Local-Level Agroecology:

Developing a new method for delivering high-quality local agroecology maps

A Flex-Fund Project funded by AFN Network+ / UKRI
and delivered by Russell Regen
April 2025

AFN Network+

UKRI

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Acknowledgements

Researched and written by Dr Henry Russell (Russell Regen Ltd). The author thanks the UKRI Agri-food for Net Zero Network+ for kindly funding this FlexFund project and the core project team of Bill Grayson, Dmitry Yumashev, Emily Linton, Rachel Marshall and Sarah Sinclair, all of whom gave invaluable contributions during the project. Thanks also to the additional attendees of technical conversations, Georgie Barber, Jim Scown, Kenny McCarthy and Will Frazer, and all those who gave their time to attend the stakeholder workshop in February 2025. All contributors have helped to shape the findings of this report and gratitude is extended. Thank you to North Aston Farms, Oxfordshire, for the cover image of their pasture-fed herd in Oxfordshire.

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Executive Summary

Background Context

The "Ten Years for Agroecology Regional" (TYFA-Regio) model commissioned by FFCC and modelled by IDDRI in 2021 provided evidence that agroecology, along with dietary shifts, can feed the UK whilst also helping to meet the UK's Net Zero, Biodiversity and other targets. It therefore represented a landmark study and countered the often-held counter-argument to agroecology that it cannot meet food production requirements. Where the TYFA-Regio model differed from many other dietary change scenario models was that there's a higher reduction in "white meat" (poultry and pork) compared with "red meat" (beef and lamb). This is because grass-fed ruminants are seen as an integral part of the agroecological system due to their contribution to nitrogen cycling, something which is included in the TYFA-Regio model. The publication of FFCC's "Farming for Change" report catalysed meaningful action and dialogue around the value and potential of agroecology in the UK over the subsequent years.

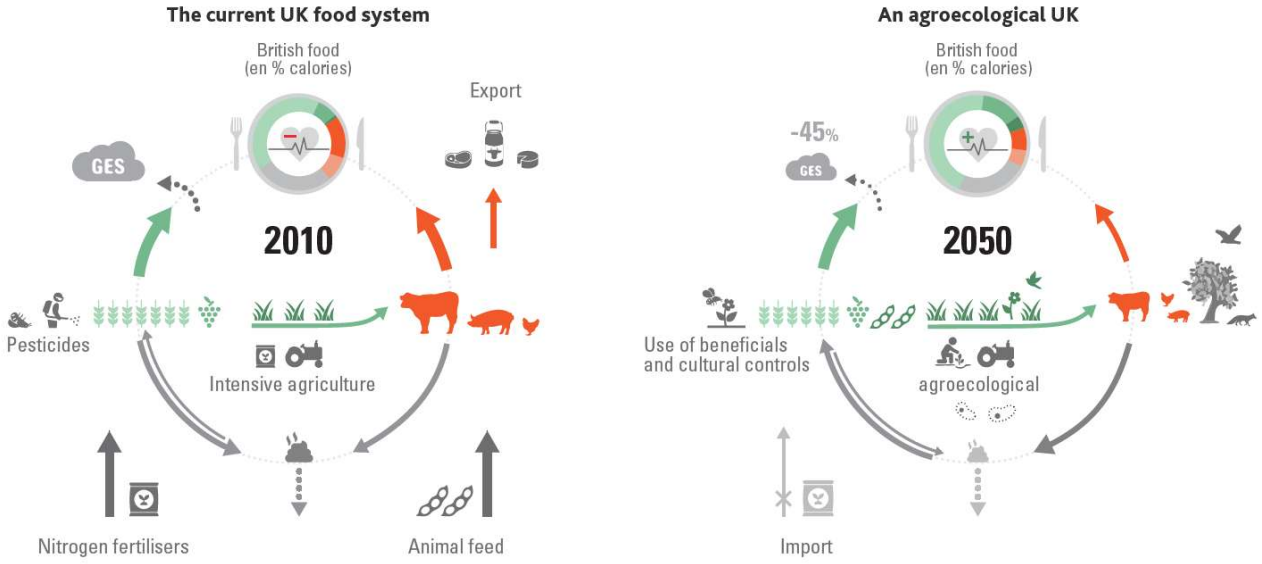

Figure 1: The current food system (left) in 2010 compared with an agroecological UK (right) (1)

Over this time where discussions were happening at UK-wide level there was increasingly a recognition that adapting the model to localised level would have significant benefits to local-level organisations including local authorities and Sustainable Food Places partnerships (of which there currently 114 across the UK) in delivering change at local level.

This led Jim Scown, at the time employed by FFCC, to begin exploring how to adapt the TYFA-Regio model to "local level" (to distinguish from the original model, this is referred to as LA-TYFA-Regio throughout this report, with the "LA" interpreted as "locally-adapted"). To give a sense of geographic scale, here "local level" was looking at the areas of Shropshire and North Lancashire, the latter in collaboration with "FoodFutures", which is North Lancashire's Silver Award winning Sustainable Food Places (SFP) partnership. This exploration showed that creating LA-TYFA-Regio without making changes to the model architecture was challenging. The principal reason for this was that the original model was conducted at European level with 21 agrarian regions. During the development of the UK-based TYFA-Regio model this constrained the number of regions to three and this modelling exercise in itself represented a challenge to merge European and UK datasets to a sufficient level of academic rigour. Taking this one step further (to UK localised level) ultimately represented a level of granularity that required further research.

During the Summer of 2024 there were a series of meetings and discussions coordinated and facilitated by Dr Henry Russell (Founder, Russell Regen Ltd) involving FFCC, FoodFutures, Small World Consulting (SWC) and

UK Centre for Ecology and Hydrology (UK CEH) to explore the next steps required to create LA-TYFA-Regio (e.g. for North Lancashire). This consortium has the following background and shared interest in the project:

- Dr Russell is a North Lancashire-based qualified regenerative agriculture consultant with a background that spans academic, charity and private sectors. He has strong experience in coordinating diverse groups of stakeholders and generating valuable outputs to ensure maximum impact from research spend.
- FFCC delivered the TYFA-Regio model and are ideally placed to shape a locally adapted version.
- FoodFutures have been developing and implementing a host of practical initiatives based on engaging the residents of North Lancashire to build a shared vision of what their own local food economy could look like.
- SWC are experts in estimating the full supply chain carbon, land-based carbon emissions and sequestration, and developing Net Zero pathways. They can supplement the TYFA-Regio data with their own land use opportunity mapping datasets applicable specifically to North Lancashire and link to initiatives such as Zero Carbon Cumbria, Race to Zero, and Local Nature Recovery Strategies.
- UK CEH have teams specialising in Net Zero pathways for land use and are well placed to contribute to the re-modelling exercise.

The consortium successfully won the AFN Network+ "FlexFund" funding in November 2024 and this has enabled sufficient focus and time to be committed to the question of how the TYFA-Regio model can be adapted to a local context. The primary project aims were:

1. Explore and identify which UK-specific and local datasets can be incorporated into the model for increased accuracy.
2. Bring together parties that are working in parallel towards the Net Zero and Nature Recovery targets and raise awareness of what information is available for sharing. This greater collaboration could provide wide-ranging benefits for local (and therefore national) action to deliver localised food systems supported by agroecological land management.
3. Offer clarity on the structure of a possible larger follow-on research project aiming at adapting the TYFA-Regio model to a "localised" i.e. sub-UK context.

Project Approach

The early stages of the project involved summarising the work that had been carried out to-date in producing the TYFA-Regio model, efforts to adapt this to local level (create LA-TYFA-Regio), and explore what was likely to be technically possible. To meet this need, in the early stages of the project between December 2024 and February 2025, several "technical conversations" were carried out with FFCC representatives, FoodFutures, Small World Consulting and UK CEH.

During these conversations an emerging theme was that holding a multi-stakeholder workshop with representation from across the food system would be a valuable next step. It was agreed that this should not be a technical discussion but would instead explore what resources from the LA-TYFA-Regio model could be valuable to stakeholders and clarify the likely primary users. One of the key aims of the workshop was to have as much representation from right across the food system as possible and therefore the format was online and duration 90 minutes. The workshop was held on 25 February 2025 and had 22 attendees with representation from local authorities, conservation bodies, farmers, growers, Sustainable Food Places Partnerships and farming organisations, amongst others. The workshop agenda design encouraged inclusivity – with the check in, scene setting and then going into breakout groups with people from similar backgrounds / contexts intended to create the greatest opportunity for a feeling of ease and likely contributions.

Key Findings

The project yielded the below key findings:

1. Plenty of lead-time should be factored in to obtain the fine detail of the TYFA-Regio model from the developers (IDDRI) to enable the creation of the LA-TYFA-Regio model.
2. Soil data could be a useful dataset to feed into the amended model.
3. The amended model should be produced at UK wide level but with the capability to "zoom" in and out of local level. This is since no one region would be self-sufficient in food and would need to "import" and "export" from other UK regions.
4. Data should be Open Source so that the ultimate resource can also be Open Source and deliver the greatest impact.
5. Carrying out updates to the TYFA-Regio model at UK-wide level (with the latest datasets) is a great starting point for a developer. This could include more ambitious food waste reductions and updated carbon metrics from the Climate Change Committee (using 7th Carbon Budget). It would have the dual benefit of familiarising the researcher with the methodology and providing a useful (guaranteed) resource/output.
6. A key stakeholder group to include in the project outputs is Land Agents who will likely find the outputs of the LA-TYFA-Regio model valuable for engaging with their clients.
7. It may be necessary to "tease apart" some of the inputs / outputs of the model in order to achieve local level granularity (e.g. omit trade balance data).
8. From FoodFutures' perspective, it's important that the LA-TYFA-Regio model is not overcomplicated meaning that useful resources (e.g. data maps) are produced within financial, feasibility and temporal constraints, whilst still meeting necessary academic standards.
9. Although substituting the TYFA-Regio model's agrarian regions for the UK Agricultural Land Classification (ALC) Grades was resisted by the original developers at IDDRI, from FoodFutures' perspective this could represent a sensible starting point for the LA-TYFA-Regio model and could be updated as/when more suitable datasets become available.
10. Have underpinning datasets that are credible in the eyes of policymakers, that can be spatially represented (ideally interactive dashboards) and that are open access (to enable the ultimate resource to be Open Access).
11. The temporal scale of the LA-TYFA-Regio model is important. One option could be to go with 5 year increments where the ten year horizon is likely to be more valuable to SFPs and the 25 year horizon more valuable for policy makers.
12. A wide range of open-source datasets are currently available and have been linked throughout this report for use by the Developer.
13. When carrying out the modelling consideration will have to be paid to the devolved administrations (Scotland, Wales and Northern Ireland) as these all have different datasets, policy commitments and cultural approaches to addressing the challenge(s).
14. Engaging with the end-user throughout the modelling process (e.g. FoodFutures and other SFP Partnerships) will give the best chance of success for the ultimate resources.
15. In SWC's view, it should be technically possible to create a "hyper-local" model which may be of interest to landowners and land agents, however, there are questions arising around IP ownership, charging structure and confidentiality (GDPR).
16. FFCC has provided a Terms of Reference document for the use of the TYFA-Regio (UK) model which has been included in full in the Appendix. These terms must be considered when planning the development of LA-TYFA-Regio or any other derivative models (e.g. "hyper-local")
17. Many of the layers in SWC's woodland opportunity maps could be used to create LA-TYFA-Regio. These layers include modified ALC Grades, which could be substituted for the agrarian regions used in the current TYFA-Regio model.
18. A major benefit of this project has been in raising awareness among the Consortium members about the work and resources that each of them has been carrying out. This increased collaboration between

the members will likely lead to increased impact beyond the scope of this project and contribute towards the UK's Net Zero and 30x30 Nature Recovery targets.

19. The infrastructure of delivering model outputs to farmers and sharing them between farmers is key. The messaging should be simple and in a form that "link" organisations such as Pasture for Life and Nature Friendly Farming Network can deliver with ease.
20. There was broad support for developing a locally-focused model (LA-TYFA-Regio) and there was a sentiment that such models are more effective for engagement than national models. This could inspire community-wide support for an agroecological transformation of the local farming system; one that prioritises local markets for its products.
21. Furthermore, any locally-focused model outputs should be in a form that is able to reach a general audience and promote effective storytelling. Having qualitative (case studies) as well as quantitative elements to the model will help to deliver this aim.

Impact

Coupling the key findings summarised above with the primary aims of the research project, it has delivered the below impact:

- The technical conversations yielded a wide range of datasets that are summarised in this report and can be used in the LA-TYFA-Regio model. The conversations also enhanced connections with organisations that are willing to develop their models further through knowledge-sharing (e.g. Small World Consulting).
- The datasets listed in this report are also available for other modelers looking to support the UK's Net Zero and Nature Recovery targets, and therefore they could have impact beyond the scope of the current research project.
- The writing of this report and the conversations that occurred during the project have deepened the connections and the awareness of the consortium's ongoing work and previous publications. This has led to ongoing conversations concerning improving land-based carbon modelling and land use opportunity mapping.
- The network building that was achieved through the arrangement and facilitation of the workshop with the wide range of stakeholders was positively reported back by the attendees. The "ripple effects" of this workshop and the likely further impacts once this report is published online for general viewing has been a success of the project. Below are a handful of testimonials from the workshop:
    - Libby Flintoff (local organic grower): *"Thank you so much for inviting us to join Tuesday's workshop - it was very well organised! It was good to have a brief introduction to others who are working within the field of agroecology, particularly those who are local to us, as we don't often have the time to do this."*
    - Claire Harris (Natural England Health and Environment Higher Officer, Cumbria Area Team): *"What I enjoyed about the session was learning about agroecology and the mix of different people and backgrounds represented on the call."*
    - Rob Bunn (Project Manager, Pasture for Life): *"I thought you did a really good job of hosting yesterday, very personable and inclusive."*
- A Developer taking forward the creation of the LA-TYFA-Regio model will have the benefit of this report as an ideal starting guide for the organisations with which to collaborate, open-source datasets to include, suggested amendments to the model architecture to make, and key stakeholder users of outputs to consider.
- The current project has increased the likelihood of a follow-on research project to develop the LA-TYFA-Regio model. As outlined throughout this report, if a LA-TYFA-Regio model is delivered, it will be a valuable resource for locally-based stakeholders working towards the UK's Net Zero and Nature Recovery targets.

Outputs

The project has yielded the following **outputs**:

1. The key output from this project is the current report, which should form an invaluable resource in the next steps of the development of the LA-TYFA-Regio model for a researcher.
2. Coupled to the full report will be a short report that will be published on the AFN Network+ website to give the key outcomes from the research project.
3. The recorded workshop which was facilitated with stakeholders from across the food system will be made available for general access on the Russell Regen, FoodFutures and AFN Network+ websites.
4. An article is planned for THRIVE magazine, North Lancashire's Community Food Magazine produced by FoodFutures, which will tell the story of the project to a generalist audience and is due for publication in early Summer 2025.
5. On the back of the article for THRIVE magazine, social media briefings will also be publicised to a generalist audience.

Next Steps

This FlexFund project has shown that there is an appetite for a LA-TYFA-Regio model and that this could have a positive contribution towards meeting the UK's Net Zero and Nature Recovery targets at a local level. The author of this report, Henry Russell, is currently the Chair of the Food Economy Working Group at FoodFutures and therefore has the advantage of staying close to and contributing towards the next steps following from this research project. Clearly, the key is to build a consortium to take this work forward and obtain funding to develop the LA-TYFA-Regio model, and therefore this will be his next priority. The first step will be to convene a meeting with the current Flex Fund project consortium to establish which partners are interested in taking the work forwards and bidding for research funding. In the event that enough resource is available within the consortium (i.e. to bid for research funding and to have a suitably qualified Developer) then the work will be taken forwards from there. If there is not enough capacity / resource within the consortium then other partners will be identified and, once the new consortium and funding are in place, then a smooth handover will be initiated, thus maximising the chances of success of the model development.

1. Introduction

1.1. The UK-wide TYFA-Regio Model

When the "Ten Years for Agroecology Regional" (TYFA-Regio) model was delivered by the Food, Farming and Countryside Commission (FFCC) in 2021 in partnership with the French-based research organisation "IDDRI"[1] it sought to answer the question:

> *"Is it feasible and plausible to plan to feed the nation through a shift to agroecology? And, if so, what are the implications compared to other scenarios, to forge a path to a more resilient, secure, fair and sustainable food and farming system?"*

When it was published, it represented a landmark report as it showed that it was, indeed, possible for agroecology to feed the nation and also help meet the UK's Net Zero, Biodiversity and other goals. It therefore countered the long-held narrative against agroecology that it would not deliver the yields necessary to feed the nation.

Here, the key set of assumptions used in TYFA (1) (and therefore representing "agroecology[2]") are as follows[3]:

1. Fertility management at the territorial level that depends on:
    - The suspension of soybean/plant protein imports
    - The reintroduction of legumes into crop rotations
    - The re-territorialisation of livestock systems in cropland areas
2. The phase-out of synthetic pesticides and the extensification of crop production - all year soil cover: organic agriculture as a reference
3. The redeployment of [semi-]natural grasslands across the European territory and the development of agro-ecological infrastructures to cover 10% of cropland
4. The extensification of livestock production (ruminants and granivores) and the limitation of feed/food competition, resulting in a significant reduction in granivore numbers and a moderate reduction in [ruminant] herbivore numbers
5. The adoption of healthier, more balanced diets according to nutritional recommendations
    - A reduction in the consumption of animal products and an increase in plant proteins
    - An increase in fruit and vegetables
6. Priority to [production of] human food, then animal feed, then non-food uses

A key requirement for the model is that diets are assumed to change in-line with recommendations in EAT-Lancet with the following highlights:

- 63% increase in fruit and veg consumption
- 25% reduction in beef and 4% reduction in lamb consumption (grass-fed ruminants)
- 50% reduction in dairy, 50% reduction in poultry, 67% reduction in eggs and 75% reduction in pork consumption (grain-dependent livestock industries)

Where the TYFA-Regio model differed from many other dietary change models was that there's a higher reduction in "white meat" (poultry and pork) compared with "red meat" (beef and lamb). This is because grass-fed ruminants are seen as an integral part of the agroecological system due to their requirement for nitrogen cycling, something which is included in the model. Whereas grain-dependent livestock systems (currently poultry, pork and eggs) represent competition for human food and increased pressure on land-use and therefore have larger reductions under the model. Dairy sits somewhere in between as it currently uses a

[1] Institut du développement durable et des relations internationals
[2] The Food and Agriculture Organisation of the United Nations (FAO) has its own definition available via this link.
[3] These definitions are directly quoted from the TYFA report but [square bracket] have been added in this report to provide additional clarification.

lot of grain-based feed, however, it is a system that can be adapted to extensive pasture-fed systems. Indeed, dairy is often the best livestock enterprise to integrate with arable as it can generate a better financial return in line with the higher quality of land.

Under the model, there were the following assumed benefits at UK level:

- Carbon emissions from agriculture reduced by 38% by 2050, coming down to 47.5MT CO2eq/annum from the current 76.6 MT. A further 28.3MT CO2eq/annum could be offset by new opportunities for sequestration, leaving 19.2 MT CO2eq/annum of continuing emissions from agriculture in 2050, which is within the Climate Change Committee's range of 14-26MT CO2/annum.
- There was an assumed crop yield reduction of 17% in the West and 25% in the East of the UK
- There was a doubling of land area for green infrastructures such as hedges from 2% to 4% of agricultural area (603k hectares) and a 7 times increase in "alternative uses" such as woodland creation up to 1.2 million hectares or restoring wildlife habitats to help meet the UK's Nature Recovery targets. It is also noteworthy that here the definition of 'woodland' is any area that contains as little as 20% tree cover, which allows for silvopasture / wood pasture options, where food production could continue,

The infographic below represents how an agroecological UK would look compared to the current UK food system which includes a vastly reduced reliance on synthetic inputs such as fertiliser, feed and pesticides; healthier diets; greater biodiversity above and below ground; and greater food security.

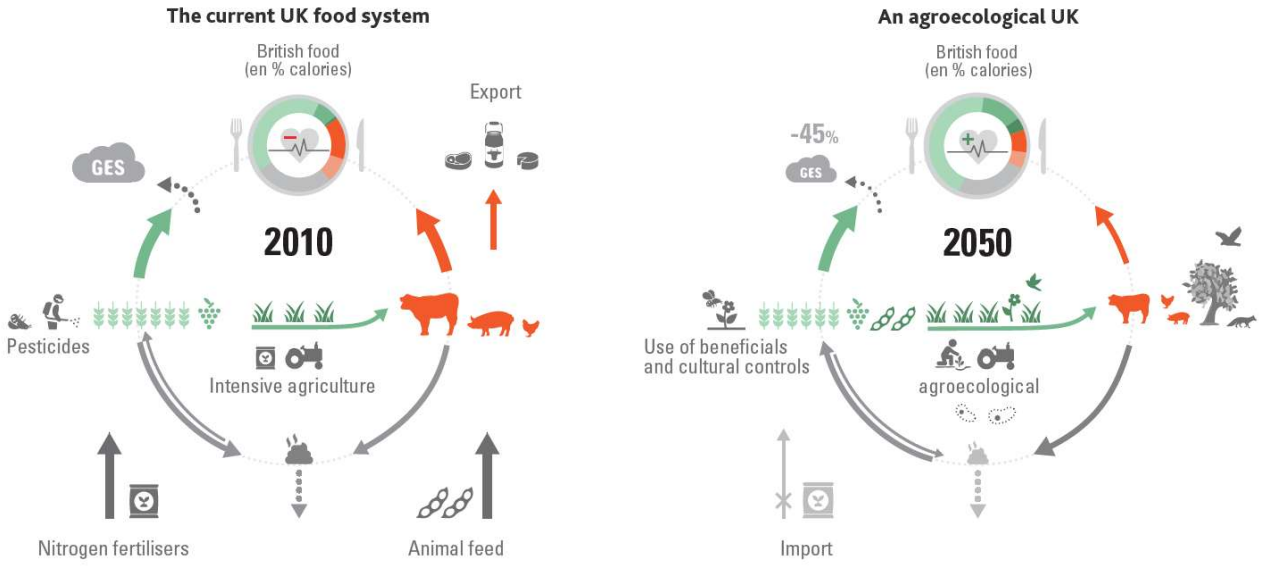

Figure 2: The current food system (left) in 2010 compared with an agroecological UK (right) (1)

1.2. Follow-on Activity and The Need for Regional Adaptation

The publication of FFCC's "Farming for Change" report and accompanying research paper by IDDRI catalysed meaningful action and dialogue around the value and potential of agroecology in the UK. This included FFCC's "Routes to Action" webinar series in 2021 where they engaged with hundreds of businesses and communities across the country to gather evidence on what changes would be required in key areas such as policy, skills and land use for agroecology to come into being in the UK.

This was followed up in 2022 with the "Economics of a Transition to Agroecological Farm Businesses" report from the Soil Association, which provided both farm-level recommendations and business strategies for transitioning to agroecology, and policy-level recommendations for encouraging and supporting this transition.

Over this time where discussions were happening at UK-wide level there was increasingly a recognition that adapting the model to localised level would have significant benefits to local-level organisations including local authorities and Sustainable Food Places partnerships (of which there currently 114 across the UK) in delivering change at local level.

This led Jim Scown, at the time employed by FFCC, to begin exploring how to adapt the TYFA-Regio model to "local level" (to distinguish, this is referred to as LA-TYFA-Regio for the rest of this report). To give a sense of geographic scale, here "local level" was looking at the areas of Shropshire and North Lancashire, the latter in partnership with "FoodFutures"; North Lancashire's Silver Award winning Sustainable Food Places partnership. FoodFutures was well placed for this exploration because, unlike many sustainable food networks, the network encompasses both urban populations and farmed landscapes across North Lancashire, and had also been the subject of Sustain's *Tale of Two Counties* report in 2022, which examined Lancashire's supply-chain infrastructure in terms of a potential transition to a local food system.

This exploration showed that creating LA-TYFA-Regio without making changes to the model architecture was problematic. The principal reason for this was that the original model was conducted at European level and adapting this to UK regional level was challenging. In order to shed light on the reasons for these challenges, a more detailed look at the model architecture / methodology is required, which is provided below.

The TYFA-Regio model identified 21 agrarian regions using EuroStat data at NUTS2 level[4] and characterised using the following criteria:

- Land use
- Yields
- Yield potential
- Total Production (including grass, density and type of livestock
- Total Animal Production

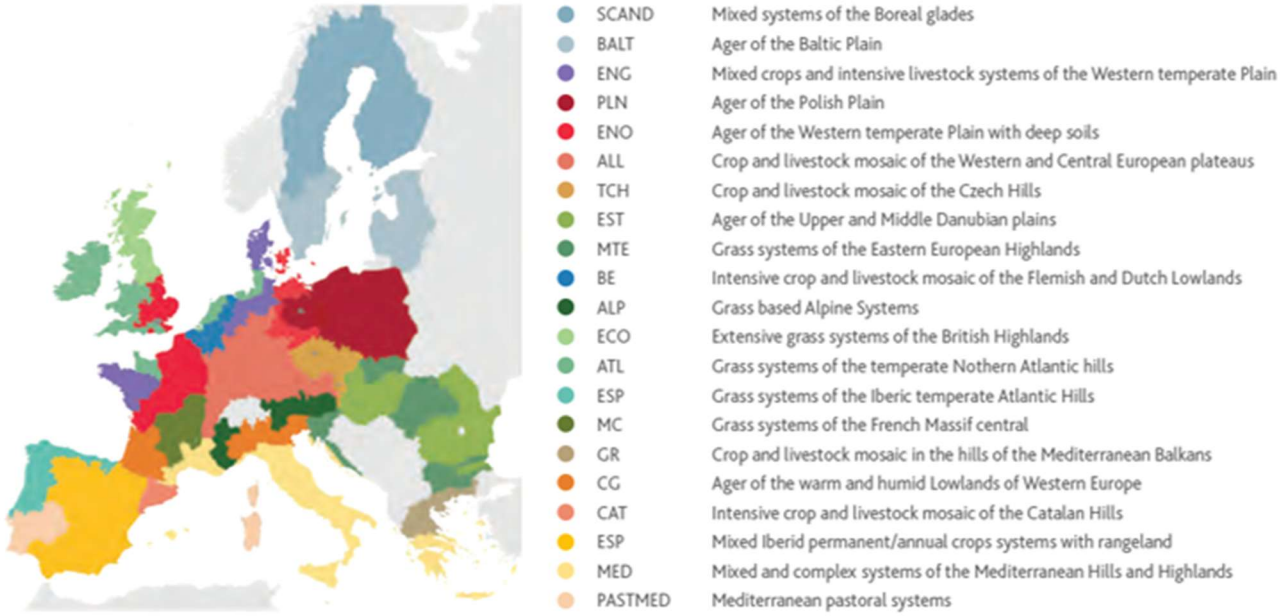

Figure 3: Twenty one agrarian regions identified and applied in the European-wide TYFA-regio model

Figure 3 shows that the UK had just three agrarian regions as detailed below:

[4] Nomenclature of Territorial Units for Statistics, with NUTS2 being the basic Regions for regional policies with populations of 800,000 - 3m.

- **aENO** = the ager of the western temperate plain with deep fertile soil. This is the eastern part of the UK and covers most of England. It has a high yield potential for crops such as wheat and barley.
- **hATL** = the grass systems of the temperate northern Atlantic hills. This covers the SW part of Enland, all of Wales and all of Northern Ireland. Due to significant rainfall provided by the Atlantic climate and the presence of deep soils, this has high yield potential for grass and cereals. It has high cattle and sheep populations.
- **hECO** = the extensive grass systems of the British highlands. This is specifically in Scotland and Northern England. High altitude and latitude, along with thin infertile soils constrain crop production in this region. Large permanent grasslands and other semi-natural habitats where sheep and cattle graze dominate the landscape.

Each of these regions includes internal heterogeneity. Most of the hATL zone counties in England, Wales and Northern Ireland also include significant areas of potential arable farmland. However, the variability of the TYFAregio parameters (e.g. yields or livestock densities) is always higher between two regions than within a given region.

Although the application of the European-model to UK-level was challenging, IDDRI was able to achieve this and deliver the Farming for Change report in partnership with FFCC. This used the following European / UK datasets:

- EUROSTAT at NUTS2 level (2010) for regional land use, livestock structure and detailed production outputs (yields). This divided the UK into 40 different units (district level in England and NI, unitary authorities in Wales and council areas in Scotland). A limitation of this is that EUROSTAT only covers the UAA of farms leaving out commons, representing 1.2 million Ha total and 4% of England, and 10% combined in the three other nations. These are mostly in the hECO region so this is less significant in terms of food production.
- DEFRA (2017) data to characterise food balances. They used data sets for import and export to estimate production.
- Food and Agriculture Organisation of the UN (FAO) (2017) data to characterise the average UK diet. This does not account for waste and losses. This is commonly used for international comparison and was also used for TYFAm.

As a result of these UK-wide datasets and the structural make-up of the TYFA-Regio model, early attempts to create a LA-TYFA-Regio model ran into challenges. In the case of Shrophire, the model could be applied without adjustment and seemed to deliver sensible results. However, in the case of North Lancashire, which contained more of a variety of soil types / climactic conditions across the District, the results were less realistic. This led to attempts to use Agricultural Land Classification (ALC) grades[5] across North Lancashire to mimic TYFA Bioregions, with the following equivalencies:

- ALC Grades 1 and 2 = aENO
- Grades 3 and 4 = hATL
- Grade 5 = hECO

Although this approach appeared to give more realistic results (in line with expectations), there were concerns from IDDRI about changing the model architecture in such a way. The explanations for the reasons behind this were not clear at the outset of the project and therefore it may be necessary to do a full re-structuring of the model in order to achieve clear, reliable results at local level. The creation of a LA-TYFA-Regio model would therefore require further investment of time and funding resources.

[5] North West England ALC Grades provided here: https://publications.naturalengland.org.uk/file/127054

1.3. Current Project Need and Aims

During the Summer of 2024 there were a series of meetings and discussions coordinated and facilitated by Dr Henry Russell (Founder, Russell Regen Ltd) involving FFCC, FoodFutures, Small World Consulting (SWC) and UK Centre for Ecology and Hydrology (UK CEH) to explore the next steps required to create LA-TYFA-Regio (e.g. for North Lancashire). This consortium has the following background and shared interest in the project:

- Dr Russell is a North Lancashire-based qualified regenerative agriculture consultant with a background that spans academic, charity and private sectors. He has strong experience in coordinating diverse groups of stakeholders and generating valuable outputs to ensure maximum impact from research spend.
- FFCC delivered the TYFA-Regio model and are ideally placed to shape a locally adapted version.
- FoodFutures (FF) have been developing and implementing a host of practical initiatives based on engaging the residents of North Lancashire to build a shared vision of what their own local food economy could look like. The potential of the LA-TYFA-Regio model for development of such a vision soon became obvious to members of FF. The group is already well connected to other cross-sector food partnerships across the UK, providing access to diverse perspectives and clear routes for increasing engagement with any project outcomes.
- SWC are experts in estimating the full supply chain carbon, land-based carbon emissions and sequestration, and developing Net Zero pathways. They can supplement the TYFA-Regio data with their own land use opportunity mapping datasets applicable specifically to North Lancashire and link to initiatives such as Zero Carbon Cumbria, Race to Zero, and Local Nature Recovery Strategies.
- UK CEH have teams specialising in Net Zero pathways for land use and are well placed to contribute to the re-modelling exercise.

The consortium applied for (and was successful in obtaining) AFN Network+ "FlexFund" funding in October 2024 to enable sufficient focus and time to be committed to the question of how the TYFA-Regio model can be adapted to a local context. The primary aims were:

1. Explore and identify which UK-specific and local datasets can be incorporated into the model for increased accuracy.
2. Bring together parties that are working in parallel towards the Net Zero and Nature Recovery targets and raise awareness of what information is available for sharing. This greater collaboration could provide wide-ranging benefits for local (and therefore national) action to deliver localised food systems supported by agroecological land management.
3. Offer clarity on the structure of a possible larger follow-on research project aiming at adapting the TYFA-Regio model to a "localised" i.e. sub-UK context.

2. Project Findings / Activity

2.1. Technical Conversations

The early stages of the project involved summarising the work that had been carried out to-date in producing the TYFA-Regio model, efforts to adapt this to local level (create LA-TYFA-Regio), and explore what was likely to be technically possible. Several "technical conversations" were carried out with FFCC representatives, Small World Consulting, UK CEH, and FoodFutures.

Unfortunately, the original modelling partners did not have capacity within the timescales of this project to participate in a technical interview nor were they able to provide in-depth detail on the methodology. This therefore formed one of the key findings of the exercise right from the outset:

Key Finding 1: Plenty of lead-time should be factored in to obtain the fine detail of the TYFA-Regio model from the developers (IDDRI) to enable the creation of the LA-TYFA-Regio model..

2.1.1. FFCC Findings

Five separate conversations were carried out over the space of two months with the following current and former FFCC representatives:

- Dr Jim Scown, currently Lecturer in Environmental Humanities at University of Exeter, formerly Programme Co-Lead Farming Transition at FFCC.
- Emily Linton, currently Farming Transition Programme Co-Lead at FFCC
- Georgie Barber, currently Land Use Lead at FFCC
- Kenny McCarthy, currently Programme Manager – Citizen Engagement (The Food Conversation) at FFCC, formerly Programme and Partnerships Lead at FFCC
- William Frazer, currently Project Manager at Growing Innovation Network (FFCC), formerly Programme Co-Lead – Farming Transition at FFCC

These conversations provided rich background to the work that had come before as well as their views on the most effective next steps to take.

Initially the conversation with **Jim Scown** was valuable in establishing his work in creating a LA-TYFA-Regio model. He had the following recommendations / comments:

- Quantitatively, the Agriculture Land Classification (ALC) grading system is far from perfect. Soil data could be a good dataset to feed into the model for its adaptation. An example includes Carnfield's NatMap data for soil carbon.
- Local knowledge is essential and grounding and truthing the data should be carried out after modelling.
- For making good quality decision a "granular" level of data precision is required. However, due to the scale used in the TYFA-Regio model, putting granularity back into the figures may well be impossible to do at the farm level using the IDDRI data alone. It therefore likely requires a different methodology altogether.
- The information being Open Source is absolutely critical. This can then be used by Food Partnerships on the ground for engagement. That's the starting point for bringing farmers into that discussion.
- Currently the TYFA-Regio model has an import/export balance at UK level. Therefore adjusting it down to "localised" (e.g. North Lancashire) level does not account for the amount of food grown in North Lancashire that is fed to local residents. It may therefore be better to calculate the diet balance at UK level then break it down by region. Cereals, meat and dairy would inevitably be UK wide with the exception of fruit and veg. This could be an important point to consider when getting to the methodological side of things.
- IDDRI had resistance to equating the ALCs to their agrarian regions as they felt the current 90% grassland makes Lancashire much closer to the hECO (northern uplands) portion of the model and therefore advised to use these figures alone. One interesting thing to note here is that different starting assumptions with this modelling lead to very different results, which ties in nicely with FFCC's message that this is not a top-down modelling exercise. Future development of LA-TYFA-Regio should therefore look to incorporate a wide range of UK-based datasets. It also raises the question to what extent *current* land use represents a good guide as to what might be *possible* with the land.

This was followed by a conversation with **Emily Linton** who has a focus on farming transitions (i.e. towards a more sustainable future with a just transition) and this returned the following recommendations / comments:

- It's important from FFCC's perspective to use these findings as a starting point for conversations rather than a "top-down" recommendation of what should/must be done.
- It's important to consider the broader food system and the fact that it's not just what we're growing on the ground but also the whole supply chain including processing, transport, infrastructure etc.
- When thinking about localism structure it's important to think about collaboration countrywide. Then understand what's needed at local level where actual decisions take place.

- Emily agreed with Jim's position that the ultimate resource should be Open Source and on a zero cost model. She added that FFCC's ethos prioritises inclusivity in access to knowledge and structural change at a system level.

A joint call with **Kenny McCarthy** and **Georgie Barber** yielded the following insights:

- England is much more diverse in terms of land use pressures than Scotland, Wales and Northern Ireland, which makes it more challenging from a modelling perspective.
- Due to the current political climate and the fact that things are changing dynamically (including the current Land Use Framework Consultation, ELMs Review, discussions around land sparing / land sharing etc), carrying out an updated TYFA-Regio model at UK-wide level (with latest datasets) would be a great starting point for a researcher. This could include more ambitious food waste reductions and updated carbon metrics from the Climate Change Committee (using 7th Carbon Budget). It would have the dual benefit of familiarising the researcher with the methodology and providing a useful (guaranteed) resource.
- It's important to reach farming organisations and landlords in some way with the modelling outputs as they are the people "on the ground". Land Agents often have a lot of influence in this regard, therefore could they be included in the conversation?

Finally, a conversation was held with **Will Frazer**, who was responsible for crystalising the main narratives that arose from the IDDRI report. He provided the following insights:

- During the TYFA-Regio modelling the various datasets utilised were not always available as they were released at different time points and from different sources. This therefore represented a challenge.
- Will mentioned that "Feeding Britain" by the Sustainable Food Trust was really valuable in validating their approach at FFCC and adding further weight to the feasibility and credibility of an agroecological future.
- The Trade Balance aspect of the model may be a reason that it's difficult to translate to regional level (to get the granularity). This impacts the input data and the assumptions that are made. Therefore, something to explore is whether you can tease the different elements apart and see what impact that has (e.g. if it was a more simplified model then this could be beneficial for getting down to regional level).
- One of the benefits of models such as these (including the Land Use Framework) is that it encourages people to think in terms of systems.

These insights were critical to shaping this project and the steps that came next. Below are the key findings that were yielded from these conversations to be taken forward in the next steps:

Key Finding 2: Soil data could be a useful dataset to feed into the amended model.

Key Finding 3: The amended model should be produced at UK-wide level but with the capability to "zoom" in and out of a local area. This is since no one region within the UK would likely be self-sufficient in food and would need to "import" and "export" from other UK regions.

Key Finding 4: Data should be Open Source so that the new LA-TYFA-Regio model can also be Open Source and deliver the greatest impact.

Key Finding 5: Carrying out updates to the TYFA-Regio model at UK-wide level (with the latest datasets) is a great starting point for a developer. This could include more ambitious food waste reductions and updated carbon metrics from the Climate Change Committee (using 7th Carbon Budget). It would have the dual benefit of familiarising the researcher with the methodology and providing a useful (guaranteed) resource/output.

Key Finding 6: A key stakeholder group to include in the project outputs is Land Agents who will likely find the outputs of the LA-TYFA-Regio model valuable for engaging with their clients.

Key Finding 7: It may be necessary to "tease apart" some of the inputs / outputs of the model in order to achieve local level granularity (e.g. omit trade balance data).

2.1.2. FoodFutures Findings

This technical interview was carried out with Rachel Marshall and Bill Grayson. At time of writing, Rachel is the Healthy Food and Environment Working Group Lead at FoodFutures and coordinator of a community climate action project in North Lancashire called "Closing Loops". Prior to this she worked as a soil scientist and was involved in a modelling project called Rurban Hope Spots which looked to model potential land for food growing in North Lancashire using open source datasets. Whereas Bill co-runs the Morecambe Bay Conservation Grazing Company with his wife Cath and has done so for the last 30 years. Bill has a background in ecology and nature conservation, experience that has helped him deal with some of the challenges that can often arise when trying to combine efficient animal husbandry with effective habitat management for nature conservation. Bill has been involved with FoodFutures for many years and actively feeds in on conversations around agroecology and local food system transformation. He is also an active member of the Zero Carbon Cumbria Land Use Panel, contributing to formulating their Emissions Reduction and Sequestration Action Plan.

The key findings from this conversation were as follows:

- The LA-TYFA-Regio model will be valuable for FoodFutures and other Sustainable Food Places Partnerships to start similar conversations about what an agroecological future could look like for their locality. Their initial interest was in using model data from the 'Farming for Change' model to form localised visualisations as tools for discussion but want to be confident that scaling the model down to sub-regional is a robust and valid approach
- It will be valuable to both FoodFutures and Lancaster City Council to create data maps to assist with engagement. For example when attempting to model nature and climate as well as food.
- The scale down modelling that was carried out in partnership between FoodFutures and Jim Scown substituted the three agrarian regions (aENO, nATL and hECO) with agricultural land classification (ALC) grades data which seemed like a sensible approach to bring more granularity to local level. However, more investigation into the fine detail of the model is required given IDDRI's comments shared by Jim Scown (see Section 2.1.1.).
- Bill in particular felt that regardless of the views of the original modellers, using ALC grades still represented a valid approach provided that all assumptions made were clarified. At the very least, it would represent a valid starting point for the modelling, then as and when more refined data sets for land use potential becomes available the model could be further refined. The main benefit would be in demonstrating the principle underpinning what could be a really useful next step in refining the process of envisioning an agroecological transformation.
- A key concern that was raised was around making the model "overcomplicated" to the point that the project doesn't keep momentum. Discussions around developing a regionally adapted model have been ongoing for a couple of years and there is a desire for action to take place. With this in mind, three elements arose in considering the next steps:
    - Funding – how likely is it to find / get funding for the next steps?
    - Feasibility – how likely is it that a sub-regional model will actually be possible?
    - Timing – given how fast things are moving in the policy space at the moment, ideally this would not be a project that takes more than a year.
- With all of this in mind, it's also important that the model should still maintain academic rigour to ensure it is respected by end-users (confidence and conviction). With this in place, the main benefit for FoodFutures would be to be able to use the results of the model to provide a vision of what an agroecological food and farming system would look like in North Lancashire and then to use that vision to attract and motivate stakeholders and funders to work with them to start delivering it.
- In terms of engaging people with the existing 'Farming for Change' model, what is the potential to create local maps (or other data visualisation) of potential land-use change based on the model scaled

down using Jim Scown's original sub-regional approach (without adaptation for more granular land classifications).

Rachel and Bill also provided the below valuable **data resources**:

1. DEFRA farm business survey and all the raw data. This has been put to good use by John Nix's team through interpreting the data and including in their annual "John Nix Pocketbook for Farm Management".
2. Natural England has been mapping linking up biodiversity spots with a focus on Priority Habitats Inventory, which could feed into the eventual model.
3. Lancaster City Council has their own maps of community space, green space and allotments.
4. Since DEFRA is undergoing their Land Use Framework consultation, they may have access to a number of valuable datasets that they may be willing to share for these purposes. This is one that could be followed up by the researcher and leverage connections that FFCC has with DEFRA on an ongoing basis.

Key Finding 8: From FoodFutures' perspective, it's important that the LA-TYFA-Regio model is not overcomplicated meaning that useful resources (e.g. data maps) are produced within financial, feasibility and temporal constraints, whilst still meeting necessary academic standards.

Key Finding 9: Although substituting the TYFA-Regio model's agrarian regions for the UK Agricultural Land Classification (ALC) Grades was resisted by the original developers at IDDRI, from FoodFutures' perspective this could represent a sensible starting point for the LA-TYFA-Regio model and could be updated as/when more suitable datasets become available.

2.1.3. UK Centre for Hydrology and Ecology Findings

This technical interview was held with Dr Sarah Sinclair from UK CEH, where at time of writing she is a Scenario Developer within the Land Use Group, focusing on pathways for land use for net zero. Sarah's research interests are interdisciplinary, focusing on how qualitative engagement with stakeholders can feed into the pathway development process and consequent quantitative modelling of those pathways. Sarah also has interests in the implications for food systems; from the production to the supply chain and consumer behaviour. Given this background, her input to the project was valuable, with details below.

- There may be something within the current TYFA-Regio model methodology that means if the land use data is amended (e.g. substituting for "land grading") then it could impact the biomass model. UK CEH has encountered similar challenges with the Food, Agriculture, Biodiversity, Land-Use and Energy (FABLE) Consortium. With all of this said, the land graded data could be better for the regional application and therefore could be incorporated into the model for improved granularity.
- Another consideration when working at UK-wide level is the challenge of the different devolved areas have different classification systems e.g. Scotland uses "Less Favourable Areas" and seven classes[6] rather than five in England. In addition, it's important to consider the political and cultural differences between devolved nations. UK CEH is currently facilitating workshops under the LUNZ Hub project with all the devolved governments and the preparation for each workshop requires different approaches owing to availability of information and cultural contexts. The CEH Net Zero Futures platform has been created in order to bring the countries together.
- Also, within work of the LUNZ hub in Northern Ireland they've had comments that the diet of England directly impacts NI more than the diet of NI because they export so much to England. This is therefore a consideration for the model / trade.
- In agreement with Jim Scown, Sarah liked the idea of starting at UK level but with the ability to "zoom in" to regional level. She thinks this will be the most valuable use of the datasets.
- Sarah was also supportive of potentially using TYFA-Regio as inspiration for a new model (rather than tweaking the existing model). The existing regions of the TYFA-Regio model are quite broad (just three in the UK) and therefore using other land classifications but still a biomass balance could be the way to

[6] https://www.data.gov.uk/dataset/72ba06ca-0239-4e99-a9ad-4a48f755a3bd/land-capability-for-agriculture-scotland

go.

- When selecting the datasets it's important that these are credible in the eyes of policymakers. For instance, at UK CEH they've been using UK specific data (such as agricultural statistics from DEFRA) with FABLE for their food system and land use model, as opposed to the FAOSTAT data, after workshops with UK stakeholders (UK FABLE link is here).
- One drawback of FABLE is that it's not spatial. UK CEH has a paper in review at time of writing that may be useful / of value as it used a downscaling optimisation model and they are looking to spatialise that. This could highlight some of the same issues that we've run into with the TYFA-Regio model and act as inspiration.
- The temporal scale of the regionally adapted TYFA-Regio model is a key factor. I.e. how far into the future will the model go? Looking at modelling the different pathways and could do sensitivity modelling around "If we went to 100%, 75%, 50% uptake of agroecology etc" what is the impact on various metrics? A good option could be to model to 2050 but do it in 5 year time steps, to provide the following opportunities:
    - 2025 - 2035 (ten year horizon): Shorter term it's probably more beneficial to the farmers / Sustainable Food Partnerships because they want to and *can* make decisions in the short / medium term.
    - 2025 - 2050 (25 year horizon): The long term is more important to policymakers and environmental groups to meet Net Zero and biodiversity targets (amongst others) as the impacts of afforestation, restored peatlands, rewilding takes more time to feed through in terms of improved emissions.
- Another consideration is that farming is just one part of this supply chain and incorporating other links / layers to this is going to be valuable. Having a mapped supply chain of the region could be a useful link between the modelling of the land use specifically and where the SFPs could be invaluable. This would address how we link Production with Society (the infrastructure).
- From the workshops CEH has run, what came across strongly from all nations was the need for spatial modelling and outputs when looking at different agricultural practices for nature and net zero – particularly within the context of different land use types. This included lots of discussions about how changes may be different depending on what land use or management was already in place, something that the TYFA-Regio model and this pilot can speak to quite well at a regional level.

In terms of the form that data takes, Sarah had the following recommendations:

1. For it to be available as spatial data and potentially for the resources to be interactive dashboards. This makes it valuable for making local decisions.
2. For them to be open access. This is a particular benefit about looking at things that are non-government as they tend to be Open Access. One thing UK CEH has found with datasets like livestock is that they're embargoed (sensitive data). Therefore if we want the ultimate *resource* to be Open Access then the underlying *data* needs to be Open Access.
3. For the model architecture and data sources to be transparent (i.e. to not be a "Black Box" model) as this is key to building trust with stakeholders and avoid resistance to engagement.
4. When building a new model (regionally) there needs to be consideration given to the national park boundaries (i.e. what the actual rules are)
5. To be mindful around GDPR data protection sensitivity issues, which is particularly relevant when getting down to high-resolution maps such as field level.

In terms of valuable datasets that could feed into the model, Sarah provided the following datasets (all of which meet the above criteria):

1. Land Cover Map - This is to 0.25km level and has been published yearly since 2019 by CEH. It's generated through remote sensing and lidar and carried out by Drones / satellites before processing at CEH and presented at different levels. Sarah discouraged using this for land use change decisions as it changes so much year on year. However, for a static baseline shot it's a great resource. The data behind it is not readily available but the spatial categories can be lifted.
2. Crop Map - This is an evolution of the Land Cover Map and includes crop rotations every three to five years which can be really useful (especially in North Lancashire where there is intensive grassland).

The model excludes NI though so we would need to make a decision here to fill in the gaps (it's difficult to find equivalents for NI). As a follow on, this is a good paper. To access this dataset you need to fill in a form then they let you access it.

3. There's various farming datasets available from DEFRA and national governments including livestock data, agricultural surveys and farm management practices. In England these go down to regional levels.
4. AgLand is a valuable resource. It aims to provide new data and models to support decision makers in the design and management of future landscapes. These will deliver both sustainable food production, and a wide range of other ecosystem goods and services.
5. The UK shared socioeconomic pathways (SSPs) project aims to help answer key questions about the country's resilience to climate change. They have many resources available including systems diagrams, semi-quantitative trends, quantified projections and publications, with all their spatial data and quantitative spatial trends free to access.
6. ASSET (assist scenario exploration tool) is an interactive dashboard that's been developed by CEH where various features can be adjusted vs the baseline including land cover change and crop grassland scenarios, and the impact this has on various metrics (including incomes, calories, soil nutrients and biodiversity). This is illustrated in Figure 4, below.
7. Other examples of interactive dashboards include:
    a. the Agrifood Calculator, which explores how different interventions in the food system impact the UK emissions balance, self-sufficiency, and land use;
    b. Land Use Transformations, (from The James Hutton Institute) which shows how land use change in Scotland can contribute to the delivery of net zero, climate adaptation and other environmental objectives
8. A recommended paper was "Pathways to achieving nature-positive and carbon-neutral land use and food systems in Wales" (2) which makes use of the FABLE calculator to explore land sparing (i.e. sustainable intensification of agriculture) and land sharing (i.e. agroecological principals) scenarios in Wales to see the impact this had on a range of metrics.

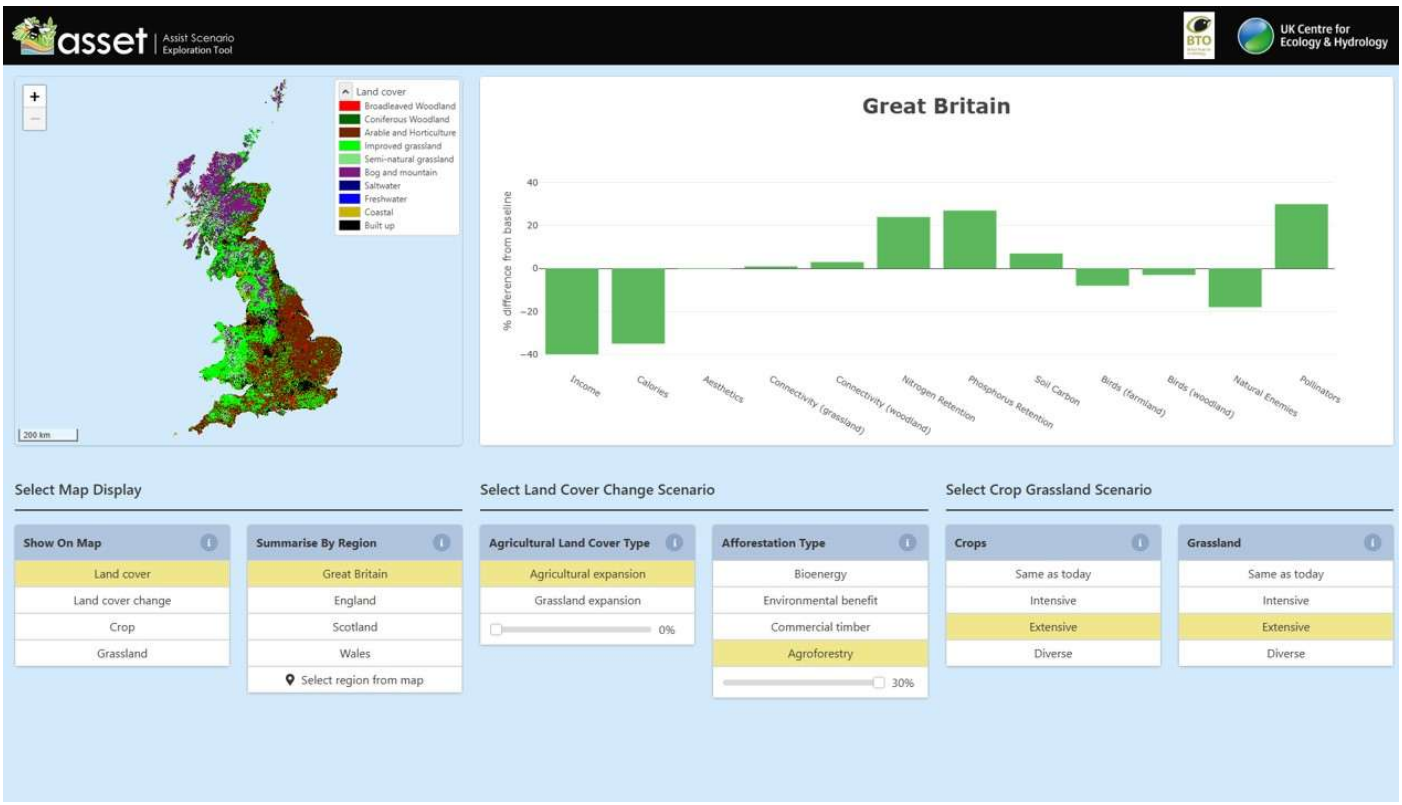

Figure 4: Example of the power of interactive dashboards: ASSET from UK CEH. Here showing the % difference from baseline under an extensive cropland, extensive grassland and 30% agroforestry afforestation type.

As someone that has worked on the development of models and resources previously, Sarah liked the idea of the workshop of this project to bring together the various stakeholders / "clients" at this stage to work out what will be valuable outputs. This "beginning with the end in mind" approach is likely to give the best chance of success and identify who the likely users will be of the resources. The recommendation was therefore in the workshop to elaborate on who the end user / stakeholder is and address this by including a wide range of stakeholders in the workshop and posing the question "what will be of most value to everyone?".

Key Finding 10: Have underpinning datasets that are credible in the eyes of policymakers, that can be spatially represented (ideally interactive dashboards) and that are open access (to enable the ultimate resource to be Open Access).

Key Finding 11: The temporal scale of the LA-TYFA-Regio model is important. One option could be to go with 5 year increments where the ten year horizon is likely to be more valuable to SFPs and the 25 year horizon more valuable for policy makers.

Key Finding 12: A wide range of open-source datasets are currently available and have been linked throughout this report for use by the Developer.

Key Finding 13: When carrying out the modelling consideration will have to be paid to the devolved administrations (Scotland, Wales and Northern Ireland) as these all have different datasets, policy commitments and cultural approaches to addressing the challenge(s).

Key Finding 14: Engaging with the end-user throughout the modelling process (e.g. FoodFutures and other SFP Partnerships) will give the best chance of success for the ultimate resources.

2.1.4. Small World Consulting Findings

The final technical conversation was conducted with Dr Dmitry Yumashev, who at time of writing is the Principal Consultant (Land Use) at Small World Consulting and leads the portfolio of projects on assessing landscape-level carbon emissions and land use change options to aid carbon sequestration. Recent clients include all UK National Parks, all Welsh National Landscapes, Cotswolds and Cannock Chase National Landscapes, multiple Local Authority districts and counties, and several private estates. This yielded the following valuable insights:

- Dmitry's view is that it should be technically feasible to develop a farm-level tool as SWC is currently achieving 10m by 10m resolution with national (England-specific) open-source data for their woodland opportunity mapping tool, which has 50+ different data layers incorporated. The model could include additional datasets for the given local area, e.g. local data on habitats, connectivity and planned urban development.
- An example woodland opportunity map for the Lancaster District is provided in Figure 5, below. In this, SWC is able to specify both the key ecological and policy constraints and opportunities for tree planting, and adjust their relative weights in a clear and transparent manner.
- Later in 2025, the woodland map is going to be extended to include a range of regenerative agriculture practices as alternative to tree planting. SWC also plans to developed it into an interactive web-based tool where more layers could be added and weights could be changed depending on the users' local knowledge and policy priorities. For example, the user would be able to adjust weights for agricultural productivity, flood mitigation, bird species protection, priority habitat enhancements, etc.
- Biomass balance modelling includes the nutrient balance within the food system. Dmitry would ideally like to see the underlying TYFA datasets and how they determined the productive land regions. This could be really valuable for integrating into the land-use models that SWC has already developed.
- In terms of the methodology of TYFA-Regio, Dmitry was keen to know more about the fine detail here. He was interested in potentially integrating datasets on subsidies, business revenue generation etc, that could be obtained from various national agricultural databases and are location-specific.

- Dmitry wondered whether financial incentives could be incorporated into the model including the public subsidies (different Tiers of the Environmental Land Management Scheme) and private add-ons (BNG, carbon credits etc).
- It was postulated that there could be two different forms and "clients" for the model:
    - Local (i.e. LA-TYFA-Regio e.g. North Lancashire scale), for which the clients would include any local authority, Sustainable Food Places Partnerships, National Parks etc. These don't have the direct capability to make changes to the farming practices on the ground but they create the conditions and momentum within their region to encourage landowners to pursue certain actions. To date, SWC has been mostly working with regional clients, but they're looking to bridge the gap between them and the landowners / farmers by teaming up with specialist consultancies such as Russell Regen and Restore.
    - Hyper-local (e.g. farm scale), for which the clients would be landowners, farmers, clusters of farms and land agents. This would be to the very granular geographic level to see what is possible on their land to make changes.
- Another area of discussion emerged: if a "hyper-local" TYFA-based model with SWC's opportunity mapping were developed, then "who will own the IP and the commercial rights?". SWC's land opportunity mapping uses Open-Source Data but it's part of their R&D cost and therefore it would need to be covered in fee-payment eventually. Therefore, there could be the following setup where:
    - LA-TYFA-Regio (e.g. North Lancashire scale) = free to all;
    - Hyper-local (e.g. farm scale) = online subscription-based.

  This was subject to further discussion with the wider consortium.

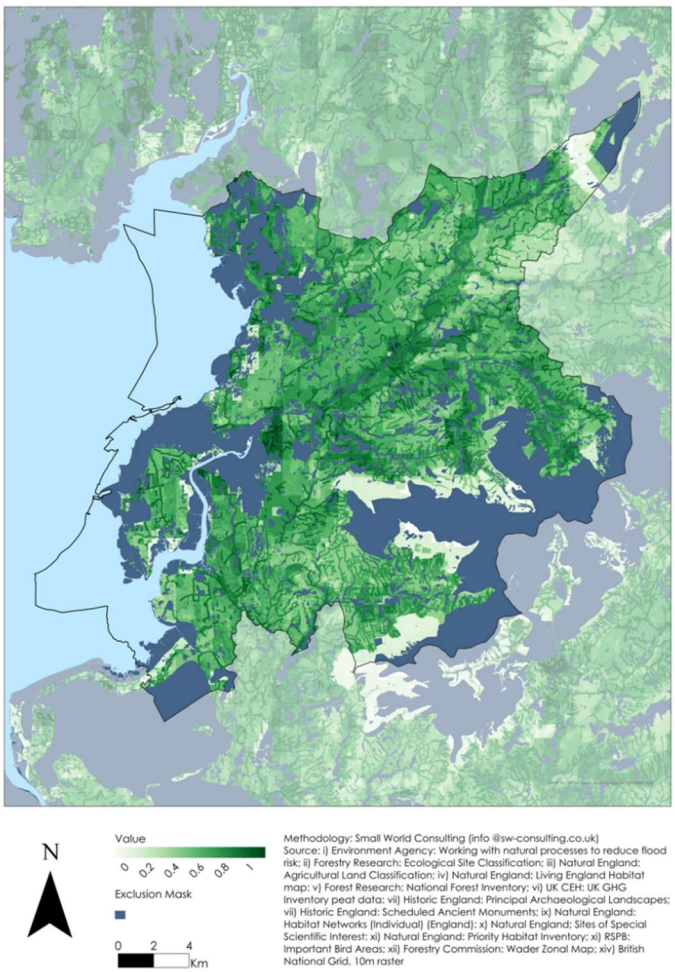

Figure 5: Example SWC Woodland Opportunity map for Lancaster District which is to 10m by 10m raster resolution.

Key Finding 15: In SWC's view, it should be technically possible to create both the "local" (e.g. District, County, National Park) and "hyper-local" (e.g. individual farms, clusters of farms) extensions to the TYFA-Regio model. Combined, the two extensions will reach and inform all the key stakeholders in the agroecological transition. However, development of the hyper-local model leads to questions around IP ownership, pricing structure and confidentiality (GDPR).

2.2. Consortium Discussions on Next Steps

Following the technical conversations, an interim update was provided to the Consortium which covered many of the key findings included in this report along with suggested next steps. There was particular focus on the feasibility and desirability of a "hyper-local" model under the current project aims. FFCC and FoodFutures both raised concerns, particularly around the principles of "knowledge of public good" and "accessibility and equity", all of which are impacted under a fee-based arrangement.

In order to bring clarity to the ownership and future development of the LA-TYFA-Regio model, FFCC provided a Terms of Reference document which provides a framework for the adaptation, refresh and ongoing use of the TYFA (UK) Modelling work. This clarified that intellectual property of the original model had not been registered. However, it outlines that future iterations or adaptations should follow stated principles, licensing terms and governance arrangements. Whichever consortium and/or Developer takes forward the next stages of developing the LA-TYFA-Regio model, these Terms of Reference must be considered before work commences.

Key Finding 17: FFCC has provided a Terms of Reference document for the use of the TYFA-Regio (UK) model which has been included in full in the Appendix. These terms must be considered when planning the development of LA-TYFA-Regio or any other derivative models (e.g. "hyper-local").

Following this discussion, it was recognised that the hyper-local model is one that could be developed in the future but would likely form a distraction to the focus of the current project, the "local" model. However, this conversation led to the emergence of other potential applications of SWC's datasets towards the planned LA-TYFA-Regio model. In particular:

- Dmitry shared that there should be ways to account for land sharing (agroecology / mixed farming) in the models that have so far generally adopted a land sparing approach due to ease of implementation. An example provided is the N14CP model for soil and biomass (3), where herbal leys were included in crop rotations where applicable to simulate agroecological transition as part of the ASSET scenarios (mentioned above). The model was run for the whole of the UK with a relatively high spatial resolution (~100,000 land parcels).
- Bill and Dmitry held a conversation around the fact that Agricultural Land Classification (ALC) grades had been used, alongside multiple other datasets, in SWC's woodland opportunity mapping to mask out the best agricultural land and target tree expansion on ALC grades 3 and above, which chimes with Bill's suggestion that the starting point for a re-modelling could be to equating ALC Grades 1 and 2 to TYFA Regio's ENO (arable east); Grades 3 and 4 to ATL (grassy west) and Grade 5 to ECO (uplands). Note that SWC's mapping breaks ALC Grade 3 into three sub-grades according to the current type of agricultural management. It was agreed that the mapping principles could provide a simple and hopefully straight forward way of interpolating IDDRI's original datasets for the different food outputs from these three land types into their equivalent areas within the North Lancashire system. A range of other datasets could also be explored / incorporated to refine the modelling further, including the Living England habitat map, UK CEH land cover and crop maps, Priority Habitat and SSSI maps, habitat connectivity maps, etc, many of which are already included in SWC's woodland opportunity mapping tool and could also be used to identify spatial opportunities for regenerative agriculture practices.
- SWC also clarified their mapping process for designating areas for nature conservation or nature restoration, e.g. Priority Habitats and SSSIs. The woodland map has multiple layers depicting these policy preferences. Most of these layers act as constraints, which restrict suitability for planting trees to

various degrees and in some cases result in complete exclusions. However, these zones are different from the blanket a-priori exclusions such as deep peat. The zonal constraints and uplifts act as adjustments to the underlying ESC bioclimatic suitability scores for trees (provided by Forest Research) and ALC Grade 3, 4 and 5 classes (with sub-grades for Grade 3). SWC is open to supporting the next steps in the project by employing many of the layers in the woodland opportunity mapping to fine-tune the adjustment of the TYFA-Regio to the regional context in the UK.

Key Finding 17: Many of the layers in SWC's woodland opportunity maps could be used to create LA-TYFA-Regio. These layers include modified ALC Grades, which could be substituted for the agrarian regions used in the current TYFA-Regio model.

Key Finding 18: A major benefit of this project has been in raising awareness among the Consortium members about the work and resources that each of them has been carrying out. This increased collaboration between the members will likely lead to increased impact beyond the scope of this project and contribute towards the UK's Net Zero and 30x30 Nature Recovery targets.

It was agreed between the Consortium that holding a multi-stakeholder workshop with representation from across the food system would be a valuable next step. This should not be a technical discussion but would instead explore what resources from the LA-TYFA-Regio model could be valuable to stakeholders and who would be the primary users.

2.3. Multi-stakeholder Workshop

2.3.1. Workshop Design and Invitees

The workshop had the following key design features:

***Intention**: To explore with a wide range of food-system stakeholders the key barriers to transitioning to an agroecological future and what features of a modified TYFA model could overcome these barriers.*

***Format:** Online*

***Date/Time**: 10:00 - 11:30 Tuesday 25 February*

Agenda:

1. *Welcome, personal share and Check In (via chat)*
2. *Scene Setting - Background to the TYFA model, intention for the session and proposed group agreements*
3. *Breakout Group Session - Grouped together by "food producer", "academia", "policy" and "advisory", and invited to explore what is within and outside of your control to transition to agroecology*
4. *Breakout Group Harvest - Gain feedback from the various groups.*
5. *General Discussion – What are features of the TYFA-Model that would be valuable to you?*
6. *Close, Thank Yous and Next Steps*

One of the key aims of the workshop was to have as much representation from right across the food system as possible, which was a primary reason behind the online format and relatively short duration (90 minutes). The technical detail of the model was also left out of the discussion in order to make it as accessible and attractive to attend for as many people as possible.

In terms of outreach, all of the consortium's networks were leveraged to maximum effect and this resulted in 22 attendees with representation from the following organisations (in addition to the consortium):

- Lancaster City Council
- Westmorland and Furness Council
- Natural England
- RSPB

- Woodland Trust
- Low Sizergh Barn (Cumbria dairy farm and farm shop)
- Brook House Farm (Lancashire organic horticulture farm)
- Botton Head Farm (Lancashire sheep farmer)
- Nourish Northern Ireland
- Cumbria Action for Sustainability
- Pasture for Life
- Nature Friendly Farming Network

In addition, the workshop agenda design had the greatest level of inclusivity in mind (along EDI principles) – with the check in, scene setting then going into breakout groups with people from similar backgrounds / contexts intended to create the greatest opportunity for a feeling of ease and likely contributions.

2.3.2. Workshop Outcomes

There were multiple benefits / outcomes from the workshop. During the **Check In**, invitees were offered the prompt "I'm here because I want to get … from the session" to get a feel for what people were looking for from the session and therefore make it as valuable / meaningful as possible. Below are the responses:

- Interested in how the model could be implemented and reflect the needs in NI
- How the model could fit with existing farming and land use plans
- Explore opportunities for reducing carbon emissions in agriculture
- Learn about agroecology principles and their implementation
- How the model relates to work on connecting people with nature and benefiting health
- Learn about the model and how the NFFN network can help support the transition
- Background info to help understand what we might need in order to work with a data model/visualisation of the land use
- Be part of the network operating beyond what we do today
- Gain knowledge locally
- Hear about how a more localised version of the model could be useful at a grass roots level
- To hear about what's happening in project area (Pasture for Life)
- To see whether spatial mapping of regenerative practices underpinned by the best available data could be useful to accelerate the transition

This demonstrated the broad range of interests in this particular area and the key themes appeared to be building local networks / awareness; increasing technical understanding of agroecology and exploring how the TYFA model could help to accelerate the transition to agroecology.

Following on from this and the scene setting presentations, the Breakout Groups grouped by area of the food system provided the following insights when asked what they have within and outside of their control in transitioning to agroecology:

Group 1: Food producers' group

- One of the key themes was around the need for awareness of the benefits of agroecology to consumers. Routes to achieving this are through certification (as demonstrated by the Organic sector; giving confidence to consumers around what they're buying), agroecology-focused membership organisations such as Nature Friendly Farming Network and Pasture for Life, and peer-to-peer learning which is why local connections such as FIPL (Farming in Protected Landscapes) is so valuable.
- Once the awareness is achieved then more of a premium can be charged for produce (this offsets the cost of certification) which can be more difficult for livestock producers than horticulture producers. That said, affordability needs to be considered for the end-user and food justice discussions.

- This group also discussed the importance of having a local market, which really makes a difference to working in local areas.

Group 2: Academia / Specialist Consultancies

- Academia and consultancies can help with modelling and the evidence base but it's important to clarify what we're setting out to achieve at the outset e.g. what scale from local through to regional.
- In addition, academia and consultancies can provide high resolution data tools to share "best practices". Here the farm can be seen as a micro-business and for this to be accounted for in the model. However, concerns were raised in this group about the data intrusion at farm level.
- It was agreed that farming decisions are driven by multiple factors and that the model might not have much influence over the farming community. It's therefore important to be careful with how the model is used.
- Finance is not the only lever for delivering change, there's also cultural and social factors which should be considered and the question was asked about how the models could be constructed to help facilitate these conversations and ultimately changes.
- Food choices are a big part of making the model work - what are the economic and societal norms that will drive that. This element felt out of the academics' and consultants' control (consumer behaviour difficult to model) and therefore there was an inclination to focus more on the production side, starting with financial incentives for farmers.

Group 3: Policy

- This group identified that the positive aspects already happening in this space includes:
    - Highlighting what can be done and what is possible
    - Policy support for land sharing
    - Supporting the need for transition
    - Alternative models for shifting language use to bring people together on the same page (i.e. diverse stakeholders including farmers, consumers, policy-makers and academics.)
    - Bringing stakeholders together - collaboration across groups
- The barriers to taking the change forwards includes:
    - Consumer change
    - Financial barriers
    - Land use policy not allowing for change
    - Carbon calculators - so many out there that can be confusing (e.g. often producing significantly different results when applied to the same holding.)
    - Resourcing on projects (e.g. suspension of Sustainable Farming Incentive applications)
    - National funding landscapes (including both uncertainty around availability of funding and longevity of schemes, and funding differences between the four UK nations).
    - Asking people to invest in land use change. Positive changes often don't come for several years down the line and there's a need for long term investment planning at all levels of the supply chain. Short term tenancies also cause barriers here.
    - Engagement - some people are leading the way, although some people haven't yet engaged in the process, although the winding down of the Basic Payment Scheme by 2027 will help to focus their attention[7].
    - Lack of coordination / collaboration that can sometimes be found in the funding/ advice/ research space. An example of this is that there are different definitions of sustainable land use, with "agroecology" not used in some places.
    - Conflicting advice can make the landscape confusing for a wide range of stakeholders including the farmers.

[7] Although not mentioned in the session, for additional context, at the time of writing DEFRA has now hastened the process and BPS payments for 2025 will be considerably less than was originally proposed.

- Pressure on farmers - from every single angle - which makes things very difficult

Group 4: Advisory / Advice

- What was within this group's control was a recognition that the most powerful interaction is likely the farmer-to-farmer (peer-to-peer) learning and therefore our key role is to facilitate these learning opportunities and increase the chances of this interaction.
- The main challenge this group faced was that, although they are offering advice / creating spaces for things to happen, they don't have direct control over decisions that are made. There was a recognition that interacting with the farming community around nature is challenging, especially with the wide range of pressures that farmers are under currently. In addition, engaging with wider society around the importance of nature-friendly methods of (whole) food production can be challenging for some people who can barely afford to put food on the table.

Building on the breakout group discussion and sharing back to the main group, the discussion then turned to what features of a modified TYFA-Regio model would be valuable to the attendees. Below are the key discussion points from this section:

- The model should have a form that stimulates interest from other local food groups across the country to push back against the "business as usual" food system.
- We should recognise that farmers are unlikely to look at models such as these due to their workload and therefore consideration should be paid to the "infrastructure" that delivers the model outputs to farmers. This should include groups like Pasture for Life and the Nature Friendly Farming Network both of whom communicate directly with their farmer members (together with the various organic sector bodies, local farmer networks and national farming unions like NFU and for facilitating peer-to-peer learning or agricultural consultants/advisors/land agents.
- As a response to the above, Pasture for Life stated that:
  - regional models work much better than the national scale
  - short, sharp and simple is best for communicating - sometimes if there is too much information it's not read / looked at
- Pasture for Life also stated that sometimes little things start from nowhere, e.g. one chef might champion PFL and stock their restaurant, which builds and builds. An overarching theme is that farmers need to sell their story to sell their products and that PfL's role is to support farmers in telling those stories.
- The model can be used to create a different story about food production - we have been told for a long time we can only create enough food if we use a greater amount of inputs and farm intensively - a model of an agroecological food system can help change that narrative and create images of a different future.
- The model could be used by corporations and they were perhaps a missing link in the workshop. They are interested in where food is coming from (the story) and do want to source food responsibly in order to demonstrate their commitment to providing sustainably produced food. Therefore, the model could be used to show how food could be produced in another way, i.e. as a communication tool.
- As a counter-view to the above, concerns were raised about relying on big food businesses as this could take away from the food sovereignty principles of agroecology. FoodFutures is demonstrating that there are other ways to sell and engage with consumers where local producers can forge closer links to those that are eating the food they are producing (rather than through supermarkets) e.g. through their Food Hub "Gather".
- A benefit of the modelling is to provide information for really effective storytelling – there's so much evidence out there already that agroecology is good for the farmer, the consumer and the planet. It will therefore serve multiple purposes including:
  - To provide evidence to policy makers regarding the feasibility and desirability of transforming the UK's food and farming system along agroecological lines;

    - To show that there is popular support for such a transition centring on and inspired by the efforts of the many community food initiatives that between them make up the membership of Sustainable Food Places network;
    - To demonstrate to a farmer-led audience that agroecological farm businesses can still be profitable without having to depend on artificially elevated and, in the long term, unsustainable use of chemical inputs.
- The model outputs should be such that we can widen who we are sharing this with (i.e. the general public) so we can talk to people we haven't spoken to before. The benefits of this are to connect people with where their food comes from in an effective way and therefore facilitate nature connectedness (connecting people with nature in a relationship way). i.e. to demonstrate that providing a continuing and sufficient supply of healthy food for ourselves depends on restoring and maintaining all of the essential ecosystem services that only a properly functioning natural environment provides.

In the author's view, the workshop was a success and revealed several key findings which can be taken forwards in future research as detailed below:

Key Finding 19: The infrastructure of delivering model outputs to farmers and sharing them between farmers is key. The messaging should be simple and in a form that "link" organisations such as Pasture for Life and Nature Friendly Farming Network can deliver with ease.

Key Finding 20: There was broad support for developing a locally-focused model (LA-TYFA-Regio) and there was a sentiment that such models are more effective for engagement than national models. This could inspire community-wide support for an agroecological transformation of the local farming system; one that prioritises local markets for its products.

Key Finding 21: Furthermore, any locally-focused model outputs should be in a form that is able to reach a general audience and promote effective storytelling. Having qualitative (case studies) as well as quantitative elements to the model will help to deliver this aim.

In addition, below is a selection of positive feedback from a handful of attendees:

- Libby Flintoff (local organic grower): *"Thank you so much for inviting us to join Tuesday's workshop - it was very well organised! It was good to have a brief introduction to others who are working within the field of agroecology, particularly those who are local to us, as we don't often have the time to do this."*
- Claire Harris (Natural England Health and Environment Higher Officer, Cumbria Area Team): *"What I enjoyed about the session was learning about agroecology and the mix of different people and backgrounds represented on the call"*
- Rob Bunn (Project Manager, Pasture for Life): *"I thought you did a really good job of hosting yesterday, very personable and inclusive"*

3. Conclusion and Next Steps

3.1. Key Findings and Delivery against the Primary Aims (Impact)

This FlexFund project, kindly funded by AFN Network+ and UKRI, sought to provide the foundations for the development of the TYFA-Regio model into a locally-adapted "LA-TYFA-Regio" model through the exploration of relevant datasets, establishment of what resources from the model would be desirable to stakeholders, and build connections along the way. Although it was short in duration, the project was flexible in its approach based on findings along the way. It's the author's view that this emergent approach to the project has maximised the key findings which are summarised below for easy reference:

1. Plenty of lead-time should be factored in to obtain the fine detail of the TYFA-Regio model from the developers (IDDRI) to enable the creation of the LA-TYFA-Regio model.

2. Soil data could be a useful dataset to feed into the amended model.
3. The amended model should be produced at UK-wide level but with the capability to "zoom" in and out of a local area. This is since no one region within the UK would likely be self-sufficient in food and would need to "import" and "export" from other UK regions.
4. Data should be Open Source so that the new LA-TYFA-Regio model can also be Open Source and deliver the greatest impact.
5. Carrying out updates to the TYFA-Regio model at UK-wide level (with the latest datasets) is a great starting point for a developer. This could include more ambitious food waste reductions and updated carbon metrics from the Climate Change Committee (using 7th Carbon Budget). It would have the dual benefit of familiarising the researcher with the methodology and providing a useful (guaranteed) resource/output.
6. A key stakeholder group to include in the project outputs is Land Agents who will likely find the outputs of the LA-TYFA-Regio model valuable for engaging with their clients.
7. It may be necessary to "tease apart" some of the inputs / outputs of the model in order to achieve local level granularity (e.g. omit trade balance data).
8. From FoodFutures' perspective, it's important that the LA-TYFA-Regio model is not overcomplicated meaning that useful resources (e.g. data maps) are produced within financial, feasibility and temporal constraints, whilst still meeting necessary academic standards.
9. Although substituting the TYFA-Regio model's agrarian regions for the UK Agricultural Land Classification (ALC) Grades was resisted by the original developers at IDDRI, from FoodFutures' perspective this could represent a sensible starting point for the LA-TYFA-Regio model and could be updated as/when more suitable datasets become available.
10. It is important that the underpinning datasets are credible in the eyes of policymakers, that they can be spatially represented (ideally interactive dashboards) and that they are open access (to enable the ultimate resource to be Open Access).
11. The temporal scale of the LA-TYFA-Regio model is important. One option could be to go with 5 year increments where the ten year horizon is likely to be more valuable to SFPs and the 25 year horizon more valuable for policy makers.
12. A wide range of open-source datasets are currently available and have been linked throughout this report for use by the Developer.
13. When carrying out the modelling consideration will have to be paid to the devolved administrations (Scotland, Wales and Northern Ireland) as these all have different datasets, policy commitments and cultural approaches to addressing the challenge(s).
14. Engaging with the end-user throughout the modelling process (e.g. FoodFutures and other SFP Partnerships) will give the best chance of success for the ultimate resources.
15. In SWC's view, it should be technically possible to create a "hyper-local" model which may be of interest to landowners and land agents, however, there are questions arising around IP ownership, charging structure and confidentiality (GDPR).
16. FFCC has provided a Terms of Reference document for the use of the TYFA-Regio (UK) model which has been included in full in the Appendix. These terms must be considered when planning the development of LA-TYFA-Regio or any other derivative models (e.g. "hyper-local").

17. Many of the layers in SWC's woodland opportunity maps could be used to create LA-TYFA-Regio. These layers include modified ALC Grades, which could be substituted for the agrarian regions used in the current TYFA-Regio model.

18. A major benefit of this project has been in raising awareness among the Consortium members about the work and resources that each of them has been carrying out. This increased collaboration between the members will likely lead to increased impact beyond the scope of this project and contribute towards the UK's Net Zero and 30x30 Nature Recovery targets.

19. The infrastructure of delivering model outputs to farmers and sharing them between farmers is key. The messaging should be simple and in a form that "link" organisations such as Pasture for Life and Nature Friendly Farming Network can deliver with ease.

20. There was broad support for developing a locally-focused model (LA-TYFA-Regio) and there was a sentiment that such models are more effective for engagement than national models. This could inspire community-wide support for an agroecological transformation of the local farming system; one that prioritises local markets for its products.

21. Furthermore, any locally-focused model outputs should be in a form that is able to reach a general audience and promote effective storytelling. Having qualitative (case studies) as well as quantitative elements to the model will help to deliver this aim.

With these key findings in mind, the following has been delivered against the Primary Aims of the project set out in the Introduction (i.e. the Impact of the project):

Primary Aim 1*: Explore and identify which UK-specific and local datasets can be incorporated into the model for increased accuracy..*

The technical conversations outlined in Section 2.1 contains a wide range of datasets that can be used in the LA-TYFA-Regio model, as well as connections with organisations that are willing to develop their models further through knowledge-sharing (e.g. Small World Consulting). This primary aim has therefore been met and gives a good foundation from which to start for a researcher.

A "value add" from this is that the current report offers a useful summary of datasets available for other modelers looking to act towards Net Zero and Nature Recovery targets (e.g. those provided by UK CEH), and therefore could have impact beyond the scope of the current research project.

Primary Aim 2*: Bring together parties that are working in parallel towards the Net Zero and Nature Recovery targets and raise awareness of what information is available for sharing. This greater collaboration could provide wide-ranging benefits for local (and therefore national) action to deliver localised food systems supported by agroecological land management.*

This was one of the primary successes of the project in the view of the author. Starting with the consortium, the publication of this report and the conversations that occurred during the project have deepened the connections and the awareness of the consortium's ongoing work and previous publications. Section 2.2. (Consortium Discussions on Next Steps) was a case-in-point, where the discussion around the "hyper-local" model led to awareness-building and ongoing conversations that are still underway at the time of writing concerning improving land-use carbon modelling thus likely to positively contribute towards meeting Net Zero targets.

In addition, the network building that was achieved through the arrangement and facilitation of the workshop with a wide range of stakeholders was positively reported back by attendees. Again, the "ripple effects" of this workshop and the further impacts once this is published online for general viewing has been a success of the project.

Primary Aim 3: *Offer clarity on the structure of a possible larger follow-on research project aiming at adapting the TYFA-Regio model to a "localised" i.e. sub-UK context.*

The primary audience of this report is intended to be the researcher who will take forwards the creation of the LA-TYFA-Regio model. The intention is that this report will act as the ideal starting point in terms of:

- the organisations with which to collaborate
- some key open-source datasets that are currently available
- previous explorations into LA-TYFA-Regio (e.g. agrarian regions to ALC grades application in North Lancashire)
- suggested starting points with the model architecture (e.g. removing trade-balance aspects to drill down to local level) and approach (e.g. running the model as-is to start with using updated datasets)
- key stakeholder users of the outputs (e.g. local authorities and Pasture for Life) and the form that these outputs should take

The current project has both increased the likelihood of a follow-on research project occurring (i.e. as a result of clarity around the scope of the research project and therefore attract research funding) *and* of it being a success. As outlined throughout this report, if a LA-TYFA-Regio model is delivered then it will be a valuable resource for locally-based stakeholders towards Net Zero and Nature Recovery targets, and therefore increasing its probability of coming into being is the main impact of this project.

3.2. Outputs

The project has yielded the following **outputs**:

1. The key output from this project is the current report, which should form an invaluable resource in the next steps of the development of the LA-TYFA-Regio model for a researcher.
2. Coupled to the full report will be a short report that will be published on the AFN Network+ website to give the key outcomes from the research project.
3. The recorded workshop which was facilitated with stakeholders from across the food system will be made available for general access on the Russell Regen, FoodFutures and AFN Network+ websites.
4. An article is planned for THRIVE magazine, North Lancashire's Community Food Magazine produced by FoodFutures, which will tell the story of the project to a generalist audience and is due for publication in early Summer.
5. On the back of the article for THRIVE magazine, social media briefings will also be publicised to a generalist audience.

3.3. Next Steps

This FlexFund project has shown that there is an appetite for a LA-TYFA-Regio model and that this could have a positive contribution towards meeting the UK's Net Zero and Nature Recovery targets at a local level. The author of this report, Henry Russell, is currently the Chair of the Food Economy Working Group at FoodFutures and therefore has the advantage of staying close to and contributing towards the next steps following from this research project. Clearly, the key is to build a consortium to take this work forward and obtain funding to develop the LA-TYFA-Regio model, and therefore this will be his next priority. The first step will be to convene a meeting with the current Flex Fund project consortium to establish which partners are interested in taking the work forwards and bidding for research funding. In the event that enough resource is available within the consortium (i.e. to bid for research funding and to have a suitably qualified Developer) then the work will be taken forwards from there. If there is not enough capacity / resource within the consortium then other partners will be identified and, once the new consortium and funding are in place, then a smooth handover will be initiated, thus maximising the chances of success of the model development.

References

1. **Poux X, Schiavo M, Aubert P.** *Modelling an agroecological UK in 2050 - findings from TYFAregio.* s.l. : IDDRI, 2021.

2. *Pathways to achieving nature-positive and carbon–neutral land use and food systems in Wales.* **Jones SM, Smith AC, Leach N, Henrys P, Atkinson P, Harrison PA.** 37, s.l. : Regional Environemntal Change, 2023, Vol. 23.

3. *Terrestrial carbon sequestration under future climate, nutrient and land use change and management scenarios: a national-scale UK case study.* **Yumashev D, Janes-Bassett V, Redhead J.W, Rowe E.C, Davies J.** 11, s.l. : Environmental Research Letters, 2022, Vol. 17. 114054.

APPENDIX

Food, Farming & Countryside Commission

Terms of Reference for the use of the TYFA(UK) Model

This Terms of Reference (ToR) provides a framework for the adaptation, refresh, and ongoing use of the TYFA (UK) modelling work originally commissioned by the Food, Farming and Countryside Commission (FFCC) and produced by IDDRI. Given that the intellectual property (IP) of the original model has not been registered, this document clarifies the principles, licensing terms, and governance arrangements to guide any future iterations or adaptations of the model.

This ToR is intended to:

- Ensure the model remains freely accessible to users.
- Clarify intellectual property considerations and licensing terms.
- Set out approval and oversight processes to manage risks, including potential changes to core assumptions.

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1. Intellectual Property

- **Original Model IP**: The original model produced by IDDRI remains unregistered, meaning there is no formal IP ownership claim beyond acknowledgment of authorship.
- **Future Adaptations**: Any significantly adapted or refreshed versions of the model are likely to constitute new IP and will be regarded as distinct iterations, though they may refer back to and build upon the original assumptions and structure.
- **Attribution**: Future adaptations must appropriately credit the original authors and the commissioning role of FFCC, along with any other contributors involved in subsequent iterations.

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2. Core Values

The adaptation and use of the model will adhere to the following core values:

- **Transparency**: Assumptions, methodologies, and data used in any version of the model should be clearly documented and openly accessible.
- **Accessibility**: The model and any supporting outputs must remain freely accessible to the public.
- **Collaboration**: Where feasible, contributions to model development and assumptions should be co-created or peer-reviewed to enhance legitimacy and diversity of input.

3. Approval & Oversight

- **Decision-Makers**: Key stakeholders, including designated FFCC leads, must be made aware of significant adaptations to the model.
- **Risk Management**: Any major changes, especially those affecting core assumptions or outputs, should be discussed and approved by FFCC to mitigate potential risks (e.g., loss of model control or misalignment with FFCC's goals).
- **Advisory Role**: If IDDRI is not directly involved in future iterations, an advisory group may be engaged to provide oversight and input on key assumptions.

4. Licensing & Attribution

- The model and any future iterations will be released under a **Creative Commons license (CC BY 4.0),** allowing for adaptation, sharing, and non-commercial reuse, provided appropriate attribution is given to the original authors (IDDRI and FFCC).
- Supporting documentation, publications, or tools derived from the model will follow the same open-access principles.

5. Dispute & Conflict

In the event of any dispute over the use, attribution, or adaptation of the model, the following resolution process will apply:

- Initial resolution attempts will be made informally between the parties involved.
- If unresolved, the issue may be escalated to FFCC's designated decision-makers for mediation.
- If necessary, a third-party mediator may be engaged to facilitate a resolution.

6. Definitions

For the purposes of this ToR, the following key terms apply:

- **Model**: Refers to TYFA(UK), the original FFCC-commissioned model produced by IDDRI , as well as any future adaptations or iterations.
- **Adaptation**: A significant refresh, alteration, or extension of the model, which may involve revisiting or revising the original assumptions.
- **Creative Commons License (CC BY 4.0)**: A public copyright license that allows for free distribution, adaptation, and reuse, provided appropriate credit is given.

7. Appendix / References to Model

- The TYFA(UK) model, as outlined in the "Farming for Change" report, explores the feasibility of transitioning the UK's food and farming systems to agroecology by 2030. It assumes the elimination of synthetic inputs, a shift to healthier, lower-meat diets, and extensive livestock farming integrated with natural grasslands, aiming to reduce greenhouse gas emissions, enhance biodiversity, and improve food security. Though it anticipates a decrease in overall production, this is balanced by reduced food waste and dietary changes to ensure sustainable outcomes.
- The original work can be found here.
- Contact information for relevant FFCC stakeholders and key decision-makers.
    - Dr Charlie Taverner, Farming Futures Policy Lead: charlie.taverner@ffcc.co.uk
    - Emily Linton, Farming Futures Pathways: emily.linton@ffcc.co.uk

Courtenay House,
Pynes Hill,
Exeter, England,
EX2 5AZ

Emily Linton
emily.linton@ffcc.co.uk
+44 0 123 456 7890

www.ffcc.co.uk
@ffc-commission.bsky.social