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The Multidisciplinary Approach of Rural Studies - Research article

## Contested ecological transitions in agri-food: emerging territorial systems in times of crisis and insecurity

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**Abstract.** The paper will assess the extent to which sustainable transitions are occurring with reference to Europe in the 2020's. Here, re-assessing the relationships between science, policy and politics is critical given the 'polycrises' which are impacting upon our food systems. Do these interlinked crises and disruptions suggest opportunities for sustainable and more territorial transitions in agri-food to gain traction and scale out? This is a possibility, but we have to critically assess the revised power configurations that are emerging in a more variegated and diverse agri-food policy and political landscape. Established theories of sustainable transitions need adjusting to take account of a changing science-policy-political landscape, and one which will have to integrate (rather than fragment) the new drivers of net-zero, necessary health and diet shifts, food poverty and security concerns, as well as sustainable and regenerative farming and land-use practices. This gives more opportunity, it will be argued, for integrated territorial management which encourages multi-stakeholder policies and politics. The routes to this are, based upon our recent empirical evidence far from linear; rather they are often inert rather than capable, competing rather than collaborative. As such we need to devise political and policy frameworks at devolved regional and territorial levels. The paper will explore examples of how and where this might be taking place, and what lessons can be learned for re-theorising agrarian transitions.

**Keywords:** transitions, polycrises, land use practices, sustainable and regenerative farming.

**JEL codes:** Q18.

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### HIGHLIGHTS

- Re-understanding agrarian transitions
- Re-theorising transitions towards more sustainable agri-food systems
- The role of science /policy interfaces
- The role of neo-liberalised governance in the case of the UK.

## 1. INTRODUCTION: BIMK SYSTEM

This paper considers the processes of agri-food transition in a period of polycrisis. The 2020s represent perhaps a surprising but disturbing upturn in the volatility and vulnerability of European agri-food systems; embodied as they are in current and ongoing wider macro-economic and geopolitical convulsions. This comes also at a time when more rationalist scientific and policy thinking has become highly normative around the macro-concerns and indeed imperatives of reaching ‘net-zero’ targets regarding carbon emissions and de-carbonisation, restoring natural forms of bio-diversity, ‘sustainable intensification’ and significantly improving consumer diets. Yet as we see here with empirical reference to longstanding and longitudinal research on two agri-food regions in the UK, there are significant gaps and fissures developing between this growing scientific and policy rationalism and yet the diverse and embedded empirical realities, which display highly contested, somewhat inert and differentiated pathways of transition.

These empirical realities and relationalities point to the systemic relevance of focussing and understanding the sociological Bio-physical-Innovation-Market-Knowledge Systems as transition mechanisms which are engrained in agri-food production and processing systems (BIMK-systems)<sup>1</sup>. The paper first outlines the contours of the polycrisis, and then through a comparative empirical lens, looks at the diverse realities of transition and adaptation in BIMK systems now occurring in the agricultural systems as part of their role in wider food systems. In conclusion we ask the question: what does this mean for our theorising of more sustainable agri-food transitions?

## 2. TRANSITIONS AMIDST POLYCRISIS

The current global food system exhibits a series of combined negative and interconnected sustainability issues associated with biodiversity loss, water pollution, soil degradation, climate change as well as diet-related health problems. Agricultural contributions to greenhouse gas emissions and food waste are also concerns particularly relating to intensive animal production. Changes to the agri-food system is critical so as to align

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<sup>1</sup> I use the term agri-food system here throughout the text to locate the relationships between agricultural production practices and its links with the wider food system. This is the focus of the paper. This is a subset of the wider concept of food system which incorporates the whole nexus of relationships including food consumers and consumption realms.

environmental (food, energy, water) and health goals. Also, global demand for food by 2050 will require dietary change and significant reductions in food waste, whilst current technological and yield increases will be insufficient to meet these demands. These problems are being exacerbated by a series of interconnected political and market power asymmetries associated with ongoing land concentration, supermarketization, financialization and digitalization which are concentrating the ownership and management of food systems in few hands. Also today, at the agricultural level as we shall see, these environmental vulnerabilities and volatilities have been joined by growing market-based impacts and perturbations associated with the onset of global geopolitical crises (trade wars and restrictions, wars), the threats of variant animal and human diseases, and the incidence of severe and regionalized floods, droughts and fires which are challenging the levels of food security in many countries. As such it is necessary analytically to now embed our discussions of agri-food transitions very much within the more unpredictable context of polycrisis. It might be argued, as we shall suggest in the conclusion to the paper, that polycrisis makes the notion of agri-food transitions as any form of assumed linear dynamic all that more difficult, more diverse and unpredictable.

Nevertheless, it is increasingly recognized that to address these interrelated challenges will require system-wide changes. However, so far and despite sustainability discourses becoming common-place in scientific circles for over two decades, agri-food systems are showing only slow or inert levels of transition (see Lamine and Marsden, 2023). This inertia I will argue needs to be critically explored and is related to the long-standing socio-natural distinctiveness of agri-food production, markets and exchange, their power asymmetries, and more specifically, how embedded power and BIMK relations within agri-food systems are enacted and re-configured over time and space. Unlike other socio-technical systems (such as industrial manufacturing, transport, digital or energy systems, agri-food systems depend upon combinations of BIMK systems for their sustainability over time and space.

In this sense, it is worth in summary, reminding ourselves of the broad distinctive and interconnected features of BIMK systems in agri-food production, for it is significant shifts in these which are necessary if we are to achieve wider more sustainable transitions in agri-food systems. There are four interconnected realms.

- (i) Bio-physicalities: Food production, to be sustainable over time and space, needs to arrange local and regional bio-physical systems (ecologies, water, micro-climate, soils and vegetational systems)

in particular ways which rely upon complex and spatially embedded systems of land practices. Of course, it can never completely control these elements; only managing to ‘fix’ systems within sets of practices created by past and established innovation and knowledge systems. These systems then produce a recombined series of bio-physical entities -food commodities themselves- which in turn come with their own bio-physical novelties and attributes-qualities, durability, DNA and nutritional qualities. They are elementally embedded in their socio-natural and spatial contexts because it is these which give sustenance to sustaining production and exchange.

- (ii) Innovation systems: farmers, farmer networks, corporate agri-business, governments, R and D bodies and Universities, provide a constant flow and interchange with this bio-physical system as a means of intervening and modifying their ecologies. This is a process of constant intervention, trial and error and social and technical learning; pleated histories and techniques over time and space.
- (iii) Market conditions: some of these innovations and products enter into complex market and exchange relations and this leads to:
- (iv) Particular and defined knowledge systems being created and sustained in agri-food; for instance, as associated with productivist conventional farming, organics, agro-ecology and a growing variety of nature-based farming practices as well as consumer and market driven systems associated with, for instance vegetarianism, veganism, protein and plant-based ‘lab’ based systems etc. There are multiple feedback loops between these realms.

As such, any radical changes in such agri-food systems needs to address the adjustments in BIMK systems. We begin to attempt to do this in two case study regions in the UK below. Indeed, it is we can argue, at the regional level that the current sustainability challenges and transitions need to be addressed.

So far, research has tended to focus upon the macro and abstract level with regard to plotting sustainable transitions in the agri-food sector. At the macro-scale, the multi-level perspective (MLP) (Geels, 2004; Geels and Schot, 2007) has been adapted to the specific type of consumption-production systems that are food systems. This approach has been refined by including food practices in the focus of research (Spaargaren, Oosterveer and Loeber, 2013), and highlighting specific transition mechanisms such as the combination of the action of diverse “niches” (rather than one singular niche) which generates wider changes in visions and practices (Bui *et al.*, 2016). While

MLP is increasingly used at the scale of specific food industries (Magrini *et al.*, 2016; Rossi and Bocci, 2018), or specific agricultural segments such as the organic sector or geographical indications in the UK (Smith, 2006; Belmin, Casabianca and Meynard, 2018), there are few applications at the scale of regional food systems.

This body of work considers both multiple regime dynamics and multiple niche-innovations (Bui, 2021) in addressing whole system reconfigurations. This calls for a change in the conceptualisation of transition dynamics towards a more distributed, multi-source view of change (Geels, 2018). This suggests more granulated accounts of anchoring processes, of the non-linearity and contingency of transition pathways, and of the contested visions of transitions.

Despite this progress we can argue that at least two key dimensions of agrifood system transitions are still partially overlooked: *the role of specific socio-ecological settings and that of power relations*. Power relations have begun to be debated in the transition studies community (Avelino and Wittmayer, 2016; Haxeltine *et al.*, 2017; Rossi, Bui and Marsden, 2019). Yet it is rarely related to the particular and embedded bio-physical distinctiveness of regionalised agrifood systems. The bio-physical distinctiveness relates to both the intrinsic characteristics of food production-consumption systems (i.e. the high variability and uncertainty due to their reliance on bio-physical processes, not least climate, soil quality, and variability in fertility and plant nutrition) and to the specificities of some contexts in regard to others – whether at the national or regional scales. *How do bio-physical features interact with the other key components of the agrifood systems, i.e., knowledge, innovation, market, regulations and policies?* To address this question creates a basis, it is argued, for a deeper and more nuanced understanding as to why sustainability transitions are so difficult and slow to achieve. It is suggested that a focus upon the biophysical-innovation-market-knowledge (BIMK) relational-nexus approach is necessary to characterize these interactions. How are power configurations redefined along the (re)design of these arrangements? How do the articulations between BIMK arrangements and power configurations allow to characterize agrifood systems trajectories and the transition mechanisms at play?

The objective of this paper is to explore these different questions. First, by contrasting two trajectories at the regional, scale, which will allow us to analyse the impact of different power configurations on these trajectories. Second, by contrasting different regional trajectories, which will allow us to analyse the impact of different articulations of such power configurations with specific (contextu-

alised) biophysical-innovation-market-knowledge arrangements. This will finally lead us to demonstrate the layered nature of successive arrangements and the related articulations with successive power configurations.

This defines the analytical building blocks for our analysis of regional trajectories. For the territorial trajectories, we will explore the role of some key territorial bio-physical features in supporting the emergence or re-design of specific biophysical-innovation-market-knowledge (BIMK) arrangements. To build these analyses, we rely here on place-based longitudinal studies, conducted by the author and their research colleagues involving combinations of ethnographic, documentary and interviews over at least 25 years.

The conceptual approach applied to transitions here combines but also extends insights from the MLP with those from political ecology and endogenous rural development that have more specifically explored power relations and the territorialization of markets (see Milone, Ventura and Ye, (2015) and Ventura et al, 2010). From the former, we can incorporate the focus upon global drivers and the rise of niches and their influence on the consumption-production system, which will help us address our first research question about the processes of stabilization, destabilization and inertia in national food systems. From the latter, we can borrow the critical attention to the agro-industrial system, the related controversies and alliances, and the “situated” and embedded power configurations articulated through combinations of political, market and civic/public processes. BIMK systems also incorporate the regional bio-physical systems which emerge and are managed through combinations of innovation, market and knowledge systems. These are themselves regionalized and spatialized as we see below. These partly explain the differences between the two regional trajectories, demonstrating the need to address the articulation of bio-physical, innovation, marketing and knowledge systems as a dynamic and spatialized process as part-and-parcel of the transition process over agrarian times and spaces.

### 3. REGIONAL CASES

#### 3.1. *Carmarthenshire (Wales)*

Before the post-war modernisation and productivist period, Carmarthenshire had a diversified production system with livestock grazing farming for red meat (mainly sheep and beef) and dairy production as well and local forms of horticulture. Wheat, bread and fruits such as apple and pear had long been part of the landscape (and BIMK) until the middle of the 20<sup>th</sup> cen-

tury. This system was based upon relatively small family farms which were increasingly family owned as former tenants were able to buy their farms from former landed estates especially from the First World War onwards. In the post-war modernisation period, and especially from the 1980s onwards, both the dairy and meat sectors begin to lose their traditional locally-based productive and processing infrastructures because of the increasing dominance of retail and manufacturing corporate concentration and their links to mass UK markets and associated long-distance supply chain logics.

This period was dominated by strong policy incentives both through UK and then EU production subsidies to produce standard food inputs into the mass markets with little or no regional branding or certification. Steadily these markets became dominated by oligopolistic and corporate food processing and retailing firms. Interestingly this incentive system of production subsidies did not extend to horticulture. Whilst red meat and dairy production remained the staple production systems in the region, horticultural production was vanquished as a result of the incentives to produce more red meat and dairy, and the rise of corporate retailers who sourced horticultural products at concentrated scale. As a result, horticulture witnessed a significant decline in land area. Both the beef and sheep sectors have been since the 1980s affected by a series of intensive livestock diseases (mad cow disease, foot-and-mouth disease, and bovine tuberculosis) which has periodically affected market volatilities, and indeed led to further concentration of production into fewer and larger units.

However, from the mid-1980s onwards, we can witness the emergence of a more ‘regionalised food regime’ based upon the ‘quality’ production and marketing of red meat (lamb, beef), dairy products (mainly milk and cheeses). This was based upon the development of farmer-based cooperative organisations, which begin to share input purchasing, coordination of self-defined quality standards and, especially, marketing and local branding strategies. A much smaller but emerging horticultural sector, based on other kinds of initiatives and actors (collective farms, new entrants, CSAs etc.) also began to emerge. Of significance here was the use of EU regional development funding and the role of the devolved Welsh government (post- 1998) in stimulating regional branding and food processing.

Thus, for the 2008-2015 period, longitudinal studies in South West Wales (Marsden and Morley, 2014; Rossi, Bui and Marsden, 2019) analysed the emergence of ‘regionalised food regimes’ in the pasture-based agricultural economy based upon the ‘quality’ production and marketing of red meat (lamb, beef), dairy prod-

ucts (mainly milk and cheeses), and a much smaller but emerging horticultural sector. Over the past decade then the multifunctional development of a more spatially and 'quality-driven' agro-food sector in the region has grown. This has been partly a response to the overall crisis which has afflicted the 'conventional sector' in terms of market volatilities associated with diseases, relatively lower farm-gate prices associated with corporate market domination of the downstream sector, and the costs of credit and other inputs. Both the dairy and beef sectors have been historically affected by a series of intensive livestock diseases (mad cow disease, foot-and-mouth disease, and bovine tuberculosis), whilst also losing their traditional locally-based productive and processing infrastructures because of retail and manufacturing corporate concentration. New shorter-supply chains based upon the distinctive bio-physical characteristics of the region have multiplied.

The growth in this multi-functionality and diversification can be very much seen as a shift in BIMK systems based upon the need to 'exit' from conventional supply chains and markets; to innovate organisationally and in terms of quality production conventions; and in re-creating more cooperative and collective knowledge systems. In most cases there were varying degrees of autonomous control and innovation pursued in the science-innovation and bio-physical matrix, such as 100% pasture-raised dairy or beef, and/or short-supply chain innovations. These, in turn, led to a re-capturing of 'market-power' by producers and local processors, benefitting both the producers and, more in general, the region. This is a shift towards more regional re-valorisation.

The significant empowerment of the new or revised scientific-technical and bio-physical elements, when matched with the regeneration of spatially and socially distributed local infrastructures, demonstrates how the building blocks for more regionally-based food clusters can gain transformative potential at regional levels. Many of the producer groups examined here attempt to create a regional and bio-physical niche in this context. The meat sub-sector in South Wales is one such case. This is typified by a strong industrial element with many of the producers servicing mainly UK and EU markets. It is also setting new additional rules and standards with regard to the embedded quality of the products, and also increasingly entering global market demands for regionally based products (in both lamb and beef). The producer groups do not restrict their routes to market. Rather they seek forge a more innovative and diverse range of markets, including re-creating regional livestock markets and local abattoirs.

Since 2020 and the Covid epidemic, local authority food partnerships have also been created to further

stimulate a territorial approach to agri-food transitions. As a response to the effects of the pandemic, Carmarthenshire Association of Voluntary Services (CAVS) facilitated the creation of grass-root networks which marked a milestone in the consideration of food security and poverty issues at a local scale. The principal aim of the association was to bring organisations, businesses, community groups and individuals together to share ways of tackling food poverty, and to further relocalise regional supply chains. It constitutes the starting point of another territorial network called the Carmarthenshire Food Network (CFN) in 2021. Since the beginning, the CFN has brought individuals, community groups, businesses, and organisations clustered into four groups (community growers, community Food Providers, private Sector, Wider Support) to develop a healthy regional/ local food system. In 2021, the county obtained funding from the Wales Poverty Alleviation fund aiming at working and increasing access to fresh food at emergency food services across the county. At the same period, a new steering group besides the CFN's one was created. This steering group was led by the County Council and the aim was to provide a strategic vision (while the CFN is more focused on actions and coordination). This parallel partnership is called Bwyd Sir Gâr Food (BSGF). CFN and BSGF are thus two complementary organisations. While CFN works with grass-roots operators and coordinates actions, BSGF thinks in term of strategy. In 2022, BSGF became part of the wider national Sustainable Food Places membership which covers many local authorities and city governments across the UK. This recognition helped the territory to get Welsh Governmental support, provided by the the Ministry of Social Justice, for the development of the local multi-sectorial food partnership. The strategy is still in development and is being discussed with the Public Services Board, which is an innovative way of conducting food policy at the national scale. Part of this work is also in creating a regenerative demonstration farm by converting what was formerly a county council owned dairy and beef farm. In Carmarthenshire, post Brexit and post covid local governance innovations are assisting sustainable food transitions, and a new post Brexit sustainable farming scheme is planned for introduction in 2026 based upon principles of regenerative farming and decarbonised food systems.

### 3.2. Cheshire – Shropshire

Cheshire and North Shropshire in England represent a largely flat but fertile bio-region of land which originated from the glacial and alluvial lake and out-

wash of the last glacial period. This provides rich and cultivable soils. Much of it called geologically: the 'Cheshire Plain' but extends across most of the counties of Cheshire and the Northern parts of Shropshire to its south. Traditionally, and from the industrial revolution in the 19<sup>th</sup> and early 20<sup>th</sup> centuries, it was an agriculturally-productive region for arable and especially dairy and cheese production, serving the neighbouring and growing urban agglomerations of Liverpool, Manchester and Stoke-On-Trent. For instance, 'Cheshire' Cheese was and remains a regional brand. And Shropshire 'blue' cheese also represents another. Major transport routes- canals, roads and rail links provided the means for transporting ever increasing foods from the region to these expanding urban areas.

The region developed an advanced, innovative and increasingly intensive/ productive agriculture built upon large owner-occupied and tenanted farms, many of which were originally tenanted to large private estates. Some of these estates still remain (such as the Grosvenor Estate), but along with the rest of England, the 20<sup>th</sup> century saw a continual rise in family farm owner-occupation, now the major form of land occupancy. The region thus developed a very innovative, and lucrative farming infrastructure during the late 19<sup>th</sup> and early 20<sup>th</sup> centuries, based upon the provision of expanding urban markets around its perimeter.

We can identify three more recent periods in the territorial food system's trajectory.

#### *1960-1985 a Mass and Export-Oriented Agriculture*

Post-war agricultural policies incentivised the further intensification and specialisation of its production systems. By the 1980s, the region was a nationally specialised region for intensive dairying and potato production, also holding significant food processing facilities in these sectors. There were numerous and large livestock markets. Now livestock markets have been reduced and concentrated in towns like Market Drayton, Shrewsbury and Oswestry, which also hold large food processing and retailing industries. The overall logic was to increase the 'economies of scale' and to replace farm labour with machinery and associated technologies was particularly prevalent in the dairy and potato sectors. Continued 'cost-price' squeeze pressures forced most farmers down this route, and it also led to the reduction of the number of working farms.

#### *1985-2008 Emergence of Regionalised Food BIMKS*

The reductions in price support linked to the CAP reforms, UK neoliberal policies (abolition of milk marketing board, privatisation of state supported farm advice

etc.) and the rise of retailers' power have reinforced the previous trends: dairy processing became further concentrated and the food processing and retailing in general more oligopolised. Symbolic of this period is the establishment of the Muller dairy in Market Drayton in 1992.

In this period there was a steep and continuous decline in the number of farms and amalgamations, especially in dairy. The number of farms dropped from a total of 8500 in 1985 to 4545 in 2007, of dairy farms down from 1000 in 2002 to 716 in 2007. There have been further declines and amalgamations since.

State supported farmers' advice was privatised, although in this period the AHDB (Agriculture and Horticulture Development Board), a levy board funded by farmers' contributions, still promoted the marketing of food products. On the other hand, the region hosts the Organic Food and Gardeners organisation, created in 1973, which became in 1992 the first OF certifier in the UK, and now certifies over 30% of the UK organic sector. Environmental issues have also risen on the agenda (water pollution due to intensive dairy farms) but not generated profound changes until the late 2000s.

#### *2008 - 2024 Fragmentation and Contestation of Narratives and Models*

From the 2000s on, the region has faced increasing population growth as ex-urban groups wish to move to rural or suburban locations and there are considerable pressures on further urban growth on highly productive agricultural land (suburbanisation of the countryside), despite relatively strong land use planning policies. Linked with these new demographic trends, more alternative forms of farming and food networks have developed despite a continuity in intensification and specialisation and a larger supermarketization trend.

The growth in supermarket procurement led the farmers to increasingly being committed to retail-led preferred supplier contracts which have to obey to retailer's guidelines and protocols. The continuing cost-price squeeze in the conventional sector also encourage more innovation and transition. Some farmers specialised in meat production and developed an orientation toward short circuits, with thriving butchers' shops in market towns and agricultural markets, in towns like Market Drayton, Oswestry and Shrewsbury. Some are developing a richer tapestry of differentiated farming practices based upon improving the quality of production practices and adapting to more differentiated market demands

In the last decade, consumers demand for organic food and environmental issues have generated new dynamics towards multifunctionality, rather connected to the national food markets than to local ones. Organic

oat production and milling is developing so as to meet the growing demands for oat and plant-based milks and bread products. Some large arable producers are returning to more mixed and rotational methods of rich herbal ley undersowing and pasture-based livestock production. Due to these diverging trends, a more bi-polar spatial model of farming practices seems to be taking hold, which involves new insertions of ‘sustainable intensification’ on the one hand, and restorative and/or agro-ecological farming on the other (see for example the two cases below).

The Royal Show (a large agricultural event) long organised in Stoneleigh stopped in 2009, while The Groundswell regenerative farming event started in 2016 in nearby Hertfordshire; focused on Conservation Agriculture and regenerative systems. Still strong intensive productionist interests ally with high-tech sustainability solutions, based on ‘hands free’ farming and robotics, precision farming; many being trailed at the regional Agricultural university Harper Adams.

This University played an important role in these recent evolutions by creating an agroecology Master, a School of sustainable food and farming (2023), by establishing partnerships with various farmers organisations (Nature Friendly Farming, Holistic farm management, etc) and with large players (eg. Jordan Farm Partnership launched in 2020 and involving the Shropshire Wildlife Trust Morrisons Sustainable Network launched in 2024 and focused on net zero farming), also by launching a paludiculture program aimed at developing a modern ‘wet’ agriculture in the region; which is experimenting with re-introducing wetland and marshland eco-systems.

Since 2021, the Shropshire Good Food Partnership brings together food chain actors (producers, retailers and consumers “with a vision to create a local food system more resilient, sustainable and fair”).

In organic farming itself, contrasted BIMK tendencies and models can be acknowledged, as exemplified by two farms: the Fordhall Organic Community Farm and the N. Taylor organic farm.

*Fordhall Organic Community Farm, an extensification model based on a strong socio-ecological anchorage*

Located in North Shropshire, Fordhall organic farm is a 128 acres farm property surrounded by 2 rivers and a main road on the outskirts of local market town Dayton. Following the intensification period of the Second World War, the Hollins family decided to orient its farm production toward ‘compost-based production’; a chemical-free and pasture-based production which rears cattle of sheep, pigs and beefs. In 2006, Fordhall turned into a “community owned company” to face agricultural land development pressure of the mid-1990’s from large-scale dairy company Muller. The Fordhall Community Land Initiative is owned by 800 shareholders which finance, vote and

decide the agricultural and economic orientation of the farm, which tends to diversify its production by developing agro-tourism, catering events, and social initiatives. Fordhall Farm is led by one tenant farmer, while the community land initiative employs 30 people part-time and 1 person full-time. The production is local-based and sold directly to the public through farm-shop, online shops, farmers markets or outside catering. The current dynamics of the farm development is being debated with the shareholders, the prevailing view being that of supporting the viability of the farm by extending the land property (as the tenant also rents land to produce animal feed and maintain the farm’s autonomy).

*“It’s not about getting bigger now, it’s about getting smarter”: intensification through digitalisation of Taylor organic farms in North Shropshire.*

Taylor organic farm describes itself as a large-scale farming family business covering 2,471 acres of plain and fertile agricultural lands. Until the beginning of the 1990’s, agricultural production was conventional and specialised in pig, dairy and vegetables. As means to be competitive, the owner of the farm turned organic and intensified vegetable production from the mid-1990’s onwards whilst progressively shelving livestock and developing mechanisation on farm in order to increase the production and show that “organic could feed the world”. This farm uses a 7-years based rotation system on one-third of its production. All carrots and potatoes produced are sold to main distributors and supermarkets of England. This modified organic production tends to get more intensified through mechanization and digitalisation. The owner wishes to develop mechanics assisted by artificial intelligence on the farm, to supplement the 10 full-time farm employees and face a shortage of farm labour. Whereas intensive agriculture is still the main type of agriculture in Cheshire and Shropshire regions, Taylor organic farms appear to be an innovative but relevant example of current new digitalisation movements.

Interestingly, the two farms’ strategies are led by an entrepreneurial ideal and the wish to produce affordable organic food, even though they illustrate two different visions of organic agriculture both in technical terms and in the relation to the local region and communities.

Brexit had an important impact in many farms that relied on seasonal work of European migrants. In terms of farm scheme, most large estates are subject to environmental greening as a result of the post-Brexit transition to English Environmental Land management scheme (ELMS).

Finally, and like in other regions, new initiatives and networks were launched in the last years to address the increasing food poverty and accessibility issues. The Shrewsbury Food Hub was started in 2016 as a charity, that brings together 60 partners, and runs two restaur-

rants, kitchens and a food share system. The Shropshire Food Poverty Alliance was created in 2018, bringing together various civil society organisations and charities and the Shropshire Council. A Cheshire East Food Network was also created and actively worked to impose a Right to Food Strategy within the Cheshire East Council (2022). The Harper Adams Agricultural University also started to tackle food justice and waste management issues by putting in place a community fridge aimed at distributing surplus food and assessing changes in practices. It also started to work with allotments in various towns across the region.

However, in this region, local public institutions such as counties have minimum policies or no role at all in food and agriculture at least in comparison with other case studies such as Carmarthenshire in Wales. Most county farms have been sold off or are abandoned, and charity or civil society organisations supply to the absence of public action.

It is important to recognise that whilst the basis of this productivist region may now be changing and indeed diversifying, productivism is still a very strong feature of the region. This has now, however become more diversified with more innovation in the areas of agro-ecology, organics and what is being termed 'regenerative farming'. Thus, the BIMK systems are very much under transition, but is a very diversified and multiple-pathways way.

Also the region, as a result of its contiguity with its large urban neighbours, faces increasing suburbanised population growth, as demand for housing in and around many of the attractive former market towns expand. There are considerable pressures on further rural and suburban growth on highly productive agricultural land. Planning policies are coming under considerable pressure from developers; and many farmers are diversifying their land use into recreational and residential conversions as a way of enhancing their farm incomes. In all this agricultural and rural land prices and values continue to increase, making development gain and increasing incentive for many farmers and land owners.

The region now represents a complex layering of more multi-functional agri-food and rural-urban transitions. These include: (i) pre-productivist (the large estates and tenant farming system feeding the industrial neighbouring hinterlands); (ii) productivism and specialisation; (iii) post-productivist dimensions and the rise of ex-urban populations; (iv) now more regenerative multi-functionality and multiple transition pathways based upon new innovation and knowledge systems linked both to agri-food and wider forms of multi-functional rural development.

#### 4. COMPARATIVE INTERPRETATION OF THE TWO REGIONAL CASES

In both case study regions here we can begin to see in the most recent periods the development of re-territorialisation as an active, contingent and indeed multiple pathway process. At the territorial level of analysis, innovations, short circuits, and more community-based initiatives and agro-ecological networks are also proliferating. Thus, at the territorial level we witness *a contested layering of food production BIMK systems-both conventionally linked to the corporatist-environmental regime, and the more autonomous clustering of more embedded more sustainable production practices.*

More generally, the post 1980s the dominant UK political culture and governance of economic liberalism has rendered matters of food and farming, and especially questions of food security and diet, as matters that need to be resolved 'by the market'; when in fact as we have seen, this 'market' is neither functioning openly, and it displays high levels of both financialised economic concentration and asymmetrical power relations. Underneath, or perhaps we should say alongside this dominant 'regime', we see here, especially in the most recent period of polycrisis (post 2020) increasing numbers of producers and smaller food businesses who are progressively detaching themselves from these logics and creating renewed and revised BIMK systems. These may provide more autonomy and overall resilience for farm business. Our comparative regional analyses above thus show how transformations in BIMK agri-food systems are contrasted, embedded and are evolving in each region, as a result of the articulation of bio-physical, innovation, market, knowledge (BIMK) arrangements and power re-configurations.

Biophysical elements strongly determine agrifood transitions both in terms of reversibility and potential ecologisation. Some regional agroecosystems are more damaged than others. For example, soil quality and biodiversity have been durably impacted by intensive agriculture in Cheshire and Shropshire; some structural features prevent or favor the potential ecologisation, like the size of plots or presence or not of hedges, cannot be changed in the short term. In our case study regions, we see significant evidence of new innovative ways to relate to regional bio-physical features being experimented and then established. These biophysical features, that used to be/are still considered as « obstacles », « limiting factors » etc. in the modernisation/intensification period and models, are increasingly considered in terms of carrying capacity and valorisation of diversity in some current narratives and initiatives, giving way to potential ecologisation pathways through new BIMK arrangements. In



some regions like South West Wales, this leads to re-designing plant and animal production around redefined local and regional features, such as local cattle breeding and processing, wine growing, organic production of local vegetable or cereal varieties, thus leading to « systemic » redefinitions of innovative BIMK arrangements. In other regions like Shropshire/ Cheshire, biophysical features are considered in terms of resource preservation and reduction of impacts and support less systemic redefinitions of such arrangements.

Of course, such redefinitions do not happen alone or independently. They require the (re)emergence of knowledges and farming or processing techniques; and in turn this need then relating and articulating to both agricultural and rural development actors and market actors. Sometimes the new arrangements can be given a 'helping hand' by local and regional public policies such as food procurement initiatives in the UK or territorial food projects like the emergence of local food partnerships in Carmarthenshire. In other cases, as in Shropshire and Cheshire it is very much left to the networks of farmers and processors themselves to promote their new brands and to re-empower themselves through collective and cooperative actions.

This takes us onto another key feature of these transitions; that of the power re-configurations, which are to be tackled in terms of both their multifunctional nature and their multiple processes (power over what, and how power balances are redefined).

Power relations are reconfigured along with the new arrangements that articulate biophysical features with adapted market options and knowledge and innovation. A feature of the regional transformations is for farmers and small food businesses to attempt to escape the asymmetrical market power of external price-setting by the no-farm corporate actors (corporate retailers, farm input suppliers – e.g. fertilisers, machinery – and food processors). This occurs in some farm businesses as we see in Cheshire and Shropshire. Developing short supply chains so as to deviate from the powerful market rules applied by the retailers is one way to do this, as is reducing external inputs use to avoid input suppliers and their increasing costs. To do so and develop ecological more autonomous practices, these actors also need to take more control over their agricultural knowledge and innovation system. We see in our case study regions an increasing number of farmers opting out of the conventional power and technological frameworks – although they are still in existence on the larger, more intensive farms. In both our case regions examined here we see then the evolution of adjusted BIMK systems as the vehicle to articulate and enact transitions.

## 5. CONCLUSION: CREATING TRANSFORMATIVE POTENTIALS IN AGRI-FOOD SYSTEMS

Whilst our comparison of the two regional trajectories has shown that despite many similar trends linked to shared global drivers, different power and BIMK configurations increasingly explain dynamics and differences. Analysis of regional cases has also shown that transitions in territorial agri-food systems are currently occurring as a result of the following key transition mechanisms:

- (i) Partly as a response to polycrisis, the re-incorporation of place-based biophysical elements within newly forged or reforged biophysical-innovation-market-knowledge (BIMK) arrangements, i.e., particular recombinations of relations between biophysical features, forms of innovation, market orientations and knowledge exchange processes.
- (ii) The reconfigurations of power relations, particularly in changing market relations, in their multifunctional nature (as they impact the different components of the agrifood systems and of the BIMK arrangements) and through the growing 'quests for autonomy' associated with multiple farm strategies. We see in both cases study regions farm businesses creating new forms of autonomy and power relations around managing their bio-physical complexes, in re-establishing 'shorter' market exchange relations and in harnessing new knowledge systems linked to new networks.
- (iii) These new and revised BIMK systems are significantly challenging and in fact denuding the conventional notions of a 'dominant regime'. They are enacting this through a greater variety of BIMK systems and arrangements. In this sense this suggests the absence of any notion of a 'grand transition' in agri-food systems; but rather a diffuse undermining of former more dominant systems by a growing variety of spatially interconnected BIMK systems whereby combinations of bio-physicality, innovation, market and knowledge systems form a rich archipelago of colliding productive forms and practices.

These explorations suggest the absence of both a linear or 'grand transition' from conventional productivity farming to more sustainable and/or agro-ecological models. Rather, and indeed re-enforced by more recent polycrisis, farm businesses are creating diverse transitional pathways by modifying their BIMK systems and attempting to create more empowered and resilient systems in the context of higher levels of vulnerability and volatility. This shows all the signs of eroding the old

dominant productionist regime, ‘from within’; particularly in a national neo-liberalist governance context which is at best reluctant to prescribe any dominant or strongly interventionist ‘post war’ type policy regime on its farmers. In addition, the reluctance by government to intervene in food markets, especially the corporate retail dominated ‘markets’, means that it is left to farmers, food processors and civic society and consumers to reform market relations in adaptive and new ways.

It is thus not only the nature and succession of (different) BIMK arrangements that characterize transition pathways but also their articulation with specific configurations of power relationships in the agrifood system. BIMK arrangements and power reconfigurations are reciprocally interlinked and their resulting articulations are layered, i.e they do not totally replace previous ones: rather they are partially and variably super-imposed (as palimpsest) in the regions.

In current agri-food systems this comparative approach shows the significant empowerment of formerly powerless actors in new or revised biophysical-innovation-market-knowledge arrangements. These regional empowerments in the most recent period (post 2010, and especially during polycrisis ensuing during the the 2020s.), are not just about the creation of more regional diversity. They represent discrete regional transition trajectories in agri-food, not least because of the enhanced and place-based bio-physical nature of agroecological transitions. They are also reliant upon creating more local, regional and bio-physical autonomy from (former) prevailing supply chain power configurations. For instance, in the construction of short and re-localised supply chains as a way of generating autonomy from prevailing asymmetrical corporate retail and food processor-led chains. Also, changing consumer demands, active civil societies, new forms of multi-actor networks and public policies (such as the emergence of the Carmarthenshire food partnership) also play a key role in opening up power spaces for action and innovation, with different degrees and balances in different regions.

However, we should recognize that all EU countries and regions are exposed to combinations of global drivers and different elements of the polycrisis as well as developing their own variable responses and strategies to these drivers. In all regions there are competing and fragmented alliances and networks which are claiming and creating divergent pathways (and indeed highly variable and territorial BIMKs) towards more sustainable food systems. As we outlined in the introduction to this paper this territorial variability is both a cause and a consequence of the reconfiguration of BIMK systems. As such this begins to partly explain explain and indeed

open up the possibilities for both the relative complexity and diversity of more sustainable agri-food transitions.

This is highly spatially variable with different BIMK alliances and networks becoming more influential in one place or another, and wider system change being inhibited by still established power relations in governments and corporate firms which attempt to marginalize and dilute these networks. For instance, there is still a knowledge-system strong reliance upon narrow “technical-fix” solutions in climate smart-farming and food processing (such as the use of gene-editing) emanating from the conventional regime. These trends tend then to reject and oppose more radical agroecological place-based initiatives that are indeed taking hold and “anchoring” in some regions (as in parts of Wales in the UK).

It is necessary given this territorial variability and contingency to conceptualize the most recent polycrisis and volatile period as also pluri-versal. How this unfolds is also reliant upon changing and segmented food, producer, consumer and market shifts, not least the growing pressures for health-related diets and reduced, or at least more extensively produced, meat production and practices. This paper and its empirical approach has concentrated upon the agricultural/agri-food system as part of the necessarily wider overall food system. It has shown the centrality of their BIMK systems in evolving transition pathways. These are not divorced, however from wider systemic processes. Consumer concerns are indeed playing an increasingly important part in power re-configurations. Yet institutionally and indeed politically these are still largely conceptually detached from the more land-based agricultural and environmental policies currently being formulated. Current food governance mechanisms and institutions have yet to fully embrace and recognise this pluri-versal challenge, or to appreciate that in setting aggregated and ‘top-down’ targets for objectives such as net-zero, bio-diversity restoration, or healthier diets, requires a more nuanced understanding of the grounded and spatialised relational interactions explored here as indeed vehicles in bringing about sustainable transitions in agri-food.

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