation. Several TUKFS projects have engaged with co-design, co-creation or co-production methods. The projects included in the case study are FoodSEqual, BeanMeals and Social Enterprise as a catalyst for sustainable and healthy food systems (SEFS).

A4.9.1 Context

A key aim of the TUKFS programme is to encourage citizens to take an active part in transforming their local communities to create healthier and more sustainable food environments. TUKFS projects can help to achieve this by using co-production approaches that engage community members directly to drive food systems transformation. This includes, for example, training community led researchers and working with schools and students. TUKS projects can also help to achieve this through sharing knowledge and evidence co-produced with communities, citizens and CSOs that have not been engaged with the funded projects. Co-production approaches are increasingly used in food systems research with the aim of empowering communities, and engaging citizens more fairly in decision making and research processes[54]. This case study explores how co-production approaches and processes are expected to lead to the following outcomes:

- Citizens are actively involved in local food systems transformation.
- Community researchers have confidence, knowledge, skills and capacity to transform food systems.
- Co-produced creative outputs help to engage citizens in food systems transformation.
- Co-produced knowledge is more widely disseminated through community networks.

Table A4.12 gives an overview of the distribution channels with which the projects have engaged.

Table A4.12 Project summaries

Project name	Co-production approach	Participants	Co-produced Outputs
FoodSEqual	Community Researchers led co-production and co-design	Local community, school children and local social enterprise staff	Sustainable, local fish finger Creative outputs
SEFS	Community Researchers led co-production	Social enterprise staff and service users	Impact projects e.g. food carbon Top Trumps game at Cultivate and winter cultivation project at Social Adventures
BeanMeals	Co-design	School children and teachers	BeanTopia, a bean based game, designed to show the journey of beans from farm to fork in the food system.

[54] UKRI Transforming UK Food Systems - Evaluation Team Only Channel [all partners] - SynergyProject_Mapping_Co-production.pdf - All Documents (sharepoint.com)

A4.9.2 Findings

The next sub section explores how the projects collaborated with communities, and citizens so they can take an active part in transforming their local communities to create healthier and more sustainable food environments. It discusses how projects engaged with communities directly, and how the knowledge generated by these project activities led to less traditional and potentially more engaging outputs, leading to improved outcomes.

A4.9.2.1 Community engagement directly with funded projects

TUKFS projects can help to achieve this by using co-production approaches that engage community members directly to drive food systems transformation. This includes, for example, training community led researchers and working with schools and students. TUKS projects can also help to achieve this through sharing knowledge and evidence co-produced with communities, citizens and CSOs that have not been engaged with the funded projects. Co-production approaches are increasingly used in food systems research with the aim of empowering communities, and engaging citizens more fairly in decision making and research processes. This case study explores how co-production approaches and processes are expected to lead to the following outcomes:

Community engagement through co-design

The co-design methods used by TUKFS projects encourage the target community to have an active role in food systems transformation. BeanMeals worked with school children and teachers, FoodSEqual worked with the local community and school children, and SEFs worked with service users at the partner social enterprises.

These TUKFS projects demonstrate the co-design methods can lead to transformation that:

- Engages a wide variety of local food system stakeholders
- Considers the needs of the target community and involves citizens as decision makers
- Creates a tangible impact on the local food system
- Generates creative and engaging outputs

<u>Engaging a wide variety of local food system stakeholders</u>

The TUKFS project co-design activities involved a range of local food system stakeholders. TUKFS projects engaged with a broad range representing different areas of the local food system. For example, in Plymouth the FoodSEqual team involved stakeholders from across the community including community researchers, school children, school caterers, social enterprises, and the fishing community.

TUKFS projects also engaged with several stakeholders within a specific food environment, such as a school. For example, the BeanMeals project took a “whole school engagement” approach[55]. The team co-created a boardgame with students and a game designer to demonstrate the journey of the bean and the main benefits of eating beans. The project consulted school science leads to identify curriculum requirements and a psychologist to understand behaviour change strategies that could encourage children to eat more beans, whilst working alongside teachers, cooks and caterers and lunchtime supervisors. The game co-design process included workshop activities during which 200 school children designed their own bean themed games, game prototyping based on the children’s ideas, and playtesting with a group of year 5 school children at six schools in Leicestershire. TUKFS projects have also engaged with targeted stakeholders to inform impact projects. For

[55] Whole-school engagement in BeanMeals - University of Plymouth

example, the SEFS team engaged with community researchers and service users at partner Social Enterprise Social Adventures to co-design a winter cultivation plan. Service users were also engaged in project implementation, for example by repairing greenhouses for winter cultivation.

Involving citizens as decision makers and considering the needs of the community

The co-design approaches taken by FoodSEqual, BeanMeals and SEFS considered the needs of the target community and involved citizens as decision makers. For example, The FoodSEqual team conducted concept development workshops with community researchers and the wider community which resulted in the creation of six possible concept ideas for local innovation on fish. The process for deciding on fish was collaborative and considered community needs; the CRs facilitated a series of workshops run with community members during which fish was identified as a food commodity for possible development and innovation. Members of the local community expressed that they would like opportunities to try and cook new fish, to access affordable fish and to understand the supply chain. The process for creating and deciding on concept ideas was community led; an individual at a local social enterprise came up with the idea of the fish finger which "*ticked all the boxes*" (Partner interview).

The co-design approaches were directed by the community which meant the work streams evolved alongside greater understanding of community needs. For example, as part of WP3 the SEFS project was going to focus on developing evidence of environmental health and nutritional impact by co-creating indicators to measure the impact of SE activities. However, during the co-production process the SE partners selected impact projects that fit the needs of the community and generally partners wanted to "*deliver on impact*" (academic partner interview) rather than create evaluation or impact tools. The co-design processes aimed to foster inclusivity and incorporate ideas from community members. For example, the co-design process used by BeanMeals aimed to treat children as 'design partners' and foster inclusivity throughout the process. The final game incorporated children's illustrations and was based on Snakes and Ladders which featured in many of the children's ideas.

The co-design process led by TUKFS projects provides benefits for those involved in the co-design process. For example, Social Adventures a SEFS partner explained that the project approach enabled service users to feel "*involved*" in decision making and service transformation which is important particularly for mental health services. A project partner on BeanMeals also said "*I feel like that there's kind of a collateral benefit in doing this kind of stuff with kids in terms of making them feel that they matter. A lot of them reported feeling important and really proud*"[56].

Creating a tangible impact on the local food system

The co-design projects often aimed to have a tangible impact on the local food system. For example, the Social Adventures team said that they wanted the project to have *"a real impact"* on service users (social enterprise partner interview) rather than conducting research into activities that they were already doing. Social Adventures operate a mental health project that includes food growing and the SE team decided that the impact project would focus on developing winter cultivation to ensure that the project can consistently operate throughout the year. The project has improved the SE growing spaces, improved volunteer (service user) consistency, and diversified the produce that can be grown on site.

The co-design project conducted by FoodSEqual with a local school aims to create a tangible impact on the local food system through creating the Plymouth fish finger. School children were involved in looking into different options for fish species, batters, and crumbs. The

[56] https://www.plymouth.ac.uk/research/synergy/codesigning-a-bean-themed-game-with-school-children

intention is to provide the fish finger to local schools and the co-design process ensures that the school children play an active role in local food system changes that will directly impact the food that they eat.

Generating creative and engaging outputs

This is another outcome of the community engagement through co-design which is explored further later in the case study.

Community researchers

Community researchers (CRs) are integral to FoodSEqual and SEFS. CRs have been involved in a wide variety of research and project implementation activities including running workshops, hosting events, reaching out to the community and producing creative outputs. CRs involved in TUKFS projects have improved confidence and mental health, generated new knowledge and perspectives, developed skills, and fostered new relationships and connections.

Improving confidence and mental health

CRs involved in FoodSEqual have reported a wide range of positive outcomes including improved confidence and mental health. The tangible outcome of the project, in the form of the Plymouth fish finger, also enabled CRs to feel competent and proud of the work conducted as part of FoodSEqual. CRs involved in SEFS have also reported improved confidence (partner interview, SEFS).

New knowledge and perspectives

SEFS CRs said that working with academics also provided a "*different perspective*" which comes through research. This echoes the findings published in a blog post which show that involvement in the project has provided CRs with a space to think and a catalyst for change.[57] CRs involved in FoodSEqual reported an increased awareness of the food industry. CRs also reported in a blog post that they have a "new understanding" of local food related activities such as surplus food provision and community allotments[58].

Developing skills

The partner social enterprises, Social Adventures and Cultivate, explained that community researchers have gained new skills which are useful in other aspects of their roles. CRs involved in FoodSEqual reported skills development linked to facilitating workshops and presenting information to decision makers. FoodSEqual CRs completed a series of research skills training sessions as part of the project, including training on ethical practices and the practicalities of community research[59].

Fostering new relationships and community connectivity

CRs involved in FoodSEqual also improved relationships with the university and greater connectivity with other community members. CRs in FoodSEqual had the opportunity to meet and collaborate with CRs from other communities, for example the CR group in Plymouth said "One of the highlights of being involved in FoodSEqual is having the opportunity to meet other community researchers; to date we have visited Whitley in Reading and Brighton.

[57] Exploring social enterprises' engagement in transdisciplinary research: a reflective analysis | By K Graham, K Burningham and A Loukianov (cusp.ac.uk)

[58] A team of six community food researchers are working with FoodSEqual in Whitleigh, Plymouth. - Food Plymouth

[59] A team of six community food researchers are working with FoodSEqual in Whitleigh, Plymouth. - Food Plymouth; FoodSEqual community food researchers: co-producing healthy and sustainable food systems in Plymouth - University of Plymouth

Everything we have learned will help us run future community food and research events that are relevant and appealing for people in this area of Plymouth."[60]

Challenges

However, there are challenges associated with the CR role. The SEFS project explored these challenges in a recent blog post[61], explaining that whilst the project aimed to be transdisciplinary "*much of the power and coordination still lay with the academic partners*" and research tasks were familiar for academics but not necessarily for those working in SEs. Frontline staff designated as CRs did not necessarily have the capacity to take on new tasks and found that the term "*researcher"* could be "*opaque and mystifying*". The CRs involved in FoodSEqual experienced a lack of confidence at the beginning of the project linked to the complexity of the project. One CR said the thought of being a researcher seemed "*a little scary*". There were also challenges linked to time and capacity available as CRs must balance other time commitments and constraints. These challenges were actively addressed by project teams and these approaches are linked to some of the practical considerations for co-production that were developed through the TUKFS co-production synergy project.

A4.9.2.2 Knowledge generation and dissemination

Co-produced creative outputs

The co-production activities across all three projects are associated with creative outputs that could be considered non traditional or non academic and potentially more engaging for a broader audience.

Games: A number of projects across TUKFS have been involved in creating games linked to the food system. The SEFS project supported Cultivate to create an interactive game based on Top Trumps that enables players to understand carbon in the food system and encourages players to consider the environmental impact of food choices. The project also created teaching packs alongside the game so that teachers could engage students on carbon impacts, water impacts and locally sourced food. The BeanMeals game BeanTopia has been played in several schools in Leicester.

Creative Resources: Many TUKFS projects have also created artistic, creative and visually engaging resources which move beyond traditional academic outputs. For example, during workshops on the Plymouth fish finger the FoodSEqual project included art and craft based activities, such as decorating fish tins or using jellyfish collage diagrams to map findings. FoodSEqual used visual engagement activities to improve access to information for those with lower literacy rates, hearing loss and language barriers[62]. The project also supported participants to engage with workshops and events through creative methods such as mapping, collaging, zine making and even creating a song[63].

Co-produced creative outputs can help the community to engage with food systems challenges and solutions. The team at Cultivate explained that the Top Trumps based game is informative, educational, and fun, and helped to challenge some assumptions about the food system and carbon footprints. The game also acted as a "*jumping off point*" for talking about food sustainability topics such as seasonality and conventional agriculture (SE partner). The success of the game has created a "*third strand of community delivery*" and the

[60] A team of six community food researchers are working with FoodSEqual in Whitleigh, Plymouth. - Food Plymouth

[61] Exploring social enterprises' engagement in transdisciplinary research: a reflective analysis | By K Graham, K Burningham and A Loukianov (cusp.ac.uk)

[62] Exploring What Visual Approaches Bring to Public Engagement (fliphtml5.com)

[63] Exploring What Visual Approaches Bring to Public Engagement (fliphtml5.com)

continued delivery of the game increases the potential impact (SE partner). The Beantopia game has kept children engaged for "*full hour long sessions*"[64] and enables children to learn about the food system and the benefits of eating beans and pulses. FoodSEqual creative approaches can help to make community engagement "*more fun*" (academic partner interview). In relation to these creative approaches used during workshops one of the academic partners explained: "*I don't wanna say less formal, because one of the community researchers told me off for saying that because they were like 'that sounds like 'less than' and it's not 'less than' it's like a different way of doing things, which works really well'*". In this instance, CRs facilitated a different way of doing things that engages the community and encouraged the wider team to rethink and reframe creative methods to avoid devaluing these approaches.

Community networks and events

The projects also demonstrate how knowledge is shared through community networks and community events. For example, the FoodSEqual project shared knowledge within the community through public engagement events, including a fish finger celebration event in Plymouth which was well attended by the local community. The event included different stations so that attendees could learn more about the types of fish used, a short film, a tasting session and a sea shanty. The creative approaches used throughout the project helped to make the community event engaging[65]. Knowledge has also been disseminated informally through community networks. For example, children involved in the Beantopia game went home and discussed the game and shared knowledge with their families.

A4.9.3 Conclusions

The TUKFS programme demonstrates that co-production and co-design methods can lead to transformation that:

- considers the needs of the target community and actively involves citizens as decision makers.
- creates an inclusive participatory environment which fosters relationships and community connectivity.
- engages a wide variety of local food system stakeholders and fosters partnerships between different food system stakeholders.
- benefits from creative outputs that engage broad audiences on food systems topics.
- creates a tangible impact on the local food system.
- promotes knowledge exchange within the community.
- provides benefits to community researchers involved in co-production.

A4.9.4 Future outcomes

A4.9.4.1 Behaviour and dietary change

TUKFS project activities may lead to changes in food behaviours and diet. Co-produced creative outputs may promote a change in attitudes and behaviours leading to dietary change. For example, the BeanTopia game, the creative output co-produced through BeanMeals, could promote the uptake of bean meals in schools that they work with. The

[64] Children are game to try healthy foods | Environmental Change Institute (ox.ac.uk)

[65] Exploring What Visual Approaches Bring to Public Engagement (fliphtml5.com)

Top Trumps game, the creative output co-produced by Cultivate and SEFS, could encourage people to think about their food choices which could lead to dietary change. For example, one of the researchers involved in creating the game no longer eats cheese as a result of learning about the environmental impact of foods including cheese through the game. Co-produced products may also be linked to a change in food behaviours and diets. For example, the intention for FoodSEqual is to produce the co-designed Plymouth fish finger for the local school meal system. The Plymouth fish finger may evolve into a community led initiative that has longevity of impact on the local community and local economy.

A4.9.4.2 Ripple effects

The impact of the programme may be amplified by future activities which could increase the reach within the community and lead to a greater longevity of impact, essentially a ripple effect. This can occur through ongoing use of creative outputs, knowledge transfer and policy influence.

There is evidence that TUKFS co-produced creative resources will continue to be used and may reach a broader group of citizens. For example, teachers using the Beantopia game have said they will continue to use the game which means the impact of the game may continue beyond the TUKFS timeline and beyond the cohort of students involved in the project. The BeanMeals team is also exploring developing Beantopia into an online game with a group of secondary school students studying Games, Animation and Visual Effects.[66] Similarly, the SEFS partners at Cultivate are considering how to progress and expand the impact of the game. The team at Cultivate are considering using the game as part of funded delivery to engage the community on carbon in the food systems, training facilitators to deliver the game in schools and other settings, attending events such as a gaming conference and the Royal Welsh Show, and exploring the possibility of commercialising the game. The impact of the project could also be amplified and extended through knowledge transfer that occurs when citizens involved in co-production move into new roles linked to food systems transformation. For example, CRs involved in FoodSEqual reported that involvement in the project has made them aware of new opportunities for the future and expanded their CVs.

The impact of the programme may also be reinforced when co-produced knowledge and insights is shared with policymakers. This could lead to long term future outcomes for a broader set of citizens. For example, BeanMeals are in discussion with Oxford County Council and Oxford City Council around developing better school programmes linked to healthy eating (Partner Interview).

A4.9.4.3 Future co-produced research

The TUKFS projects involved in co-production approaches demonstrated the value of these approaches for researchers and civil society organisations. TUKFS projects have developed practical considerations, sharable guides and key recommendations on how to approach and conduct research projects involving co-production approaches. The co-production synergy project developed a resource on co-production best practices and practical considerations[67]. These sorts of resources have potential outcomes for future research, which are explored in Case Study 2, and potential outcomes for citizens involved in future research, which are explored here. Demonstrating the value of co-production whilst producing practical

[66] Finding fun with BeanMeals - Food for Life

[67] Synergy_Illustrated_Checklist.pdf (plymouth.ac.uk)

recommendations may help to facilitate effective, considerate and appropriate future citizen engagement in food systems projects.

The TUKFS projects demonstrate the value of CRs as trusted gatekeepers that can help facilitate broader community engagement and the importance of face to face social interactions to build rapport[68]. For example, the FoodSEqual CRs helped to facilitate workshops and make community members "*feel more relaxed and welcome*" (partner interview). The CRs added caring and thoughtful touches, such as bringing flowers to workshops, which has helped to boost community connectivity and trust. The CRs act as a gateway to the community and amplify the importance of the community, stating in an interview that "*the voice of the community is key*" (CR interview) to the success of the project and the scale of the impact. Future research projects may seek to involve community researchers resulting in more meaningful opportunities for citizens to engage in food systems transformation.

The success of TUKFS co-produced projects may help create an enabling environment for future collaborative research projects with civil society organisations. For example, the SEFS partner Cultivate shared that participation in the project "*has opened us up to wanting to partner with universities and research institutes, and seeing a real value in that hybrid space where what we can bring is very different... and of real value to researchers and they bring real tangible value [to the SE]… the legacy will be that we're really receptive to that now*".

The TUKFS projects also demonstrate that they considered and responded to barriers that may prevent engagement in co-produced research and individual preferences about project related communication when working with CRs. For example, an academic partner on SEFS explained that they tried to overcome the challenge associated with CRs not identifying as researchers by thinking about different titles such as "*community engagers*". Another academic partner on SEFS explored how their approach was adjusted to each individual CR, as some CRs "*found it more challenging than others*". An academic partner in FoodSEqual explained that they built flexibility into the project structure to ensure the project can accommodate CRs with different time constraints and capacity to engage.

The TUKFS projects have also published lessons and recommendations which may inform future co-production approaches. For example, the SEFS project shared three key lessons in a recent blog post:

1. Funders of truly transdisciplinary projects should balance resources between academic institutions and social enterprises, including paying for proposal time.
2. Academics should work to demystify research and ensure research is related to activities that SEs are carrying out.
3. SEs value the opportunity to work alongside academics when research is tailored to their organisational aims[69].

Future research projects may implement these recommendations, which could lead to more effective and considerate engagement with community researchers resulting in more fulfilling and appropriate opportunities for citizens to engage in food systems transformation.

[68] Synergy_Illustrated_Checklist.pdf (plymouth.ac.uk)

[69] Exploring social enterprises' engagement in transdisciplinary research: a reflective analysis | By K Graham, K Burningham and A Loukianov (cusp.ac.uk)