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Third Natures? Reconstituting Space through Place-making Strategies for Sustainability

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Abstract. The recent rises in food prices represent the 'tip of the iceberg' and a 'canary in the mine' moment for world agriculture. They are underlain by a continuing race to the bottom and by speculative processes whereby systems of resource production and exploitation are continuing to rely upon 'infinite supply' assumptions and narrow technological solutions to world hunger. It is argued here that these conditions are leading to a dominant and aggregated policy framing that tends to marginalize diverse and place-based agro-ecological systems, through the creation of a renewed legitimacy for bio-economic, rather than eco-economic, solutions. Nevertheless, the current food crisis is also providing opportunities for more place-based and reflexive governance arrangements. This article outlines the relationships between these bio-economic, and alternative eco-economic, strategies and focuses on some of the key articulation mechanisms between the two paradigms. Of key importance here is understanding the reconstitution of space and state processes in these contested but innovative articulations.

Introduction: Towards Adaptive Capacity Building

The burgeoning critical agri-food literature has now reached an important stage in its maturity. The plethora of work on alternative food networks (see Goodman et al., 2011) has undoubtedly re-energized agri-food studies in ways that have again made it central to wider rural sociological debates. Some even argue (see Friedland et al., 2010) that this new phase – one of investigating how alternative movements are providing opposition to the dominant regime – has become a new defining moment for the twenty-first century rural sociological enterprise and, as such, is creating a vibrant and rich global network of scholars who are progressing this agenda. Indeed, the volume and sophistication of the work is impressive and potentially transformatory in a paradigmatic sense: an argument hotly contested, but one which is important to portray and progress (see Van der Ploeg and Marsden, 2008).

In contributing to this 'rebuilding' exercise through the lens of agri-food, the article aims to support this paradigmatic shift in three ways. First it will be argued that, at this particular juncture of the now well-documented crisis in the conventional regime of agri-food, we have to theoretically and conceptually readdress the complex distinctiveness of agri-food as a set of important 'third nature' arrangements,

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or what can be called 'patterned' hybridities. In short, the old modernist arrangements associated with the standard relationships between capital, nature and food are exploding. They are giving way to a range of more sophisticated 'third natures', whereby the relationships and transformations of nature are becoming at the same time both more complex, potentially irreversible, and potentially more empowering and sustainable. Third natures move on from the categories of first natures (raw, uncommodified) and second natures (commodified and adapted to the laws of capital accumulation; see Smith, 2007) in that they incorporate patterned forms of hybridity between the natural and the social. They can delve into the very reproductive and cellular structure of nature itself but can also be imaginatively mixed with human and social practices. As such they demonstrate a more variable re-calibration between ecology and 'the economy', mixing these in new and creative ways. These 'mixtures', as the discussion here outlines, are not totally fluid or contingent; they are fixed at least for a time by competing paradigms of theory, science and politics. In short, and under these third and more 'unruly' nature conditions (see Clark, 2011), we have to open the conceptual door to find ways for more articulation of alternative and robust forms of sustainable adaptive capacity building, even when these tendencies are under attack from corporatized neo-liberalism, which attempts to marginalize and fragment their legitimacy.

Second, after outlining some of these 'third nature' processes and oppositional expressions it is important, by adopting a modified transitions theory framework, to address the question of adaptive capacities with regard to shifting agri-food systems towards more sustainable and 'scaled up' adaptations (see Spaargaren et al., 2012). In doing this, it is argued that it is timely and critical – not least given the resource depletions with which twenty-first century society is increasingly contending – to explore conceptually as well as empirically the contestations in science, politics, economy and culture between the dominant regime and a vast variety of socio-technical niches. These are associated with agri-food, no doubt. But the important point now becomes to regard agri-food not so much as a separate or aggregated 'sector' but more as an embedded mobilizer of social nature, together with other key resource spheres (see Tucker et al., 2006). It is therefore necessary to build some important conceptual links and bridges between these key resource spheres, the different logics associated between what I have generally called the bio-economy and the eco-economy paradigms, the transition mechanisms and contestations that are mediating these logics and, indeed, their variable spatial expressions and configurations.

Such a conceptual process begins from a premise that it is important to create a more critically normative approach to sustainable adaptive capacity building (see Blay-Palmer, 2010). Indeed, I would argue that the established sub-discipline of rural sociology should be seen partly as a crusading force in wider interdisciplinary environmental and sustainability science debates (see Henrichs, 2010). This leads to the third contribution. We have to reintroduce two major distinctive features of both past, and indeed future agri-food landscapes. *These concern the distinctive and transcending role of the state and of space in the reconstitution of agri-food relations.* In the agri-food sector specifically we know that governments, at least since the 1930s, have felt obliged in the public interest to intervene directly in the fields of agriculture and food. They have – ever since – never been completely 'left to the market'. Moreover, as part of the distinctiveness of agrarian capitalism we can clearly note since the work of Marx and Kautsky that space, either as a set of land rights and/

or as bundles of ecological resources, is critical as both a condition and form of production and consumption. First, we consider some of the new landscape pressures that are colliding with the dominant conventional regime and also the dominant responses and framings that are currently being made to it. In the final section of the article, I discuss the prospect of developing a more reconstitutive and reflexive state and spatial intervention system that is attuned to the new sustainable place-making necessities that currently confront us.

The New Landscape Pressures and their Partial Responses

Since the food price hikes of 2007–2008 and the continuing volatilities in global food supply and demand, there has been a significant growth in policy reports and statements regarding the problems of global food security. This has rightly reinforced the UK's combined research councils (RCUK) decision to make this one of their 'grand challenges'. It has also recently led to a new synthesis published by the UK Government Office for Science, entitled *The Future of Food and Farming: Challenges and Choices for Global Sustainability* (Office for Science, 2011). It is not necessary to reiterate the main arguments as to why this is now a renewed and pressing international policy issue, but it is a good moment to begin to assess the general policy landscape and framing of the debates, given that, as I shall argue below, some significant gaps or missing links are emerging in the ways in which main arguments and solutions are being posed. One key question (see Horlings and Marsden, 2011) is why is it proving so difficult to arrest the twin problems of resource depletion and climate change vulnerabilities by developing more sustainable and 'place-based' agricultures? To answer this question we have to go beyond the rhetoric of many of the major reports now before us and address the more prosaic question of what are the obstacles to adaptive change within the agri-food sector and how can these be overcome? Once we identify these more clearly, it may be easier to see how we might begin to examine the potentialities and opportunities for adaptive changes, which could lead to both more sustainable *and* productive agri-food systems.

It is argued here that these opportunities and potentialities will have to be 'place based' and, as such, will not lend themselves to generic or globalized 'one size fits all' solutions associated with genomic technological fixes or generalized notions of 'sustainable intensification' (Office for Science, 2011, p. 35). One of the problems with most of the recent policy statements is that they have not addressed the issue of context-dependent sustainable 'place making'; and they have tended to assume, albeit with scattered attention to some selected case-studies of 'good practice', that the answers as well as the solutions to the current unsustainability of agri-food lie in addressing the aggregate problems rather than those that are more spatially specific. Agriculture will have to return to being what it was: a more embedded, connected and localized activity largely serving and being served by its city regions.

If one of the obstacles in our thinking about both the problems and solutions concerning unsustainable food lies with the dominant aggregated conceptualizations of the problems – a sort of 'ecological fallacy' – another is the failure to appreciate agri-*culture* as an interdependent and integrated component in complex human, cultural and ecological systems. For too long, and in the advanced world especially, we have tended to treat agriculture as a separate and independent sector both in policy and academic terms. This secular way of seeing agriculture is now coming back to haunt us, as we witness how it is inextricably linked to the wider ecologies and cultures

of place. It is being articulated constantly (not least by the now disbanded Sustainable Development Commissions' final statement [2010] on food policy; Sustainable Development Commission, 2011), for instance, that global agriculture accounts for about 70% of all fresh-water extracted for human use (via irrigation systems), and that the food system is a major source of land, forestry, fisheries and water degradation, with 15 out of the 24 world ecosystem services being degraded or used unsustainably (Millenium Ecosystem Assessment, 2005; Sustainable Development Commission, 2011). Livestock farming gets an even worse press in these debates, as it accounts for 40% of the UK citizens' agricultural water footprint and 57% of agriculture's carbon and methane emissions.

These kinds of aggregated and sectoralized statistics certainly indicate the size and proportional nature of the problem of the unsustainability of many conventional agricultural practices. But they should also indicate the inherent multifunctional role that agriculture *could play* in potentially adapting to these unsustainabilities. Such 'facts' about the negative contribution of conventional agricultures to the wider and severe problems of resource depletion and carbon emissions should serve as a significant wake-up call for scholars and policy-makers. They demonstrate the explicit interdependence and integrative potentials of agriculture to affect its wider ecologies and social systems in profound ways. As empirical evidence suggests from many parts of the world (see below), sustainable agricultural systems can provide far wider sets of positive social, economic and ecological benefits for more sustainable communities and regions. In this sense we should reject the assumption that agriculture necessarily is a 'declining industry' even if increased rates of urbanization and migration from the land are the norm in many developing parts of the world. In order to sustain these movements, more eco-economic systems of production and consumption will need to be created, implying a vast skill and social capital base. Hence any 'solutions' to these unsustainabilities will need to adopt a much more integrative, spatially based, approach. We can no longer divorce agricultures from the wider social and ecological spaces in which they are created, or from the complex interdependencies they help to sustain.

We urgently need to move beyond aggregated and sectoralized ecological fallacies in our attempts to deal with creating more sustainable, diverse and place-based agro-ecological systems. Whilst we should not lose sight of the macro, global picture, we also need to realize that in order to imagine and plan realistic alternatives it is necessary to adopt a more creative eco-economy paradigm which replaces, and indeed relocates, agriculture and its policies into the heart of regional and local systems of ecological, economic and community development. This was no more clearly exposed than in the 'Arab Spring' in the Middle East, where uprisings have been underlain by growing food and water shortages, price hikes, and fast-growing populations in countries such as Yemen and Syria. Saudi Arabia is actively purchasing land- and water rights elsewhere in order to cope with pending water and food shortages (Brown, 2011). Some regions of China are following this course of action, leading to internationalized 'land and resource grabbing' as palliatives to impending shortages. The irony is that the more governments and scholars recognize the need to make a transition in agri-food to low carbon alternatives, the greater the international 'race to the bottom' to fuel the agri-food 'growth machine'. Yet, as the saying often goes about charity, the solutions and priorities should start at home by re-calibrating and reframing more integrated and embedded notions of agri-food into regional and local systems.

The current food debate is dominated by aggregated and sectorialized 'bio-economical' solutions which still tend to side-step and deny the embedded nature of agri-food. This is a sort of active process of 'unknowing the known' and creates and maintains a set of key 'missing links' in the framing of policy debates. Underestimated are the social, cultural, political and spatially embedded aspects.

Socially, we have seen a large decrease in recent decades of agricultural employment, farm enterprises, and a loss of farmers' freedom with more dependency upon privately regulated global markets, retailers, privatized research and policy measures. This means that, just at the point when a sustainable transition is necessary in their agri-food systems, many local communities have lost or reduced the social and skill capacity to mobilize such changes. Rebuilding the social and knowledge/skill capacities to create sustainable alternatives becomes limited and in many cases constrained by generic technoscience solutions.

Culturally, 'the environment' has been reduced to a series of concerns about resource inputs, waste and pollution emissions, demoting cultural needs and non-anthropocentric values (reflected, for example, in the concept of wilderness) to monetary terms (as can be seen when these inputs are addressed as different packages of 'environmental goods and services'). The culture of 'agri-*culture*' itself, expressed in craftsmanship and a large variety of farming styles, has become more marginalized as the influence has become more dominant of external agencies such as privatized extension services and bio-economic scientific research.

Politically, a 'hygienic mode of regulation' has become dominant in agri-food in the form of bureaucratic forms of environmental safe-guards, risk management and instruments. Private and public forms of regulation have led to a schematization that creates new regulatory barriers to market entry for many smaller producers and processors. Such regulatory costs tend to stifle co-operative innovation and ecological knowledge sharing, whilst creating market barriers for smaller producers.

Spatially, agricultural production has been decoupled from space and place; this is visible in the form of more foot-loose production systems (such as 'mega-farms', internationalized food transport, 'lean' logisitics and traceability, and the deconstruction and fragmentation of food into different but standardized, value-added components). This gives the super-intensive producer, processor and corporate retailer the power to exchange their commodities worldwide, using globalized standards, and making many small farmers more vulnerable to global markets.

Towards a Sustainable Agri-food Eco-economy?

To address these 'missing links', we can postulate a process of 'real ecological modernization' and 'sustainable growth' that reinserts these key links and is embedded in the different contexts of space and place (Horlings and Marsden, 2011). Table 1 provides an overview of the differences between the dominant food paradigm (what we call the bio-economy) and a 'real' ecological modernization of agriculture (eco-economy); that is, one that overcomes both of the ecological fallacies mentioned above.

Overall it is useful to be explicit about the definitional status of the bio- and the eco-economy concepts. These have been further elaborated in a recent paper by Kitchen and Marsden (2011) in *Local Environment* around variations in weak and strong forms of ecological modernization (as both paradigms now espouse aspects of environmental sustainability). The bio-economic paradigm (see also Langeveld et

Table 1. Competing paradigms and pathways for ecological modernization in agri-food policy.

Dimensions	The dominant food paradigm: bio-economy	Real ecological modernization of agriculture: eco-economy
Economic regulation and control	Corporatization	Place-based-agri-food networks
	Productivity (yield) oriented	Integral approach between production of food and interdependent ecologies
	Aggregated framing of food crisis and its 'solutions'	Economic and ecological practices representing new and re-invented 'patterned hybridities'
	Maintenance of the cost-price squeeze for local producers; high levels of value-added profit margins in corporate retailing	Food security linked to multi-scalar networks of local and regional actions
Technological	Technology development as economically driven, and increasingly corporately controlled.	Technological generation as a demand-driven process
	Reduced role of the state in setting research and development agenda	Lay and indigenous knowledges can be absorbed into wider research and development base
Ecological	Ecological and genetic engineering (industrial ecology) designed to reduce externalities through 'sustainable intensification'.	Based on highly variable and both certified and non-certified agro-ecological principles linked to ecological space and place
	Lab based experimentations emphasis with field trials tending to exclude social or management behaviours and practices	Local knowledge creation and dissemination
		Emphasis on maintaining and enhancing food sovereignty for producers and consumers
Social-cultural	Dependency, scientification, rational man-nature relation, loss of farmers freedom/agricultural employment	Sovereignty
		Autonomy
		Synergy between society-nature
		Demand-driven research (mode 2 science)
		Labour and skills-intensive
Spatial	Globalized	Locally embedded in the community
	Export-oriented	Endogeneity
	Use of external resources	Use and reproduction of local resources
	Locational critieria for production footloose and/or associated with proximity of inputs. Shortages in inputs 'solved' by extending international corporate property rights	Locational criteria embedded in *terroir* and its multiple branding
Political	Top-down steering and regulation	Enabling policy
		Participatory approaches
	One-direction communication by extension services	Influence of communities in agri-food networks
	Power concentrated at multinationals and large retailers based upon notions of 'free-trade' and the minimization of 'state-aids'	Regional governance facilitating network and consortia development
		New innovation sharing and collaboration. Self-sufficiency in the context of fair trade

al., 2010) is an amalgam of science, economy and politics, which, as the OECD argue (2005, p. 22), is now:

> 'part of the economic activities which capture the latent value in biological processes and renewable bio-resources to produce improved health and sustainable growth and development. A second concept mentioned here, the bio-based economy, deals more narrowly with industrial applications: it is an economy that uses renewable bio-resources, efficient bio-processes and eco-industrial clusters to produce sustainable bio-products, jobs and income.'

Although this is a traditional economic view of the bio-economy, it is a paradigm that also fuses *particular* technoscientific and political dimensions of modernization and progress, which lend themselves to generic and aggregated solutions to the sustainability crisis (see Spaargaren, et al., 2012) as well as to the necessary transitions needed.

With 'eco-economy' a much stronger form of ecological modernization is envisaged whereby the social and ecological are far more embedded in place-based constructions of economic relations. It is an alternative and more diverse and fragmented arena, which can incorporate – but is broader than – agro-ecological or food-sovereignty practices. It partly develops its vibrancy by creating a more autonomous but also oppositional status to the bio-economic paradigm. It involves the rise of complex networks and webs of viable (and often multifunctional) businesses, which, added together, can potentially realign and spatially embed production/consumption chains capturing local and regional value between rural and urban spaces. A range of economic activities utilize ecological resources in more sustainable and ecologically efficient ways (for example, new renewable energy firms, agri-tourism, food processing and catering, and social enterprises), using and absorbing lay and indigenous knowledges. Importantly, these do not result in a net depletion of resources but, instead, provide cumulative net benefits that add value to rural and regional spaces in more integrated economic and ecologically (hybrid) ways (Kitchen and Marsden, 2009).

This incorporates an increasing and large variety of sustainable farm practices and systems based on agro-ecological principles, which take the form of 1. organic agriculture, 2. urban and peri-urban agriculture, 3. conservation agriculture or zero tillage, 4. low-input agriculture, 5. agroforestry, 6. aquaculture. However, the eco-economy does not just rely upon agro-ecological production, as it also incorporates processing, marketing and consumption practices, as well as making linkages with related land-based businesses (such as ecotourism, agroforestry and community-based renewable-energy schemes).

The question remains as to whether these practices can in fact 'feed the world'? Whilst we must recognize that 'solving' food security involves as much concern with allocation as it does with production, it is nevertheless important to ascertain if there is a basis of reliable and scientific evidence that suggests eco-economic practices and processes can contribute to food security as well as food sovereignty. And if there is, what are the impediments for mainstreaming these eco-economic processes? There are indications in the international literature that local-scale food systems are more sustainable because they have 'tight feedback loops', linking consumers, producers and ecological effects, enabling positive adaptive responses to negative effects (Sundkvist et al., 2005). This suggests that locally embedded food systems are more

resilient, and they do not necessarily deny meeting wider international and fairer trade commitments.

During the 2007 international Conference on Organic Agriculture and Food Security in Italy, it was stated that organic agriculture could produce sufficient food to feed humanity, on a global per capita basis (Scialabba, 2007). A recent FAO analysis, based on more than 50 cases in the USA and Europe, and just over a dozen studies in developing countries, showed that organic farms are more economically profitable, despite frequent yield decrease (Nemes, 2009). Higher outcomes are due to premium prices and predominantly lower production costs. These conclusions can also be drawn from studies in developing countries, but there *higher* yields combined with high premiums are the underlying cause for higher relative profitability.

A University of Essex survey of some 286 agro-ecological projects in 57 countries showed that sustainable agriculture has led to an average 93% increase in per-hectare food production (Pretty and Hine, 2001). The relative yield increases are greater at lower yields, indicating greater benefits for poor farmers and for those overlooked during recent decades of modern agricultural development.

Some of the most path-breaking examples of sustainable agriculture can be found in the developing countries of Africa, Asia and Latin America. The 'ensete' agroforestry system, for example, is a 5,000 year-old farm system practiced by the Gedeo people in the highlands of Southern Ethiopia (Kippie, 2002). The system is able to produce a large variety of products such as ensete, a high quality food, one of the best coffees of the world, honey, timber, and a superior race of highland sheep. The perennial cropping system has good resilience against droughts, thanks to the ensete plant, which captures water with its fan-shapes leaves and whose fibrous root-system also prevents erosion.

In Brazil, there are now some 15 million hectares under *plantio direto* (also called 'zero tillage'). Many of the Clubes Amigos da Terra, literally 'friends of the land clubs', have been closely involved in this transformation (see Pretty, 2003). Zero tillage means no mechanical soil disturbance, permanent soil cover, and judicious choice of crop rotations. In a few years the approach led to higher yields in crop production, decline in labour costs, a diversification into livestock as well as agro-processing, resulting in improved food security of small farmers.

In China, sustainable agricultural development is more government-led. There has been a rapid expansion of self-identified organic agricultural products in rural China, for example is the experiment in a Fushan village of 224 farm households. This has steadily derived benefits for the wider rural economy as well as the farms themselves (Lin, 2010). Analysis of the soils has shown improvements in the state of soil structure and nutrient composition due to the application of biogas residue. This also led to large reductions in fertilizer application and increases in crop yields.

From Ecological Fallacies to Real Sustainable Growth

There is enough evidence at a case-study level to question the legitimacy of the bio-economic paradigm as a possible answer to Malthusian predictions. Similarly, there is a need to question 'sustainable intensification', which Malthusians vibrantly articulate. However, this legitimacy will not be seriously challenged if the debates remain at the aggregated global level without critically confronting or transcending both the methodological problems of scale, diversity, context dependency and the

sanctity of generic (one-size-fits-all) technological solutions over more place-based technologies and knowledge systems.

Eco-economical approaches could 'feed the world', and thereby contribute to a 'real green revolution' – but this requires a more radical shift and the widening of debate amongst scientists and policy-makers about fostering new types of diverse and embedded agri-food eco-economies. This is a shift that many groups of urban consumers are now demanding. Indeed, the current economic recession and financial crisis, coupled with the growing food crisis, is giving further impetus to alternative agri-food movements. This involves rethinking established market mechanisms and organizations, more innovative institutional flexibility on a regional scale, interwoven with active farmers, consumers and wider civic society participation, along with a redirection and widening vector of science investments to take account of translating often isolated cases of good practice into mainstream agri-food movements.

It also needs to be recognized that the onset of bio-economic models can marginalize the capacities for eco-economies to flourish and to 'scale up' in particular places. The times are now urgent for this rethinking and debate, and the growing legitimacy of bio-economic solutions needs to critically inform more effectively why more and more people are going hungry, on the one hand, and becoming obese, on the other. In macro-economic and policy terms, these issues are now of such global and local concern that they will require national and international government bodies to actively incorporate agri-food security and sustainability into their foreign affairs and finance departments, rather than just their rural affairs or agricultural departments.

Towards Third Natures

The critical political economy of agri-food has tended to ignore, certainly to marginalize, nature in its framings of capitalist accumulation and appropriation. Whilst the alternative food agenda attempted to celebrate nature's distinctiveness as part of the analysis of alterity (see Goodman et al., 2011), it was conceptually difficult for political economists to absorb the complexities of social nature from within their own paradigm. As a result, nature was seen very much as outside of, or as a resistance to, full-fledged commodified relations. The post-structuralist turn, on the one hand, and the deepening sustainability crisis, on the other, has meant that more urgent attempts are needed to embrace a modified political economy of agri-food, which allows for the transformation, intervention and diversity of social nature to be conceptually incorporated. This has been pursued most effectively in the political-ecology literature (see Peet, et al., 2011; Perfecto, et al., 2010) and it is from this base that this following discussion draws most of its conceptual sustenance.

Boyd et al. (2001) and Smith (2007) have begun to explore the complex ways in which capital no longer commodifies nature but, instead, seeks to transform and intervene in it in ways that allow it to be harnessed for further rounds of capital accumulation. Mann and Dickenson (1978) and Henderson (1998) have given pioneering accounts of how 'second' nature emerges out of the distinctive features and disparities of labour and natural time associated with agricultural production and processing. It is the naturally 'awkward' character of agricultural production that has unleashed an historical series of attempts by science and capital to harness its inherent unruliness. This has occurred, first, through the attempts to remove small family farmers from the land by corporate capital and, second, by unleashing what

Goodman et al. (1987) call the arms-length appropriationism and substitutionism by agri-business through mechanical technologies and then biotechnologies. This tended to transform the agri-food labour process and governed it in ways that standardized and regularized commodities with some form of temporal consistency.

What is now clear is that this age of second nature is now insufficient (both conceptually and practically) for dealing with the continued vagaries of agri-food as a frustratingly unruly natural resource. Second-nature solutions lasted successfully and consistently for some time during the final 20 years of the twentieth century but they increasingly reached their limits, for a set of both internal and external reasons. Internally, the spasmodic and multiple food safety crises demonstrated that second nature, itself a scientifically and economic construction, could, as Ulrich Beck (1995) typified it, still 'hit back' or 'boomerang'. Much of the scholarship during the 1990s and 2000s has depicted this inherent and internal crisis of second nature and the labyrinthine ways in which the state and conventional technoscience attempted to assuage consumer and producers from one crisis after another (see Marsden et al., 2010). However, these internal pressures on the very unsustainability of second nature have indeed been externally challenged more radically by the wider and even less controllable 'landscape' pressures of global warming and resource depletion.

What both of these pressures have demonstrated is the inherent interconnectivity of what is described, here, as 'third natures'. The overall rise of environmental depletion and global warming, combined with the clear risks associated with 'second nature' foods, is transforming both the conventional and the alternative food systems in ways that force them to seek new 'more sustainable' third-nature solutions. This expresses itself through the differential and contested applications of the bio-economy and eco-economic pathways. These both display 'third nature' tendencies, albeit from different standpoints and definitions of scientific and spatial categories. What the contestations between them represent are new ways of patterning certain types of hybridities between the social and the natural. For instance, the bio-economy now espouses the need 'to be sustainable' and to be progressive as part of 'green growth' (OECD, 2011). This is seen as a particularly progressive form of sustainability for, as Carson (2007, p. 116) admits, 'the work of biological technologies will continue because the possibility of improved yields, increased near production, plentiful biofuels, and improved human health through new vaccines and replacement tissues are too scientifically, politically and economically enticing for humans to resist.'

Clearly, the bio-economy represents an important new third-nature assemblage not only to overcome the second- and first-nature obstacles to capital accumulation and appropriation, but also to do so while at the same time espousing progressive notions of sustainable development and ecological modernization. If technically it transforms nature itself by significantly manipulating natural reproductive processes in plants and animals, through largely privatized control over the techniques and practices that bring these about, more socially it can legitimate these processes by articulating that they are also reducing environmental externalities by a deeper control over nature through science. This is at the heart, for instance, of the new policy rhetoric around 'sustainable intensification'. Through the application of bio-economym the question is no longer 'can science and capital overcome the distinctive natural features of food production processes?', but rather, 'how far can they manipulate the natural processes themselves such that they play by different rules which are socially as well as economically acceptable?' Under these conditions it is

not nature itself that provides the only technical barrier. Of equal significance is the social, political and ethical public acceptance of such processes.

Hence, a key component of the bio-economic third-nature experiment is the potential for it to create an alternative public oppositional status. In this sense, the rise of the eco-economy draws part of its nourishment from the bio-economy, for it sets itself in opposition to the very parameters around which bio-economic third natures are being produced. As can be seen from the examples noted earlier, these eco-economical alternatives become based upon a substantially different set of social and spatial nature parameters (Tables 1 and 2). They also relate to broader national and regional debates concerning multifunctional and sustainable rural development, as well as the recasting of urban–rural linkages and sustainable place making. As Table 3 summarizes, the eco-economy implies different and more disaggregated logics with regard to field and intervention science (over and above lab-based science), and provides a different emphasis upon place-based research and development, the role of local small and medium-sized companies (SMEs) and clustered developments (Van der Ploeg and Marsden, 2008). The emphasis is to innovate by means of recast-

Table 2. Key parameters.

Dimension	Bio-economy	Eco-economy
Ecological modernization	Weak	Strong
Geographical scale	Global, national and regional, increase of scale and miniaturizing as expressions of the de-coupling from local conditions	Regional and local, embedded in local environmental conditions
Economic model	Economic growth	Steady-state, small-scale economy
Time-scale	Short term, speeding up life cycles	Long term
Power	Corporate control	Citizens and consumer networks
Value-adding	Supply chain logistics	Value capture at local and regional level New networks
Science	Reductionism, biological engineering Aimed at interchangeable, composable parts for industrial production	Holistic approach, use of whole products.
Driving forces of regional development	Competition, clustering and socio-technical systems	Multi-functionality, networks and resilience
Environmental goal	Closed loops of energy, waste and minerals and eco-efficiency	Based on ecological conditions and natural processes
Social	No or limited connections with local communities	Embedded in local, social networks
Rural-urban linkages	Connected to metropolitan industries	Connected to rural-urban landscapes and consumer networks
Landscape	Eco-industrial sites, agroparks	Rural, agricultural services and leisure landscapes
Innovation	Knowledge spillovers between firms, technological innovation	Open innovation and ecology based
State influence	Hygienic-bureaucratic control	Facilitate bottom-up developments
Regional policies	Trade freeness, facilitate knowledge exchange & technical innovation, redistribution and congestion.	Multi-functional land-use, facilitate new interfaces, networks and rural-urban linkages

ing the relationships in social nature through reinventing first-nature principles in a third-nature context.

It is clear then from the arguments above that what we now witness as critical social scientists of agri-food is a highly 'third-natured' contested terrain in which radically different paradigms are competing for legitimacy over the control, not just over agri-food resources, but over the wider and more interconnected natural resource complex within which those resources sit (see Table 3). The social legitimacy of these different models with regard to their long-term sustainability prospects is becoming all the more central to their functioning as the overall crisis of resources and global warming acts out. The bio-economy thus needs to embrace progressive sustainability as a key goal if it is to find some form of legitimacy with consumers and the public. Similarly, as we have seen from the above analysis, if the eco-economy is to scale up or 'scale out', it needs the supportive facilitation and institutional legitimacy of national and regional governments.

Transition Mechanisms, Contestations and Spatial Configurations

As Table 3 depicts, a key dynamic in these processes of third natures becomes the particular and potential mechanisms by which the contestations between these opposing paradigms is acted out. What becomes significant here are the ways in which the different paradigms create the space for transitions to occur over time and space. I have listed here a set of key engagement concepts in this regard.

1. *Malliability*: the degree to which the dominant bio-economy is sufficiently flexible and malliable to external landscape pressures, on the one hand, and pressures to accommodate change from a range of socio-technical niches.
2. *Scalability*: as we see from some of the examples above, how capable are socio-technical niches of scaling up – given their diversity and context dependency?

Table 3. Adaptive capacity building: reconstituting urban–rural spatial relations.

Production Consumption Resource Spheres/ ARENA (Tucker et al 2006)	Landscapes/Regimes/ Socio-Technical niches	Transition mechanisms and contestations	Spatial expression configurations
Food/Fibre Transport (mobilities) Energy Household goods and services Waste Amenity services ICT	DYNAMICS Between contesting paradigms (e.g. Bio-economy, Eco-economy) DIFFERENT LOGICS R & D knowledges and innovation strategies DIFFERENT CORPORATE/SME Competitive strategies regarding ecological modernization	MALLEABILITY SCALABILITY REFLEXIVITY SPATIALITY ENDOGENEITY NOVELTY TRANSFERABILITY ADAPTIVE CAPACITY RESILIENCE (survival, restorative, adaptive) PATH CREATION/DEPENDENCE INTERDEPENDENCE	DOMINANT REGIME SPACES HYBRID SPACES CREATIVE ECO-ECONOMIC CLUSTERS COMMUNITY PLANNING DISPUTES AND ACTIONS NEIGHBOURHOOD POLICY – 'ACTION SPACES' PLACE-MAKING

Source: Marsden, 2011.

3. *Reflexivity*: how far will firms and governments become more reflexive in their understanding of the complexity surrounding real sustainable systems and the governance thereof? Can they create new forms of sustainable intervention using novel forms of eco-science?
4. *Spatiality, novelty and endogeneity*: how is diversity and context dependency to be more effectively articulated in ways that demonstrate more scientific and political authority? How can forms of endogeneity and self-sufficiency be mainstreamed without calls of state and regional protectionism?
5. *Transferability*: how can more effective mechanisms and meeting places be formed for the transfer of best practice? Can new diversified roadmaps be assembled that assist local actors in innovating?
6. *Adaptive capacities and resilience*: how can the lock-in tendencies of the bio-economy be countered by the creation of new forms of territorial capital (combinations of social, ecological and economic capitals)? By what means can local and regional eco-economies build restorative and adaptive forms of resilience? Can sustainable communities move from survivalist to adaptive forms of resilience through redefining their agri-food networks?
7. *Path creation rather than path dependence*: can localities and regions build path creation strategies through new agri-food networks: and, if they can how do they ensure that these become sustainable over time and space? Can new food spatial strategies help to build path-creation?
8. *Interdependence*: clearly agri-food mobilization needs to be linked to wider resource spheres such as transport and mobilities, energy, household goods and services, waste, amenity and ICT. How can more conducive and interdependent links be created and sustained between these sphere as part of broader sustainable place making?

Whilst these key and interlocking concepts are not meant to be exhaustive, they do represent some of the key lenses through which to explore the dynamics and dialectics that exist between the contested relations and patterned hybridities of the current bio- and eco-economies. Moreover, the degree to which these are problematized and spatialized will clearly affect the development and further potential of real sustainable development in the form of a more mainstreamed and diverse eco-economy. The degree to which they are studied, and enacted, will be a key feature of how successful regions and localities will become in building more sustainable and resilient food systems – food systems that interlock progressively with other sustainability resource fields (outlined in Table 3). Their mobilization and enactment will, of course, be different in different spaces – with some regions (such as much of the Dutch countryside as well as parts of Southern Portugal) enacting both models in tandem.

These articulations will have to be conditioned by a critically reflexive understanding of the territorial potentials and assets of the different spaces. In this sense, there are no generic models of sustainable progress but there are useful 'road maps' and pathways to establish based upon the redefinition of place-based assets and social and natural resources. These will depend partly upon a more engaging and interventionist form of sustainability science, which gives more regard to the differential politics and social ecology of place. In the last column in Table 3, we may be able to identify different spatial expressions of the interactions between the bio-economy and eco-economy, as these sets of parameters and concepts act out contingently.

It is important to recognize here that such spatial expressions should not be read simply as outcomes of the processes and parameters outlined and proposed here. Rather, they represent a set of spatial contingencies that, in themselves, can interlock, re-enforce or weaken the sets of transition mechanisms and contestations outlined above. Nevertheless, they do create new spatial routines and infrastructures (like new urban food hubs, or clusters of mega-farms) that could have long-term impacts on the degree of real sustainable spatial development. The important point to note is that the acting out of the parameters of transitions and contestations outlined above are having, and will have, profound implications for the reconstitution of both urban and rural spaces and their interrelationships. This leads us to consider what types of third-nature food-scapes might emerge.

Conclusion: Differential Spatial Expressions of the Bio- and Eco-economies – Towards Third-nature Foodscapes?

It is reasonable to assume, in Europe at least, that we will see the co-evolution of clusters of eco- and bio-economy in different regions. The slow and somewhat inertial reform of the CAP will also reinforce this co-evolution, with its continued attempts to preserve and protect some types of farming and food-scapes, at the same time as allowing some regions to progress the intensive bio-economic model. In parts of the UK and the Netherlands, for example, we observe the move towards 'mega-farm' developments, especially since the re-establishment of a renewed productivist logic following the food security crisis (Spaargaren et al., 2012). Whilst some of these still remain at the planning stage and are creating significant local and 'third nature' opposition, the process of intensification (for instance, in the dairy sector in the UK and in the pig and poultry sectors in the Netherlands) continues at a rapid pace. This follows the principles of the bio-economy and sustainable intensification and is likely to be a dominant political discourse in the lowland regions of Northern Europe. We should remember that these are regions that will be affected significantly by climate change, and especially water shortages, over the next 20 years.

In upland regions, however, the eco-economy is gaining a far stronger spatial grip. In South-west England and in Wales, for instance, eco-economical clusters are proliferating with the dominant regime, receding as it restructures itself around ever more concentrated processing and retailing outlets. A significant minority (up to 30% in Wales, see WRO, 2010) can be identified as multifunctional farms, providing a range of agricultural value-added, amenity, and environmental activities and income streams. Moreover, city-based and region-based food strategies, for cities such as Plymouth and Exeter and for Wales as a whole (see WAG, 2010) are gaining ground, and are linking more multifunctional and sustainable agricultures to new sustainable consumer and health agendas.

We see, then, a new co-evolutionary process acting out spatially and regionally in the UK and Netherlands, with diverging innovation and economic systems reinforcing both intensive and eco-economic models – and with the multilevel state also presiding over this spatial and sectoral divergence. Urban-based consumers and environmental amenity groups become a strong mediating force, linking food provision with health and well-being. This new insertion is beginning to affect other key actors such as retailers and value-added processors in rural areas. In some ways these trends are recreating the concept of the ecological city region (Forman, 2008). Forman (2008) argues that through both economic and new ecological awareness

(that is, third-nature thinking) what we are witnessing now in many parts of the North and the South are sets of dynamic city regions, situated in their wider hinterland contexts, associated with climate change (mitigation and adaptation, biodiversity loss and partial restoration, watershed and amenity concerns). Clearly, many of the articulation mechanisms outlined above are now acting out, not just sectorally, across the food, energy, and transport fields – but also in a reconstituted 'city region' context. This again re-ecologizes the spatial economy and brings in food as a key mobilizing force for reconstituting these spatial relations.

The divergence of agri-food developmental pathways is not new (see Morgan et al., 2006). What is new is that the eco-economic initiatives (and those associated with the potentially more malleable bio-economy) are both expanding and deepening their grip on different spatial scales. This is giving all the more vibrancy to the growing consumer and public consciousness about the unsustainability of current socio-ecological conditions.

A key and final question, here, concerns the role of the state and its policies (or non-policies) with regard to these co-evolutionary processes of bio-economy and eco-economy. At international and many nation-state levels there had been much discussion about the continued neo-liberal state and its role in stimulating the bio-economy, corporatization and financialization (Lawrence et al., 2010; McMichael, 2011). This is a very active and transcending governance process, which continues to 'unknow the known' in the sense that it continues to apply the ecological fallacies mentioned above to the new and pervasive landscape pressures the world now faces. In short, it creates a dominant and aggregated policy discourse, which then attempts to marginalize eco-economical niches.

At the same time, we have begun to articulate this in the UK – for instance, around the debates concerning agricultural and agri-food multifunctionality (see Marsden and Sonnino, 2008) – while witnessing the fragmented but nevertheless significant development of local, regional and city-regional policy formation. This represents a new form of reflexive governance in that it is attempting to embrace the complexities of the current state of unsustainability through a new set of flexible spatial and integrative categories. Hence, the recognition of the growing salience of the ecological city region (as with Forman, 2008) is being matched by new levels of political and civic activity at that scale with regard to sustainable agri-food movements. In the UK most of the major cities now have some form of 'food strategy' – be it formed around food charters (Brighton), food councils (Bristol), or the development of new types of food hubs and trusts (Plymouth, Exeter, Stroud, see Sonnino, 2011).

Over the past five years place-based regional, city-region and in some cases small town and village networks of reflexive governance have demonstrated how innovations can be made to bolster and articulate collectively the above-mentioned transition mechanisms. These movements exemplify the challenges of the dimensions identified concerning scalability, transferability, resilience, path creation, and dependence. These new reflexive arrangements are potential vehicles for more-effective and reflexive institutional building around what might be called 'niche amplification'. In some ways they are 'interstitial communities' (Wright, 2001) in the sense that they are often formed and developed outside of the main governance institutions. However, the degree to which the latter are, indeed, malleable for these institutional communities to be scaled up, or mainstreamed is a key contingent question for further research. As they mature they are creating new and innovative place-based communities of practice, which can, in turn, lead to scalability and more

effective institution building. Perhaps the most well-documented of the evolutionary processes concerns the development of the Toronto food council. As Friedmann (2010, p. 168) argues in a seminal piece called 'scaling up':

> 'I understand the Toronto community of food practice to include more than networks among individuals, and more than their skilful access to institutional resources. It also includes the specific functions of a municipal government body, the Toronto Food Policy Council, and a vibrant network of non-governmental food security organizations, especially the largest, FoodShare. These organizations have provided strategic resources, as well as opportunities to experiment and learn from others' experiments, to the diverse individuals who move through them, usually leaving behind new projects and ideas. These institutions are unique in linking a wide range of top-down and bottom-up initiatives that emerge and evolve within and across a range of 'sectors' – public, voluntary (NGO), and market.'

New institution building based upon vibrant but diverse communities of practice becomes a key dimension of scalability in place-based sustainability initiatives, both related to food and other key resource areas (see Marsden et al., 2010). Indeed, they seem to cluster in some areas and not in others, and so a key undertaking is to understand conceptually and empirically the evolutionary dynamics of this eco-economic clustering.

Reflexive governance forms, and associated institution building, re-enforce a new innovative spatiality of alternatives to the dominant agri-food regime by embedding and anchoring their communities of practice in and through space. In this sense they are harbingers of a new agri-food, and more widely sustainable, form of place making and connectivity. In the Toronto city region, for instance, FoodShare links with over 200 agricultural suppliers, connecting them to food outlets in the city. Food events are held bringing together over 400 suppliers, restauranteurs, chefs and procurement bodies. Place making and governance are still highly significant factors in the alternative food movements. But, the way they are being reconstructed around new patterned hybridities of ecology and economy represents a key element in current agri-food innovation and sustainability.

In many respects, conventional agri-food policies and governance structures – especially those at the supra- and national levels of EU and UK governance – are not catching up with or understanding the vibrancy of these interstitial innovations in reflexive governance. Traditional agricultural policy is still sectoral in nature, top down, and takes, by and large, a (supply chain) commodity approach rather than one of (complex and configurative) 'place making'. It also attacks and attempts to marginalize any hint of co-operation between local producers and processors (see EFRA, 2011). In the UK, for instance, despite the real need for a reintegration of planning, rural and agricultural policies at the national level are part of a conventional system. This is one based upon an unhappy mix of neo-liberalism and market interventions, which support food processing, retailing and catering oligopolies and continue an active process of 'unknowing'. The growing crisis in food security in this context is creating a chaotic 'neo-productivism' ever more reliant upon the bio-economy and contradictory notions of 'sustainable intensification'. In these circumstances, we need to focus our attention for the development of real agro-ecological and sustainable alternatives in the agri-food sphere at least partly at the city and regional levels. These conclusions suggest the need for an ambitious comparative

research effort on the part of scholars of agri-food, such that a stronger research base can counter the singularity and ecological fallacies associated with the bio-economic paradigm.

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