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RETHINK

Rethinking the links between farm modernisation, rural development and resilience in a world of increasing demands and finite resources

Conceptual Framework

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Introductory notes: *The Conceptual Framework aims primarily at providing an overview of the discourse around the 'modernisation' of agriculture, so all project partners agree on what we need to RETHINK. However, it is not meant to be a comprehensive review of the (very large and very diverse) literature on agricultural modernisation. Rather, we have selected themes and references that seem to be particularly relevant to the work in RETHINK.*

The Conceptual Framework is closely linked to the Analytical Framework, which focuses on the four themes for the international comparative analysis. The 'case study questions' are included to help partners to position their case study within this broader discourse.

All project partners were invited to suggest additional issues and references to be included, especially relevant publications by their team members. We particularly want to thank Lone Kristensen, Jørgen Primdahl, Sandra Šūmane, Tālis Tisenkopfs, Gunilla Olsson, Anders Wästfelt and Romualdas Zemeckis for their constructive input.

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1. Setting the scene: what is modernisation of agriculture and why do we need to RETHINK it?

1.1 The modernisation of agriculture in Europe

The modernisation is a comprehensive and complex process, which is historically linked to the industrial revolution. The modernisation process fundamentally restructured societies, driven by the rationalism of science and industrial production. The aim was to make processes more predictable and controllable, making them more efficient, not least through mechanisation. While 'modernisation' as a societal process started earlier, it is only in the mid-19th century that it really gained momentum in agriculture. After the Second World War the political objectives, both in capitalist and socialist bloc countries, were to ensure domestic food production, to free labour for the industrial sector[1], and to ensure that urban populations could purchase food at affordable prices (Grin 2010). Progressively, in Western European countries, a social aim was added and used to justify public support policies: to ensure that farmers' standard of living was comparable to that of the other social classes (Allaire and Boyer 1995).

To achieve these aims, the process of agricultural modernization built on the **productivist paradigm**, which can be defined as "a commitment to an intensive, industrially driven and expansionist agriculture with state support based primarily on output and increased productivity" (Lowe et al. 1993: 221). To increase productivity (narrowly defined as an increase in output per worker, per plant and per animal) and do so efficiently, processes in agriculture were simplified, standardized and mechanized. The knowledge behind these practices was to be elaborated by scientists, which were seen as the primary source of innovation and 'progress'. And given that the goal was to be 'efficient', the productivist paradigm was also tightly linked to the capitalist logic. In this logic, markets played a key role: rather than using on-farm resources (e.g. human labour, biological controls, local knowledge), it was seen as 'modern' and progressive to purchase resources from markets (e.g. machinery, chemical inputs, proprietary seeds, scientific knowledge).

The **state** was deeply involved in promoting modernisation (Grin 2012, Hardeman and Jochemsen 2012). In Western European countries, government actions comprised institutional measures, such as structuring an agricultural knowledge system (establishing agricultural colleges, funding agricultural research) and installing 'chambers of agriculture' or other types of extension services; they included a range of structural policies to enable farms to mechanise (e.g. providing credit schemes, promoting land consolidation to enable scale enlargement or organising agricultural production on large-scale collective farms); and market and price policies, most notably product subsidies that enabled farmers to earn better incomes while ensuring affordable prices to consumers. In socialist countries, private farms were abolished and land collectivised. The state planned and organised agricultural production and delivered the necessary resources in a top-down manner, with clear targets regarding production quantities.

In Western European countries, the policies were very effective for agriculture considered as an economic sector and for most of the farmers who could adapt to the

[1] The industrial sector was expected to provide most of the economic growth needed to recover from the Second World War.

new paradigm (others left the sector, which led to a strong reduction in the number of farms across Europe). As a result of these concerted efforts, productivity increased dramatically, and farmers' incomes became relatively close to the income in other sectors. In socialist countries agricultural productivity and output also increased, but the administrative central direction regulating the sector was too faulty to make it efficient, and without strong state's intervention it was not operative. Cheap subsidised food and secure employment were the major socio-economic benefits.

1.2 Characteristics of modern production methods and their consequences

While the aims of modernisation were doubtlessly achieved, the drawback of this mode of production and of the related farm structural changes started becoming noticeable, especially its environmental impact and its impact on rural communities (Knickel 1990). These may be seen as unintended 'side-effects'[2] of the productivist logic, and their prevalence and severity is highest in those areas seen as 'favourable' to agriculture. We briefly review the productivist logic and key practices as well as their side-effects (for more details, see e.g. Weis 2007).

To increase the efficiency of production, fallows disappeared, crop rotations were shortened, and there was might a shift towards monocropping. However, biological simplification and standardization increase the vulnerability of crops to the spread of pests, weeds, fungi and disease. These need to be treated using *insecticides, herbicides and fungicides*, many of which are derived from petrochemicals. This 'chemical fix' has routinely led to a treadmill of dependence as resistance develops, natural controls diminish and more or new inputs need to be applied. However, since the 1960s, it has been pointed out that the systematic use of synthetic inputs tends to have wide-ranging **impacts on the environment**. Indeed, modern production methods are increasingly a threat to the provision of ecosystem services (e.g. pollination) and have been linked to a loss of biodiversity. More recently, the awareness regarding globalization and the related processes of delocalisation of environmental impacts is increasing. Indeed, the 'greening' of agricultural practices in some parts of Europe might go along with an intensification of other parts of Europe or outside Europe. This delocalisation is enabled by global trade flows and the unquestioned reliance on cheap fossil fuel.

To ensure high yields and given the limited use of e.g. legumes or fallowing, fertilizers are used routinely to provide external sources of nitrogen, phosphorus and potassium. However, the **fertilizer** and other chemical runoff from monocultures often have a diffuse impact on terrestrial and aquatic ecosystems. Nitrate levels are elevated in many regions, which might require water purification before being able to use the water as drinking water. Similarly, lakes and coastal ecosystems may suffer from eutrophication.

The use of ever larger and faster machines in ploughing, planting, spraying and fertilizing sometimes leads to **soil degradation** which also results from the reduction of ground cover between rows and from less fallowing. Similarly, over-irrigation of land can lead to salinization. The overdraft of water for irrigation threatens its long-term supply in some regions, as agriculture is becoming one of the major users of fresh water (MEA 2005).

[2] As the cost of many of the side-effects are 'externalised' (i.e. seen as separate costs borne by society), it has been pointed out that they can be understood as a vast series of implicit subsidies to cheap industrial food (Weis 2010: 317).

The confinement and **intensification of livestock rearing** is associated with magnified vulnerability to disease and behavioural neurosis, which is overridden by animal pharmaceuticals and practices such as de-beaking[3] and tail docking, which have raised issues linked to animal welfare. To enhance yields, antibiotics are used routinely, and in some countries hormones can be used. This 'pharmaceutical fix' also raises problems of a treadmill effect. Furthermore, the burden of large amounts of manure from intensive indoor livestock units and wastes from large-scale slaughterhouses are problematic. Modern production methods have also led to a string of 'food scares' (e.g. BSE, swine and avian flu, listeriosis, E. coli).

Scientific **knowledge** is seen as the source of innovation, and agribusiness technologies providing commercial inputs are seen as essential to implement the innovations (Cazorla et al. 2005). To enable the widespread use of technologies, production processes are standardized, which implies that the ecological context is disregarded. Farmers' local ecological and practical knowledge is disqualified as irrelevant and farmers themselves are made invisible (Santos 2004). The dependence on synthetic inputs can thus not only be connected to environmental impacts, but also to the loss of localized and shared biological knowledge in farming and its displacement by the intellectual property of agro-industry.

The emphasis on the virtues of economic efficiency and economies of scale has framed **large, specialised farms** as both inevitable and desirable. The productivist developments have thus led to fewer and larger farms. As a result, large farms (i.e. 100 hectares and above) while representing only 3% of the total number of farms, control 50% of all farmed land in the EU (Franco and Borras 2013:6)[4]. This concentration has been (indirectly) supported by the CAP subsidy scheme which is (partly) paid per hectare of farm land. For example, in 2009 in Spain, 75% of subsidies were paid to only 16% of farmers, and in Hungary 72% of subsidies were paid to 8.6% of all farms (Franco and Borras 2013:7).

Faced with markets and due to the process of modernization, farmers have become reliant on corporations to provide the technical inputs to farming (i.e. seed, feed, chemicals, and machinery) and to buy the resulting produce. As Jack (2007: 928) points out: the corporations have the power to increase the costs of the former and depress the prices offered for the latter, and there is "some considerable evidence to suggest that this is in fact the case". As a result, two possible processes imply that farmers frequently face a '**cost-price squeeze**': either prices for agricultural inputs rise faster than the prices paid for agricultural produce; or the cost of production remain fairly constant but the prices for commodities decline over time. As a result farmers need to find new ways to make their business more efficient (e.g. by expanding and taking advantage of economies of scale), or need to identify new sources of income (van der Ploeg et al. 2002).

For individual farms, the on-going pressure to ensure economically efficient production is understood as the need to take advantage of economies of scale. This implies the need for on-going investments, linked e.g. to larger, more **expensive machinery** and animal housing which is needed to increase labour productivity, and the high cost of land needed for scale increase. This leads to the use of high levels of capital (not least

[3] Two-thirds of poultry birds are already reared in factory-like conditions (Halweil 2008b in Weis 2010).

[4] Franco and Borras (2013:10) point out that official EU statistics do not necessarily provide a precise reflection of the actual situation on the ground. For example, there are many cases of 2 ha and below that are ‚hobby farms', and there are large operational farms whose landholdings are subdivided into smaller units that are reflected in the official statistics.

financed through credit), partly due to nonpecuniary benefits (tractors as prestige objects), but also the wish to safeguard against production risk (precautionary investment in powerful machinery to mitigate production peaks) and the inability of small farmers to coordinate machinery sharing and thus holding inefficiently high stocks of machinery (Petrick and Kloss 2012).

The emphasis on 'economies of scale' have also resulted in a drastic **reduction of the number of farms**, especially small (family) farms, in effect emptying some rural areas of people[5]. As a result of lower population densities, the social fabric of rural areas is degrading, with lower levels of public services (schools, health care), reducing the quality of life for farmers and others in rural areas. The desirability of large farms is also linked to framing the purpose of agriculture as primarily producing raw material for the agri-food (or energy) industry. As a result, the role of small-scale or part-time farming to rural economy to the social fabric of rural areas is undervalued (Bryden et al. 1993, 2011, Shucksmith and Rønningen 2011, European Parliament 2013). In globalised food chains, the position of small farmers has been degrading as they lose power, self-determination and benefits from the food chains is shifting towards transnational corporations who dominate these chains (Vorley and Fox 2004).

Similarly, reducing food production to the market value of the crops negates all benefits beyond market values, i.e. ignores – thus devalues – farming for example as an expression of cultural identity (van der Ploeg 2008). **Farmers** are seen as entrepreneurs applying modern technologies, not as taking pride in autonomy, in being stewards of a self-controlled and self-managed resource base that includes land, labour, knowledge, and networks.

The processes of concentration on a few large farms, of specialisation on farms and/or regions and of intensification (Ilbery and Bowler 1998) have affected **landscape patterns** throughout Europe. Widespread changes include: increases in field size; drainage and reclamations of semi-natural grasslands (heathland, meadows, pastures and salt marshes); and removal of hedgerows, stone walls and ponds (Meeus et al. 1990, Stoate et al. 2001). The market competition and the need to produce 'cheap' commodities has also resulted is land abandonment and marginalisation of regions that are 'less favoured', i.e. where difficult conditions for agriculture do not allow for economies of scale. As a result, semi-natural grasslands are disappearing due to abandonment of grazing and mowing, as well as due to afforestation (since 1990 often supported by EU subsidies). These landscape changes have led to a loss of aesthetic value, of cultural heritage and reduced the biodiversity values (European Commission 1990, Meeus 1992, Green and Vos 2001, Brouwer et al. 2008).

The above-mentioned problems linked to modernised agricultural production practices and agro-food systems are not new, even though the problems were expressed differently in different regions. Thus, in Central and Eastern Europe (CEE) currently two forms of modernisation intermingle (Tisenkopfs et al. 2011). On the one hand these countries still cope with the impact of soviet collectivisation (with its centralised control and the destruction not only of family farms, but also of the corresponding knowledge and landscapes), and the persistent distrust in collective and cooperative approaches (Tisenkopfs et al. 2011). On the other hand, they also cope with the impact of western-

[5] While mechanisation contributed to making farm work less arduous, the increased efficiency also enabled the reduction of the labour force in the primary sector, from some 20% after World War II to 3-5% in the 1990s in most European countries.

style modernisation (with its capitalist logic, market pressures and focus on increasing competitiveness and productivity).

In both Western and Eastern Europe, the environmental impacts of agricultural modernization are now well recognized (Pilvere and Zaharova 2011); however, the impacts on rural communities and public health[6] remain less prominent in the public discourse.

Case study questions: Which of the problems linked to modernised agriculture are most severe in your country and/or case study? Which of the above-mentioned problems will you specifically address in your case study? Which will you not address and why?

2. Attempts to address the problems of modernisation

2.1 Between the global and local – two policy agendas, two types of space

Environmental impact of agricultural modernisation on a global scale has been one of the key reasons for the development of new policy agendas (especially in Western Europe). After the Brundtland Report in 1986 and the Rio Conference in 1992 efforts were made to integrate social and environmental policy into economic policy (World Commission 1986, Clapp and Dauverge 2005). As a result, **two policy agendas**, both functioning at national as well as international levels have affected agricultural modernisation – and often in diverging directions (Dwyer and Hodge 2001). One is the open market – or the *neoliberal – policy agenda* which has gained momentum since the mid-1980s (Harvey 2005). A consequence of this agenda has been expanding markets including food and land markets and a centralisation of market policy which in turn has increased the distance from policy market decisions and the specific landscape in which the agricultural production takes place. The other agenda deals with environmental and social sustainability. This *'sustainability agenda'* is characterised by multilevel systems of decisions from the UN Programme for Environment and Development to the local municipality. This 'hierarchy' of policy levels enables some degree of coherence between global and local levels and permits relatively close contacts between local policy decisions and the specific local policy issues in focus. However due to the centralised character of the agricultural policy agenda it has been increasingly difficult to integrate the two agendas at the local level (Primdahl and Swaffield 2010).

Expansions of markets on a global scale have – in combinations with technological developments (especially within transportation and information) and policy agreements – resulted in systems of increasingly connected and hierarchic networks worldwide (Held et al. 1999, Castells 2000, Harvey 2000). It is within such networks that foodstuff, fibre, energy, chemicals and food are distributed – under conditions which tend to be controlled by the leading partners of the networks themselves. The farmer is the bottom partner in such food networks and through such relationship the farm's production becomes part of vertical networks. These vertical networks are not (or to a limited degree) related to other local farms. Thus the farm production is becoming part of what Castells (2000) has termed *space of flows* and consequently agricultural development is increasingly being decoupled from rural developments (Woods 2011). This does not

[6] Taking the food supply chain up to the consumers, authors point out that while highly processed industrial food may provide calories, it does not provide adequate nutrition. This is problematic from the point of view of public health (and cost for the health-care system), given the obesity-pandemic in the western world and the rise of diabetes linked to refined sugars.

however mean that the farmer and the farm family is not part of a local community. They are, and they are often very active partners in shaping and maintaining local institutions linked to religion, sport, and civil society in general. They are citizens in a local community and landscape, part of what Castells has termed *space of place*.[7] If we link the **two dimensions of space** with the two policy agendas above it becomes clear why the two agendas are so difficult to integrate at the local level: The open market agenda is closely associated with spaces of flows whereas the sustainability agenda is connected to space of place – and in practice there are few overlaps between policy interventions into the two types of spaces.

The way any agricultural region or local landscape is related to space of flows and space of place (and some kind of balance between these two) to a large degree determines the conditions for rethinking agricultural modernisation and rural development and should therefore be considered in the case studies. Hägerstrand's (2007) concepts of 'territorial' (in this case the farmers' control of their land) and 'spatial competences' (in this case agricultural and environmental policies) and difficulties these competences face in functioning together may also be used to emphasize the challenges in integrating the two dimensions of space (Primdahl et al. 2013).

Case study question: How is your case study related to 'space of flows' and 'space of place'? Which dependencies drive and constrain the rethinking of modernisation? How can the two underlying policy agendas be integrated in innovative ways?

2.2 Reducing the environmental impact and improving resource use efficiency

Addressing the environmental impact is no longer seen as a 'marginal' or an 'optional add-on'. It has become an overriding operating imperative for policies, for farms, for agribusiness corporations. There is, however, a very broad range of proposals how this is to be achieved. To illustrate the different approaches, we briefly review two models focussed on technical modifications of production methods (i.e. integrated pest management and conservation agriculture) as well as two broader models, i.e. 'ecological intensification', and 'sustainable intensification'. All four are relatively high on the agricultural modernisation agenda.

Integrated Pest Management (IPM) encompasses a large variety of practices, with the aim to control pest populations while also limiting pesticide use. Measures include preventive cultural practices (selecting varieties that are adapted to local conditions, maintaining healthy crops), monitoring pest populations (e.g. through pheromone traps), and controlling populations if they reach threshold levels (e.g. through beneficial insects, biological insecticides derived from naturally occurring microorganisms, as well as through the use of synthetic pesticides). The aim is to maintain pest populations below the economic damage level. An IPM regime may also be implemented in a quite simple way (e.g. only monitoring) or in a sophisticated way, e.g. relying primarily on the use of ecological processes and regulations. Also, while IPM initially focused only on pests, it may now include disease and weed management. Generally, IPM can be seen as a shift away from trying to *control* nature, towards *working with* nature. Indeed, it aims to limit – not eradicate – pest populations, and generally leads to a reduced use of synthetic pesticides, since they are not used in a systematic way, thus being a departure from 'calendar spraying'. The use of IPM practices can also lead to building up ecological knowledge of farmers.

[7] Castells (2000: 453) defines 'place' as "a locale whose form, function, and meaning are self-contained within the boundaries of physical contiguity".

Conservation Agriculture aims at improving soil life through three principles: less soil disruption (via zero tillage and direct seeding), a permanent soil cover, and longer crop rotations. Conservation agriculture was facilitated by two technological innovations: machine seeding without preliminary ploughing, and herbicides to clean fields of weeds (required to compensate the weed-cleaning effect of ploughing). While the system may allow farmers to save time and money in ploughing and may reduce soil erosion, it has been criticised for renewing the dependence on agribusinesses (e.g. Monsanto's glyphosate-resistant genetically modified soya seeds) and the fact that the herbicide application does harm soil life. In Europe the adoption of conservation agriculture may lead to two outcomes: zero-tillage but continued dependence on chemical herbicides (which may be reduced, e.g. through precision agriculture); or be a transition pathway to agroecological transformation (Levidow et al. 2013). Either way, conservation agriculture can indicate a shift in soil ecology towards *working with the soil* rather than *working the soil*, which underlies the modernist view of soil as mere physical support of crops (Vankeerberghen et al. 2013 in Levidow et al. 2013).

The concept of **ecological intensification**[8] has risen in the agricultural sciences discourse in the last decade. It aims at using ecological processes (e.g. legumes, cover crops, practices developed in the framework of IPM and conservation agriculture) and using ecosystem services to reducing the environmental impact of agriculture. However, the need to intensify is not questioned, as a high productivity (per ha, per animal) is seen as fundamental to 'feed the world' (Griffon 2006). Thus while the intensive use of pesticides, chemical fertilizers, water and fossil energy is questioned, the productivist aim remains, it should just be achieved by other means. While some present ecological intensification as the key to addressing a range of problems, others are unsure whether it represents a real reorientation of agriculture (Bonny 2010).

A similar concept to ecological intensification is **sustainable intensification**. As with ecological intensification its meaning and objectives are still debated and contested. While originally sustainable intensification primarily focused on increasing yields in arable crops, while lowering the environmental impact (as is the aim of ecological intensification), it has been widened by some authors to include a diversity of approaches and issues. For example Garnett et al. (2013) list four premises underlying sustainable intensification: (i) an acknowledgement that 'sustainable food security' is only in part a supply-side problem, so that the consumption of *resource-intensive foods* (e.g. meat and dairy products) and wastes need to be reduced; (ii) accepting *yield increases*, the fact that in some regions (esp. in many low-income countries e.g. in Africa), *yields must be increased* to feed the population, not least because increasing the area of land in agriculture carries major environmental costs; (iii) production must be environmentally sustainable, which might include *yield reductions* in some areas; (iv) while sustainable intensification denotes a goal, it does not specify how it should be attained, so that *all approaches* – conventional, high-tech, agroecological and organic should be assessed in a context-dependent way. Especially this last point has led to critiques (e.g. Collins and Chandrasekaran 2012): because nothing is excluded, agribusiness could co-opt 'sustainable intensification' to promote their proprietary technologies, and governments could use it to endorse existing policies (see e.g. McKhann et al. 2012).

[8] The term should not be confused with 'eco-functional intensification', which refers to intensifying agroecological processes, esp. in the context of organic farming (see Schmid et al. 2009: 59).

IPM, conservation agriculture as well as the concept of 'ecological intensification' doubtlessly have valuable contributions to offer, esp. in highlighting options to reduce the environmental impacts of agriculture. Yet they mostly pursue a technical approach, focusing on specific production methods at the farm-level. Sustainable intensification, in its wider understanding takes a more inclusive, systemic approach, and addresses the broader environmental, economic and social issues. Yet, these four approaches continue reducing agriculture to the (efficient, environmentally friendly) production of raw materials, and they do not usually address the role of agribusiness and the structure of the supply chain.

Case study question: What are the approaches to reduce the environmental impact of agriculture in your case study?

2.3 Vested interests, lock-in and path dependencies

While developments as exemplified in 'ecological intensification' and 'sustainable intensification' can doubtlessly contribute to addressing some environmental problems, their assessment need to take into account the extent to which they are driven by the **vested interests** of corporate agribusiness[9] to maintain their economic, political and cultural power (see Vorley and Fox 2004, Cazorla et al. 2008, van der Ploeg 2010).

Indeed, while some would diagnose the modern agro-food system as ailing, the 'crisis' has proven to be a profitable time for industrial farmers, grain-oilseed trading corporations, agro-input corporations and investors (Weis 2010). There are thus clearly 'winners' of the current situation, and they tend to be powerful players who can effectively promote the continued reliance on 'technical fixes', thus effectively stabilizing the operative logic of productivism.

This perpetuates a path-dependency, which reduces the future solution space. Indeed, as Lamine et al. (2012b) point out on the basis of a study of the wheat industry, the agri-food system has stabilised itself from the 1960s onwards around a productivist 'intensification paradigm', which has progressively created **lock-in effects** and path dependencies (Cowan and Gunby 1996; Vanloqueren and Baret 2009). These are the result of the convergence of innovations, such as the development of new pesticides, selection of cultivars, changes in fertilisation methods, sowing techniques; and associated actor strategies. Indeed, as Meynard et al. (2013) point out, the whole agri-food *socio-technical system* is built around the use of synthetic chemicals, which enabled practices such as monocropping. Thus, while a farmer might be willing to introduce crop rotations to reduce the use of chemicals, there is often no market for e.g. leguminous grains. Similarly, reducing pesticide use will impact the 'quality' of the produce, which may make it difficult to comply with the quality standards that have been set for industrial production (Lamine et al. 2010). Meynard et al. (2013) also point out that research contributes to these path dependencies, e.g. through the fact that research on improving the genetic material focuses on a few crops (the investment in alternative crops is not perceived as being economically attractive), that research on crop production (locally suited species, resistance to pests) equally focuses on major crops so that farmers have little information about alternative crops. Thus, the structure of agro-food supply chains, food consumption habits, the (narrow) definition of product quality, and the selectivity in research all create structural barriers to change. Thus, unless the interdependencies within the agri-food system are recognized, and a

[9] The corporate agribusiness can be seen to include agro-input and trading corporations, big farmer lobbies, processing industry, and large retailers.

coordinated effort made to align the strategies of diverse actors, fundamental and widespread changes at farm-level will remain constrained.

To rethink modernisation, we will need to ask what the main structural barriers to change within the agri-food chain are and how they can be addressed in a systemic way. Indeed, 'technical fix' approaches to change will not be sufficient to achieve resilient and sustainable agricultural systems. To enable such systems, requires that ecological factors (not reduced to the anthropocentric notion of ecosystem services) and social factors (i.e. 'soft' factors such as institutions, norms, values and discursive processes) are taken into account.

Case study questions: How will you capture structural barriers to change in your case study? Which factors and actors limit the inclusion of ecological and social aspects in rethinking modernisation?

2.4 Alternative agricultural models and social movements

Despite the existing structural barriers, there are a wide range of experiments and initiatives by farmers, consumers and other actors, which are all examples of rethinking modernisation. A wide range of citizens (e.g., farmers, consumers, nature conservation groups, entrepreneurs, rural development agencies) have been actively engaged in searching for alternatives, partly building on the opportunities offered by the shift towards multifunctional agriculture (van Huylenbroeck and Durand 2003). They also present a holistic view of agriculture and promote an adaptation of agricultural practices to the local and regional ecosystems, thus aiming for a sustainable use of local and regional resources (incl. biological diversity) (Chapelle and LaValle 2011).

Many of these initiatives can be seen as evidence of how both farmers and consumers are questioning economic 'imperatives' and demonstrating that alternative practices are viable. These **initiatives** include very diverse movements, such as small farmer organisations, organic food movements, PDO/PGI[10] product alliances, permaculture, agroecology, green care, agri-tourism, on-farm processing, direct marketing, consumer cooperatives, community supported agriculture, local food boxes, slow food movement, fair trade, food sovereignty, farm animal welfare movement, vegetarianism, veganism, urban gardening, community gardening or reducing food miles.

These innovative experiments are not necessarily visible, partly because the agricultural media are dominated by vested interests and strong adherence to the central tenets of productivism. Agricultural institutions (e.g. Chambers of Agriculture, farmer unions, education system, academic research, technology, agribusiness corporations) usually perceive them as fringe actors, rather than as valuable partners in rethinking modernisation.

A variety of alternative agricultural models can be found both in Western Europe and in Central and Eastern Europe, although the expression and predominance of initiatives differ. As Smith and Jehlicka (2013) show, in a number of countries in Central Europe, 'pre-modern' practices of agriculture co-exist with 'modern' and 'post-modern' innovations. For example, the traditional self-provisioning of food (esp. fruits and vegetables) is a wide-spread practice, both on small farms and in household gardens. Informal, non-certified organic production as a traditional way of doing agriculture is still the case in large segments of small holdings in CEE (Redman 2012). Farmers'

[10] The EC has developed several schemes to protect local designations of origin, including Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI).

markets, direct selling and short supply chains are yet another example how traditional channels of agricultural marketing retain their importance in CEE and in the meantime are being modernised by the emergent civic food movements and consumer initiatives.

Alternative models of agriculture can be seen as a 'next step', integrating elements from modernised agriculture with more sustainable practices. They take a systemic approach and thus consider the implications of the practices for the environment, for rural society and for other actors along the food chain. As an illustration, we will briefly describe two alternative models, organic agriculture and agroecology, as well as one alternative production-marketing-consumption model (AMAPs, a French model that combines community supported organic agriculture with a box scheme) to illustrate the extent to which they redefine modernisation.

Organic agriculture was developed in the 1920s and led to several strands in the following decades and to a diversity we can observe today. It is based on a 'closed system' approach, which builds on the use of diverse crops and animals, and of biological processes for building soil fertility and controlling pests and diseases (DARCOF 2000). As pest and disease control rely primarily on preventive measures, farmers need a high level of context-specific ecological knowledge. IFOAM's principles (IFOAM, n.d.) also include animal welfare, and ensuring precaution and responsibility in the selection of technologies, as well as a broad range of social issues such as human health, ensuring fairness in distribution and trade, as well as contributing to food sovereignty and to quality of life. However, such social principles, while playing an important part in the organic social movements, are not mentioned in the legal rules. This codification of organic farming has offered consumers protection against misleading labelling and thus promoted the strong growth of the organic sector. However, it has also enabled a minimalist approach to organic agriculture. As a result there is a wide diversity of certified organic practices, ranging from a minimalist input-substitution approach to a fundamental redefinition of production practices and relationships along the food chain (Guthman 2000, Lamine 2011).

Agroecology has emerged in the early 1980s as a reaction to the productivist paradigm and as a model thought as more adapted to small farmers especially in southern countries (Altieri 1995)[11]. Agroecology was first a conceptual framework with holistic methods for the study of agro-ecosystems – a concept suggested by the ecologist Odum who considered them as 'domesticated ecosystems', intermediate between natural and fabricated ecosystems. Historically, agroecology was thus conceived as a way to protect natural resources, with guidelines to design and manage sustainable agro-ecosystems (Wezel et al. 2009). However, currently agroecology strives at taking a broader perspective, by integrating three dimensions: an interdisciplinary approach to agricultural practices; a transdisciplinary approach to integrate farmers' and scientific knowledge; and strives to integrate social movements, esp. through the links between agroecology and food sovereignty[12] (Altieri et al. 2012, Levidow et al. 2013). Thus while initially applied mainly at the level of the farming system, agroecology is currently evolving to include the whole food system, i.e. food production, distribution and consumption (Francis et al. 2003, Gliessman 2007, Chappell and LaValle 2011).

[11] Even though a first use of the word agroecology can be dated back to the 1920s in the work of Bensin, a Russian agronomist, who suggested the term to describe the use of ecological methods in research on commercial crop plants. This definition of 'agroecology' as the application of ecology in agriculture is still used in some institutional and scientific communities today (Wezel et al. 2009).

[12] See Nyeleni Europe, http://www.nyelenieurope.net/en/

To illustrate how alternative models do not restrict themselves to on-farm production practices, we briefly describe the **AMAP**s (see Lamine 2005). The AMAPs (*Associations pour le Maintien d'une Agriculture Paysanne*) are a form of Community-Supported Agriculture (CSA) focusing on box schemes. They emerged in the early 2000s and currently count 1600 groups in France. An AMAP is a partnership between a farmer (often an organic farmer) and a group of consumers. One of the main principles of the partnership is that the consumers accept irregularities in both production (the content of the box) and products (their aspect and size). On-farm production is planned depending on the number of boxes and farm's organizational constraints, and is partly negotiated between the farmer and the consumers, which is an alternative way to adjust offer and demand. Consumers take part to most organizational tasks (contracts, deliveries) and in some cases can also be involved in production tasks. An AMAP secures a regular income for the farmer, which enables him/her to take technical risks linked to the necessary diversification of products. The strong mutual commitment is facilitated by the direct interactions between producers and consumers. At the *territorial level*, AMAPs encourage farmers to cooperate with other farmers to facilitate their work, e.g. to develop complementarities so as to limit the diversification on each farm, and/or with livestock farmers to limit the external inputs for fertilization. AMAPs – as well as other forms of community supported agriculture – are thus an example of a profound redefinition of agricultural practices and the *agri-food system* as a whole (Brunori et al. 2011). Importantly, the practices and organisation are redefined collaboratively: the production, the distribution, the food purchasing and preparation practices, as well as diets. Yet, the AMAPs should not so much be seen as a 'model' to be 'upscaled', but more as a source of inspiration and reflexion, demonstrating that alternatives are thinkable and doable.

What the example of the AMAPs show, is that the creation, operation and evolution of food supply chains are one key approach to generate new patterns of rural development (Marsden 1998, Marsden et al. 2000). For farmers it means that through such definitions of quality, which are associated with the locality or the region, new networks can be built (or built upon) which involve radically different types of supply chain (Murdoch et al. 2000). What is important is that these supply chains engender different relationships with consumers and may engage different *conventions and constructions of quality* (Thevenot 1998). In these alternative conventions, ecological aspects of production often play an important role (not least because many of the production systems rely on low levels of external inputs, and because they emphasize local production), rely on farmers' knowledge and traditions, and question established power relations (esp. those of retailers).

Case study questions: What alternative initiatives are particularly relevant in your case study? What are they trying to achieve? What is the role of farmers' knowledge in your case study? How are roles and responsibilities of various actors redefined over time?

3. Selected theories used to analyse modernisation and its alternatives

A range of theoretical conceptualizations can be found within the social sciences and at the intersection between natural and social sciences, which have been used to analyse agriculture. Some of these theoretical approaches are more teleological and normative, others are more neutral and descriptive. We take a broad-brush approach and do not propose a comprehensive list of theoretical conceptualizations. Nor do we want to review them, not least because these approaches are neither internally homogeneous,

nor static. The goal here is to only briefly characterise a few approaches that are relevant for our analyses and to illustrate the diversity in the conceptualisation of agriculture.

3.1 Selected theoretical approaches and their relevant characteristics

The **Efficiency-Substitution-Redesign** (ESR) framework was developed by biological and agricultural scientists to analyse transitions in crop protection practices (Hill and MacRae 1995). The ESR framework is useful in distinguishing between topical/technical and structural/systemic change. It distinguishes between three types of changes: (1) *Efficiency*: this group of changes take a technical approach, focusing on reducing inputs and reducing the environmental impact of practices. Changes tend to address one specific issue, e.g. the reduction in water use, reduction in use of inputs, the protection of soil fertility, or the protection of biodiversity; (2) *Substitution*: in this type of change, resources or inputs are replaced by more environmentally friendly ones (e.g. biological control, biological products); (3) *Redesign* denotes a systemic approach which takes into account technical interdependencies. As a result the system is re-structured and rethought through a new paradigm. The ESR framework is thus most useful to differentiate the nature of change in agricultural practices at the farm-level, but can be extended to encompass a larger part of the agri-food system (Lamine 2011). As an approach originating in agricultural sciences, it tends not to take into account social issues such as controversies, conflicts and power relationships.

The theory of **ecological modernisation** has its roots in political sciences, and focuses on the relationship between environment and society (Spaargaren and Mol 1992, Murphy 2000). It focuses on macro-economic structural change, towards a phasing-out of ecologically 'maladjusted' technical systems and economic sectors that cannot be reconciled with environmental goals. The cultural politics and discourse dimension of ecological modernisation, analyses the social construction of environmental issues (Hajer 1995). Generally, the distinction is made between 'weak' forms of ecological modernisation, which address environmental problems by a technocratic and instrumental approach while continuing to intensify production and lacks social considerations; and a 'strong' form, which includes reflexive processes of social learning (Kitchen and Marsden 2011).

Actor-Network-Theory (ANT) originated in sociology, esp. in the context of science and technology studies (Latour 2005, Akrich et al. 2006). ANT focuses on the analysis of relations that are simultaneously material (between things, e.g. the share of concentrate in the diet of dairy cows) and semiotic (between concepts, e.g. the meaning of a practice, the values that guide a 'good farmer'). The creation of a network is based on interactions through which actors construct a shared understanding of problems and solutions, thereby ordering both objects and meanings. As ANT proposes a generalized symmetry between human and non-human 'actants' it has been found to be particularly useful to address reconfigurations in complex human/non-human systems. Furthermore ANT has a 'flat' ontology, i.e. it denies the analytical usefulness of 'levels', thus flattening the distinctions between agency and structure, between the 'micro' and the 'macro', which contrasts it with hierarchical approaches. ANT has been widely used in agri-food systems literature (e.g., Collet and Mormont 2003, Stassart 2003, Diaz et al. 2013). It has been found particularly useful to 'zoom in' on the social processes through which networks form and how they change over time; i.e. the shifts in meaning, linkages, alignments, as well as processes of interpretation, negotiation and contestation that underlie networking activities.

Convention theory explores the ways in which markets, states and economic relations are conceptualized (Storper 1997, Storper and Salais 1997). It has been used to better understand the shift from public to private regulation, including the construction of new forms of certification, quality standards and place of origin branding that seek competitive advantage in a fragmented food market (see e.g. Rosin and Campbell 2009). Fundamentally the theory points out that considerations of risk and economic rationality are not sufficient to understand choices under asymmetric information systems, which are common in the real world. The approach thus focuses on understanding how the various market actors coordinate their activities by socially defined rules (so called 'conventions'), i.e. how the 'rules of the game' are defined and how they evolve. Importantly, they reject the metaphor of the market as the main or primary organising tool for a society. Rather, markets is but one of several forms of convention, not the model for all of them. As a result the focus is on how different forms of coordination mix, e.g. how non-market rules influence price setting and competition (Eymard-Duvernay 2002). By combining convention theory and the more structural dependent theory of 'worlds of production', it is possible to take account of historical tracks through institutionalized patterns of action, as well strategic actions from current actors (see Storper and Salais 1997, Egil Petter Straete 2004).

Transition studies focus on socio-technical systems and were initially applied to understand technological innovations (e.g. the historical transition from horse-carriage to automobiles) (Grin et al. 2010). However, approaches within transition studies have also been used to study agri-food systems (e.g. Elzen et al. 2004, Smith 2007, Spaargaren et al. 2012). One widespread approach is the Multi-Level Perspective (Geels 2005), which distinguishes between niches, regimes and landscape. The MLP has been helpful to highlight the interdependencies between research, technologies, infrastructure, policies, markets, user practices, cultural and symbolic meaning, and how they come together to stabilize the 'regime'. This stabilisation can create a lock-in, which impair the break-through of niches (Diaz et al. 2013). The approach has been found useful esp. to analyse fundamental changes at the macro-level, which unfold over long-term (Grin 2010). However, it has only weakly conceptualised power relations (Meadowcroft 2011).

Initially developed in ecology, the concept of **social-ecological systems** builds on an understanding that ecosystems are fundamentally impacted by human actions, so that ecological systems can no longer be studied in isolation (Carpenter et al. 2012). Indeed, some argue that we are now in the 'anthropocene' (Steffen et al. 2007). The strength of the approach is the explicit focus on the dynamics of ecological processes (e.g. hysteresis, time delay, tipping points). This body of work is also helpful through its conceptualisation of change dynamics, which were formalized in the 'adaptive cycle'. A resilient system is one that can persist despite change, i.e. can navigate the adaptive cycle. In the context of agriculture, the concept of social-ecological resilience has mostly been applied to analyse large-scale ecosystems and long-term changes (such as rangelands see e.g. Walker et al. 2009), but first explorations were made on how to apply it to farming (Darnhofer et al. 2010b). Despite recent efforts to include insights from social sciences, this aspect is still weakly conceptualised (Davidson 2010).

Landscape ecology is an interdisciplinary field that studies landscape structure, function and their changes. Landscape ecology focuses specifically on how landscape structures affect the abundance and distribution of organisms (Higgins et al. 2012), how structures and functions interact in the landscape, how the interactions change over time, thus allowing to derive recommendations how to improve the functioning of landscapes (Formann and Godron 1986). Focusing on the landscape-level, landscape ecology takes a broader spatial extend than those traditionally studied in ecology, and allows a better

integration of the role of humans in creating and affecting landscape patterns and processes. Landscape ecology can thus help understand the functioning of agriculture and what constitutes sustainable and resilient agricultural landscapes.

Overall, each theoretical approach has its strengths in the variables and processes it captures, as well as aspects it captures less well. Indeed, some focus on ecology vs. social domain; some are useful to analysing a state vs. processes; some are suitable when focusing on short-term changes vs. long-term; some conceptualize the farm-level vs. regional vs. the global spatial scale. Thus, in practice most case-studies are likely to integrate several approaches (and not necessarily any of those listed above) to capture those aspects relevant in a specific case study.

Case study question: Which theoretical approaches do you plan to apply in your case study?

3.2 Ecological economics and ethics in economics

The previous section was used to characterize some theoretical approaches within social sciences, as well as those rooted in other disciplines but providing valuable concepts related to the ecological, spatial or technological dimension of agricultural modernisation. We also want to briefly clarify the differences between approaches within economics. Indeed, the logic of neoclassical economics plays an important role in the justification of productivist agriculture, especially defining what is 'efficient' and how the system needs to be 'optimized' to ensure economic growth[13]. Since these concepts are rooted in neoclassical economics we want to briefly point out that there are alternative understandings within economics.

Firstly, to address the **environmental impact** of modern agriculture, environmental economics – which is an approach within neo-classical economics – proposes to *'cost'* the environment and thus 'internalise' the externalities. However, this approach is partly criticised on pragmatic grounds, as it is often difficult to derive a 'price' (e.g. for the loss of a species). It is also criticised on fundamental grounds by many heterodox economists (esp. ecological economists), who point out that price creates an abstraction that treats industrial and biological processes as interchangeable. Ecological economists, in contrast, argue that while monetary aspects are relevant and of interest, non-monetary aspects of transactions should be made visible (rather than hidden as part of a price or monetary cost) (Söderbaum 2008: 24). This is especially important regarding ecological and social processes, where path-dependency and irreversibility play a central role (e.g. in biodiversity loss, health impacts). Furthermore Söderbaum (2008) points out that monetary thinking tends to carry with it an idea that calculations are always possible. This ignores that in a world characterised by complexity, knowledge will always be incomplete and thus uncertainty will remain pervasive. Monetary assessments are therefore often less meaningful than commonly assumed and sometimes even misleading.

McMichael (2012) also points out that the abstract one-dimensional market calculus erases the local practicality involved in human-nature relations that are the basis of farming. Indeed, while green consumerism and certification might require consumers to

[13] In neoclassical macroeconomics, growth (measured using the GDP) is seen as essential to avoid economic instability, and to offset unemployment due to labour productivity improvements. Ecological economists point out that to achieve sustainability, GDP does a bad service as welfare indicator, especially in rich countries, and argue that more attention needs to be put on non-material dimensions of well-being (Antal and van den Bergh 2013).

pay the full environmental 'cost', this tends to hide the *practical cost* to dispossessed farmers, whose ecology is irreparably destroyed, a dispossession which includes both material deprivation and displacement of practical knowledge about the management of ecosystems (McMichael 2012:107).

More generally, the problem is that most contemporary economic studies privilege a highly mathematical and technical approach to economics – which ignores the ethical issues of **fairness** and justice (Martinez Alier 2011). Indeed, most contemporary neo-classical economists point out that whether something is 'fair' or not is necessarily subjective, so that this aspect falls outside the scope of the dominant, positivist understanding of economics (James 2013)[14]. For those economists who deem that fairness is not outside the scope of economics, the question is, how to characterise fairness in the context of market competition (James 2013). In his approach Sen (2009) suggests that justice or fairness is not about reaching a hypothetical ideal, but about finding an outcome that is less unfair than current conditions. This of course implies a debate about what can be seen as 'less unfair', and it is likely that there will be competing claims. However, for Sen, this 'inescapable plurality' is not a weakness, but rather an opportunity to continually re-examine where we are and where we could go to provide incremental though real improvements in the fairness of the system. Such improvement includes the question whether market participants have more *opportunity* to pursue their objectives, and whether the *process* of deciding what opportunities to pursue is improved.

Economic theory also plays an important role in defining **efficiency**. As Rower and Westgren (2013) point out, even within economics, efficiency carries several meanings that are tied to the context in which the term is used. In macro-economics the term is used to imply *exchange efficiency*, with the aim being to reach a 'pareto efficient' distribution of goods or resources, i.e. one where it is impossible to make any one individual better off without making at least one individual worse off[15]. In micro-economics the term is used in relation to *production efficiency*, which has two components: technical efficiency (i.e. the input/output relationships) and allocative efficiency (i.e. where marginal benefit equals marginal costs). Rower and Westgren (2013) argue that one of the problems in the agri-food domain is that technical efficiency is routinely compared for goods that are not the same[16]. For example, comparing the technical efficiency of a smallholder producing shade-grown coffee and of a plantation producing conventional coffee is only permissible if the assumption is made that 'coffee is coffee'. However this is clearly not the case, as only one production method does take moral obligations into account: while both coffees might be physically equivalent, morally they are not. Thus assessing the smallholder's operation as being 'inefficient' compared to the plantations operation omits an important 'detail', i.e. the ethical dimension of the situation. Indeed, the fulfilment of ethical constraints creates a different product. Thus the ethical production not only places a constraint that needs to be represented within the efficiency concept used to describe the production, but also adds value to the good produced.

[14] It is interesting to note that classical economic theory (the precursor of neo-classics, which can be characterised as political economy) did build on an ethical foundation, as it acknowledged that the social benefits of individuals engaging in economic activities are maximized only when economic agents do not seek to opportunistically exploit vulnerabilities of their trading partners.

[15] While the concept is attractive, it clearly is difficult to implement in practice, as calculations of gains and losses quickly become intractable.

[16] In economics goods can only be compared if they are homogeneous. The question is then what differences are seen as relevant and what is defined as being the 'same'.

Taylor (2013) points out that an economic approach that emphasizes efficiency as the primary justification for 'free markets' is not fully compatible with a **legal perspective** that places an emphasis on normative concepts such as equity and fairness. A legal perspective may thus contribute to protecting those farmers who are vulnerable to the disproportionate economic and political power of agribusiness.

These few examples serve to illustrate that the reference to 'economic imperative' can be misleading as it underplays the (fundamental) differences between economic schools of thoughts. If for example social definitions of quality, of fairness, and of sustainability are to be taken into account, we need to address the *epistemic* question of how we understand 'value' (McMichael 2012). We thus might need new analytical categories to capture what we mean when we RETHINK modernisation, as this has been done by e.g. ecological economics.

Case study questions: What understanding of 'economics' will you take into account? How will this influence your use of key concepts such as the 'value' of a good or resource, 'efficiency', 'externality' and 'fairness'?

3.3 Conceptualisations of the farm and the farmer

Neoclassical economics has played a key role in the conceptualisation of the *productivist paradigm* that underlies modernisation. It has a normative approach to the farm, which should be structured so as to allow effective production of crops and livestock, have a strong market-orientation both for inputs and outputs. In the search for efficiency (and increased economic profitability), markets play a key role, which has led to increased and direct control of agribusinesses over food production and thus on-farm processes.

This might be illustrated in the organisation of chicken production, which is one of the most 'industrialized' production processes, both in Europe and the US. It is a contract production system in which where a broiler processing firm (called an 'integrator' in the US) contracts with farmers to raise chicks that are owned by the integrator. The farmer provides labour and growout houses while the integrator provides the chicks, feed, veterinary care and collects the broilers at 'harvest' (Constance et al. 2013). While the *farmer* has a relatively steady income stream, s/he is strongly dependent on the integrator, thus eroding his/her autonomy. This production model also illustrates that knowledge is seen as produced by scientists (e.g. regarding the optimal lighting conditions in the growout houses, optimal feeding rations, antibiotics), while the farmer is expected to implement the recommendations.

Furthermore, neoclassical economics maintains that *family farms* are destined to be eliminated, in much the same way that corner shops have been replaced by supermarket chains. The fact that family farms have not disappeared has puzzled researchers who have searched for reasons for this 'anomaly'. As Shucksmith and Rønningen (2011) review, Kautsky (1899) and later Chayanov (1966) proposed such explanations in terms of farm family's different motivations, social relations, the limits of their labour power and their propensity for self-exploitation (see also van der Ploeg 2003).

Following Long's **actor-oriented approach** (Long and van der Ploeg 1994), van der Ploeg (2000) focused on the agency of the farmers, and developed the concept of 'farming styles', which frames structural forces as negotiable and circumventible, as farmers actively developing strategies and technologies to pursue their goals. Studies thus started to consider the goals of family farmers, including the 'sense of place' and the cultural fabric of the local context. They point out that in family farms, there is often a

feeling of duty towards previous and future generations, the notion of being stewards – not owners – of the land and farm (Daugstad et al. 2006).

The approach is further developed by van der Ploeg (2008:261ff) through the **'peasant principle'**, which consists of various interrelated elements including a 'self-controlled resource base', 'co-production' as interaction between humans and nature, and cooperative relations that allow peasants to distance themselves from monetary relations and market exchange; and an ongoing 'struggle for autonomy' and 'room for manoeuvre' that reduces dependency and aligns farming with the interests of the farm family. While these principles are shared by 'peasants', it does not prevent a wide heterogeneity within peasants, as these principles can be put into practice in very different ways. Indeed, van der Ploeg's 'peasant principle' focuses on the farmers agency and "stresses the value and satisfaction of working with living nature, of being relatively independent, of craftsmanship and pride in what one has constructed" (van der Ploeg 2008:274). The peasant principle is thus a cultural repertoire that contains many potential responses, it inspires and informs resilience and represents an alternative trajectory to the one proposed by modernisation.

Van der Ploeg (2008:278ff) identifies three major reversals that contrast 'modern' farming and **peasant farming**:

- the rediscovery of *ecological capital* as the main foundation for farming, thus resisting the dependence upon synthetic inputs and financial capital. This puts co-production and the 'art de la localité' at centre stage, with the aim to reduce the use of external resources, while simultaneously improving and reusing internally available resources. This is exemplified by organic farming and conceptualized in agroecology.
- Using and strengthening social capital through developing *local and regional self-regulation* as an alternative to the currently dominant regulatory schemes promoted by agro-industries, supermarkets and the state, that emphasize control at a distance. This is embodied e.g. in territorial co-operatives, effective networks, shared values, accumulated experiences and knowledge, the combination of trust and distrust, and the capacity to resolve internal conflicts, and engage in learning processes.
- Using and creating cultural capital by building *interrelations between producers and consumers of food*. This is in direct contrast with modernisation and industrialisation that allowed a disconnection both in space (spaces of production and consumption do not matter) and in time (seasonality does not matter) (Busch 2010). The distinctive cultural capital is embodied in origin, quality, authenticity, freshness and specificity of productions and the associated ways of producing, processing and marketing. The construction of cultural capital is also rooted in local, and therefore knowable practices. In other words, the more production and processing are well crafted, visible, sustainable and ethical (esp. with respect to animal welfare), the higher their cultural capital. Another aspect of this dimension is the relationship between the farm and the community he/she lives in. This is discussed below.

When clarifying our conceptualisation of the agency of farmers, we also need to take into account the **diversity of farms** in Europe. Indeed, much policy attention is given to large, *commercial farms* although these are only a small share of the total number of farms. Indeed, in the EU-27 the *larger farms* make up 0.6% of holdings but manage 20% of UAA (Martins and Tosstorff 2011:7). While some policy attention is given to part-time farming, small and semi-subsistence farms are often left unmentioned. However, in 2007, *smaller farms* (defined as holdings with a Standard Gross Margin of less than 1

European Size Unit (i.e. under 1.200 Euro)) accounted for 7% of the Utilized Agricultural Area and 1.6% of the Standard Gross Margin, however they cannot be overlooked as they account for 47% of the holdings, 39% of the regular farm workers and 23% of the total farm work of the EU-27 (EC-Eurostat, nd).

While specific definitions differ, there is a broad consensus that *'small farms'* are those that operate on 5 ha or less (Davidova et al. 2013: 24). In 2010 there were 8.1 million small farms, accounting for 67% of all farm holdings in the EU-27, including 78% of the farms in the New Member States; while they used only 7% of the UAA, they engaged 42% of the labour, in fulltime equivalents (Davidova et al. 2013: 33). Another often overlooked category are the *semi-subsistence farms,* which are often defined as those that sell less than 50% of their output, thus using most of it for household consumption. In 2010 in the EU-27 there were 5.8 million such semi-subsistence farmers, making it a large sector, providing livelihood for millions of rural inhabitants (Davidova et al. 2013: 25).

Farm sizes are but one indicator of the diversity in farming, a diversity covering agricultural practices, as well as economic, social and cultural factors. Farming is thus highly heterogeneous, embracing a wide diversity of decision-making behaviour and differences in farming practices and market integration. Farms thus range from commercial farmers who sell all their output, to subsistence farmers use all of it for household consumption (or exchange with relatives and neighbours). While for some farmers producing their own food may be a survival strategy to cope with rural poverty and lack of non-farm rural jobs, for others it may well be a lifestyle choice. Similarly, many are *part-time farmers*, i.e. farmers who earn most of their family income through a gainful activity off-farm. While some part-time farmers manage their farm as a sideline income, others will accept ongoing losses as a lifestyle choice, i.e. the farm functions more like a country home than a business. Indeed, some may be called *'hobby farmers'* (or lifestyle farmers), which are generally defined as farmers who maintain their farm without expectation of it being a primary source of income. Some of these hobby farmers merely provide some recreational land, e.g. a few horses for the family's children.

It is thus important to keep in mind that farmers covers a very heterogeneous group of rural land holders who have different motivations for maintaining a farm, different commitment to agricultural production, and different involvement in markets. All of this will affect their choices, and their engagement with the variety of local stakeholders. However, when considering a region all of the different types of farmers need to be taken into account, as their choices collectively influence the landscape, the potential for collective action, the maintenance of a 'sense of place'.

Case study questions: How is the farmer conceptualized in your case study? Does s/he have agency or does s/he have little choice but to comply with structural constraints? What diversity in farm types is present in your case study? Do you include part-time farmers, 'hobby farmers' and semi-subsistence farmers, or do you solely focus on commercial farmers?

3.4 The agriculture - rural development interface

In the late 1980s it seemed that in Western Europe the productivist approach to agriculture had lost some of its legitimacy. Public sentiment (partially) shifted from food security and food prices to environmental protection, animal welfare and public health. At the same time, in soviet bloc countries, environmental concerns emerged, sometimes

organised in environmental movements, and were confounded with a growing dissatisfaction with the political regime.

In response to concerns regarding the environmental impact of intensive agriculture, and to budgetary pressures (e.g. due to the high costs for subsidising exports that resulted from overproduction) it became increasingly clear that the CAP needed to be reformed[17]. In 1988 the European Commission published a document entitled 'Future of Rural Society', which initiated a reform and altered the sectoral policy from only funding agriculture to also funding area-based (i.e. territorial, multi-sectoral) **rural development**. The idea was to develop a more general programme for the benefit of rural areas beyond agriculture, contributing towards vibrant rural areas, thus ensuring both economic and social sustainability. The reform denotes a shift from agriculture's role as primarily producing commodities (e.g. food, fibre, raw materials for energy) towards recognition for the non-commodity outputs it produces (e.g. preservation of natural resources, landscapes and rural viability for the good of the whole society). It thus marks a partial shift from the modernization paradigm towards one that promotes integrated, sustainable and multifunctional development (van Huylenbroeck and Durand 2003, Knickel et al. 2004, Dockès et al. 2012). In other words, agriculture should not only be able to respond to consumer concerns and demands regarding food, environmental protection and the safeguarding of animal welfare; it also recasts agriculture as playing a key role in maintaining the countryside, conserving nature, and making a key contribution to the vitality and diversity of rural life and rural areas (Pilvere 2010). It also includes the understanding of agriculture as producer of ecosystem services, i.e. that it produces much more than just food, feed or fibres (Daily et al. 2009, Posthumus et al. 2010, Olsson et al. 2011). This ecosystem concept thus helps for identifying the multidimensional potential of agriculture., dimensions that need to be considered and may help identify trade-offs (e.g. between production level of food and provision of ecosystem services).

Despite the broad redirection in policy, **two understandings** of rural development can be distinguished: the widespread understanding of rural development as being mostly about a new appreciation of agriculture while still preserving a strong sectoral perspective, vs. the minority understanding that rural development is a fundamentally territorial approach, which targets both agricultural and non-agricultural population. Indeed, while it is commonly assumed that the rural area and the people living in it are largely dependent on agriculture, in many areas this is no longer the case, as some regions have a significant share of non-agricultural residents. Yet, in some countries, the various funding instruments were captured primarily by agriculture. This is not least due to the fact that the funds were administered by government offices traditionally linked to agriculture, so that the policy framing is heavily influenced by existing alliances, networks and normative understandings (Shortall 2013). Furthermore, the definition of what a vital, vibrant rural area is and how it can be achieved is never quite clear, which opens it for co-optation by those who have well established lobby groups (e.g. large farmers) through arguing for an interpretation that secures the flow of funds for their constituency. Also, these administrations do not have the required jurisdiction

[17] Additional pressure was exerted by the world trade negotiations. Indeed, the GATT 'Uruguay Round' threatened to dismantle agricultural protectionism and stimulated European farming lobbies and governments to seek new justifications for renumerating farmers. The European model of 'multifunctional agriculture' enabled continued payments, as in Art. 20 of the WTO treaty, multifunctionality is listed as a ‚non-trade concern'. It thus allows policy makers to justify policies in the agricultural sector that are related to environmental aspects, animal welfare, rural development and consumer safety.

or policy tools to address e.g. schools, housing, SMEs, or public services in rural areas, although these are arguably key for the vitality and quality of life in rural areas. There is thus an overlap between sectoral and territorial approaches to this day[18].

However, in most countries there is a clear shift in the purpose of agriculture towards the wider rural population, consumers and society as a whole. In this view of rural development, farmers are still the main policy target, but the territorial dimension is arguably stronger. The aim is thus to provide public benefits for all residents through facilitating good land management (Diaz-Puente et al. 2009, Upite and Pilvere 2011). Farming and forestry are seen as playing a crucial role in rural areas in terms of natural resources management, and function as a platform for economic diversification in rural communities. This shift is linked to two issues: an endogenous model for rural development and a 'multifunctional' understanding of agriculture.

The **endogenous model** for rural development builds on enhanced local participation and endogenous (i.e. 'bottom-up', 'participative') approaches[19]. The concept of endogenous rural development – which is also sometimes referred to as 'regional rural development' – strives to overcome the sectoral division and to integrate social and spatial approaches. This also implies a broadening of the concept of innovation from something that is primarily economic and technological to include social innovation, capacity-building and the mobilization of local resources (Šūmane 2010, Cazorla et al. 2013). As a theoretical concept, it is grounded in the 'rural web' (van der Ploeg and Marsden 2008, Von Münchhausen and Knickel 2010)[20]. The rural web is multidimensional, consisting of key conceptual building blocks: *endogeneity* (i.e. grounded in regionally available and regionally controlled resources), *novelty production* (continuous improvement of processes, products, patterns of cooperation based on contextual knowledge), *sustainability*, *social capital* (i.e. the ability to get things done collectively), *institutional arrangements* (regulations, laws, norms or traditions) and the *governance of markets* (the capacity to control and strengthen markets and to construct new ones). These building blocks are elements to be combined in response to the challenges faced by rural economies through raising competitiveness, and attempts to improve the quality of life and the sustainability of rural livelihoods. The building blocks of the web are dimensions through which human agency is expressed. The rural web is thus used to characterise patterns of interrelations, interactions, exchanges within rural societies; it interlinks activities, processes, people and resources and shapes the ways in which they unfold over time. As a result of local particularities and specific development trajectories, regions differ in terms of their webs. A strategic task of any community becomes to plan its territorial web as an flexible system which is able to adapt quickly and effectively to new developments, able to absorb new possibilities and able to cope with 'shocks' (Stokmane 2010).

Closely related to this understanding of 'rural development' is the concept of **'multifunctional agriculture'**. The concept of *multifunctionality* was developed to encapsulate the reorientation of the agricultural sector towards the provision of environmental and other public goods (Cairol et al. 2009). The shift was most vividly

[18] In the context of EU policies there is still a sectoral distinction: 'rural development' needs to be distinguished from 'regional development'. The latter aims at improving the economic well being of regions and avoid regional disparities. Funds for regional development are thus provided to e.g. improving basic infrastructure, helping businesses, or modernising waste and water treatment facilities.

[19] The endogenous model is also linked to the principle of subsidiarity, and the renewed emphasis that sub-state entities (i.e. local administrations and communities) take responsibility for their own well-being.

[20] This approach is closely linked to the concept of 'eco-economy' (Kitchen and Marsden 2011).

expressed in the 1992 McSharry reform of the Common Agricultural Policy. The reform meant that the link between production and subsidies was partly decoupled, and alternative income sources were promoted, such as farm tourism, on- and off-farm diversification, organic farming, regional marketing, environmental management and preservation of the cultural landscape. Multifunctionality had thus emerged as a counter-narrative to the neoliberal vision of European agriculture (Potter and Tilzey 2005). At the level of the farm, multifunctionality became a link between agriculture and other sectors thus grounding the farm in the territory (Knickel et al. 2004, 2011, Cairol et al. 2009) and encouraging farmers to engage with their surrounding environment (Upite and Pilvere 2011). It reconstitutes farming as a socio-technical practice, different from farming shaped by ongoing processes of specialization

When speaking of 'multifunctional agriculture' **two broad understandings** can be distinguished. On the one hand there are those who have a functional understanding and use it to consider different 'outputs' (e.g. OECD 2001), seeing agriculture as contributing to a multiplicity of ends such as landscape management, rural employment, food security, environmental protection, etc. On the other hand, there are those who understand multifunctionality more broadly, i.e. to include social and ecological reproduction, understanding farming as including restorative and regenerative principles (Hediger and Knickel 2009). Thus rather than designating separate spaces for conservation to protect biodiversity and buffer functions, this understanding of multifunctionality calls for an integration of ecological goals into the practice of farming itself. Similarly, farming should also include social reproduction, i.e. provide healthy, accessible and culturally appropriate food and contribute towards social justice.

These two understandings illustrate that 'multifunctional agriculture' was a contested concept from the start. Indeed, *powerful interests* within the bureaucracies, farmers unions and elsewhere were engaged in the social and political construction of its meaning, and deployed this in pursuit of their own interests (Shucksmith and Rønningen 2011). As a result, farming interests have partly captured the term, often limiting the shift from sectoral to territorial policies (Marsden and Sonnino 2008).

Thus, while multifunctionality is widely embraced in Europe, it may at times be primarily at a rhetorical level, while farmers and policy makers on the ground apply different and often contradictory strategies and practices. Ironically, this diversity and weakness might well contribute to its resilience as it allows the deliberate pursuit of multiple pathways and outcomes (Cairol et al. 2009, Almås and Campbell 2012b).

Yet, while the shift from productivism to a multifunctional vision of agriculture has doubtlessly opened a wide range of new opportunities for farmers, the productivist mindset was never quite overcome in most agricultural institutions. This is mirrored in:

- the size of the funds allocated to the 1st vs. 2nd pillar of the CAP,
- the fact that many extension services seem to remain in the mode of 'information transfer' rather than facilitating bottom-up initiatives,
- the fact that agricultural research is still heavily biased towards 'technical fixes' rather than systemic change.

Furthermore, it might even be argued that productivism and the central tenets of modernised agriculture have been revived following the shock of the 'global food crisis' in 2008. This crisis was marked by commodity price volatility, food riots, rapidly rising indices of the number of people in the world suffering from food insecurity and under-nutrition, and the phenomenon of 'land grabs'. The fact that one of the causes of the food price crisis has been EU biofuels policy tends to be overlooked. In the aftermath of

that crisis, '*neo-productivism*' seems to be on the rise, with its proponents arguing that we 'must feed the world' (Almås and Campbell 2012a). This neo-productivism is seen as the result of a combination of factors: the re-emerging of food security concerns, the diversion of food crops towards production of biofuels, and climate change.

Case study questions: What understanding of 'rural development' dominates in your country? How are farmers' interests and those of other rural dwellers integrated?

3.5 The agricultural landscape and farmers as landscape managers

The landscape is defined in the European Landscape Convention (Art. 1a) as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors". Thus, as a concept, landscape is increasingly understood as uniting the physical, mental, natural and cultural dimensions of human existence (Higgins et al. 2012). Indeed, when studying landscapes, four attributes need to be integrated: forms, functions, processes and context. This allows an understanding of how landscapes function and change, as well as the meanings and values attached to particular landscapes by various social groups. It thus transcends the nature/culture dichotomy, acknowledging that the maintenance of landscapes relies on the conservation of cultural (esp. farming) practices which produce a specific landscape.

All agricultural production takes place in local context, in a rural landscape, which for most part of Europe is dominated by farming. It is in the local landscape that farmers face immediate opportunities for co-operation with other parts of the rural economy (tourism, outdoor recreation, farm shops, etc.) and it is here that the farmer encounters conflicts with neighbours (or the opposite: respect and recognition). It is in other words within the context of the local landscape that the farm business is coupled to (or de-coupled from) rural development, a rural development that is increasingly concerned with nature conservation, tourism and residential developments, rather than with the future of farming (Woods 2011b).

For this reason the landscape dimension is of relevance to rethinking farm modernisation. An important aspect of the relationship between farming and the landscape concerns management choices. A farmer contributes to landscape management in three different ways (Primdahl et al. 2011, 2013b). As a **producer** of food, fibre and energy the farmer manages the fields and livestock and contributes to the maintenance and the development of rural landscapes. Without these practices, the landscape will change – most often be overgrown by woodlands through natural succession. It is primary as a producer that the farmer affects the environment and it is normally the producer who is seen as the policy target concerning environmental policies. As an **owner** of a farm property, the farmer takes long-term decisions concerning overall changes in land use (e.g. afforestation of grasslands). It is (usually) the owner who includes other dimensions to the landscape, such as decisions related to wildlife management and aesthetic qualities of the landscape. Finally, the farmer sometimes cooperates with other land owners concerning landscape change and management and this is often done in the role of a member of the local community, i.e. in his/her role as a **citizen**. It is also in the role of a citizen that the farmer takes concerns for others in his/her farming practices. However the farmer is rarely seen as a policy target in the two latter roles.

In many regions, farmers are expected to **care for valuable landscapes**, not least because the mosaic of meadows, pastures, arable fields and patches are what creates a flora and fauna rich in biodiversity which needs to be preserved. However, preserving the

landscape and the biodiversity often relies on maintaining historical farming practices. This in effect reifies a landscape – or the representation of an antiquated agricultural landscape by a specific social group – and is at odds with the dynamics inherent in both farming practices and landscapes (Wästfelt et al. 2012). The landscape – and especially how the landscape 'should' look like, which features 'should' be preserved or changed – are thus a place of conflict, contestation and negotiation by various social groups (e.g. farmers, ecologists, non-agricultural rural population) each advocating their preferences and aspirations. The challenge thus is to understand agricultural landscapes as being produced through agricultural practices, socioeconomic relations and cultural values. Indeed, rural landscapes are ever-changing spaces, resulting from a multitude of interacting influences, both biophysical, sociocultural and economic (Wästfelt et al. 2012). Environmental protection programmes should thus not be imposed by e.g. ecologists' definitions, but negotiated with farmers and the local community. This allows recognizing that individual biotopes cannot be seen in isolation, but need to be understood as part of a wider whole, which includes social relations, local knowledge and economic development (Perfecto et al. 2009). Only then will it be possible for farmers to tie together landscape care and agricultural businesses, thereby enabling the preservation of agricultural landscapes and the viability of the farming enterprise.

Promoting diversity in farming thus allows preserving both biodiversity and regionally distinct cultural landscapes. Indeed, these are maintained through a mosaic of management practices that have co-evolved in relation to local environmental fluctuations, and such practices are carried forward by both biophysical and social features, including: genotypes, artefacts, embodied rituals, art, oral traditions and self-organized systems of rules (Barthel et al. 2013).

Case study questions: How are the tensions between landscape preservation and the dynamics of agricultural practices resolved in your case study? What platforms exist to enable the exchanges between diverse groups that lay claims on how the landscape 'should' look like and thus which agricultural practices are 'desirable'?

3.6 The agriculture - urban interface: counter-urbanisation and the peri-urban

In the past it seemed that the 'urban' (built environment) and the 'rural' (natural environment) were two clearly distinct spaces, which have led to distinct approaches on how to view, manage and improve policy and decisions (Scott et al. 2013). Until recently the urban-rural relationship was relatively clear: the rural supplied the urban with food and fibre and the urban was the political and religious centre. Today the relationship has changed: the rural no longer serves a specific town or city, and agricultural production (and forestry) is no longer the only function in the rural: residence, tourism and recreation are examples of non-agricultural functions taking places in rural areas.

In recent decades, due to increased mobility, rural societies have been reconstituted by the influx of a diverse cohort of in-migrants which are attracted by the amenity-value of the countryside and the lure of the 'rural idyll'. Most of these migrants have no connection or familiarity with agriculture (Antrop 2004, Woods 2006). As a result of this **counter-urbanisation**, the population in many rural regions has changed dramatically, and the in-migrants have challenged the authority of agrarian elites and farmer unions. They challenged the primacy of agricultural interests within the rural political sphere and thus increased pressure on policy makers to address the needs of the non-agricultural residents. It has led to a discussion of what is 'appropriate' for the rural setting, raising issues such as environmental impact, pollution, noise disturbance, traffic, property devaluation, and well as provision of public services such as health care and education. All of these were invisible in the previous 'rural politics' which focused

on the family farm as the primary social unit of rural life, and on the regulation and management of agriculture (Woods 2006). These new rural interest groups have raised the visibility of a range of issues, and led to small-scale disputes over barn conservation, blocked footpaths or tree-felling, as well as large-scale conflicts over new roads, windfarms, waste dumps, housing developments and nature conservation.

Counter-urbanisation also means that many farms are taken over by urban incomers who may be more interested in recreational activities (e.g. horse-riding or hunting) and in habitat preservation and the aesthetic qualities of their property, and therefore change land use. Studies in Danish rural landscapes have shown that a significant proportion of arable farmland has been taken out of production and converted into woodlands and natural areas (Primdahl et al. 2014). Counter urbanisation causes therefore completion for land and reduces the food production capacity of the affected areas.

The **peri-urban** (also called the 'rural-urban fringe') is increasingly understood as a new kind of multifunctional territory, rather than a space 'in between' the urban and the rural (Scott et al. 2013). The common features of the peri-urban are a relatively low population density (by urban standards), scattered settlements, high dependence on transport for commuting, fragmented communities and lack of spatial governance (Ravetz et al. 2013: 13). Given the strong pressure to provide recreational space for the urban population, agricultural land in peri-urban areas is often used for golf courses or horse riding.

This points to a wider challenge: fertile and productive agricultural land which is no longer used for food production. Instead, it is used for extractive industries, bio-energy, vast solar greenhouses, urban sprawl, real estate interests or tourism. Franco and Borras (2013: 7) point out that for example in France, each year more than 60,000 ha of agricultural land are lost to make space for roads, supermarkets, urban growth and leisure parks. While these are often scattered cases of usually smaller land deals, they add up. At the same time, new green structures are emerging within the urban, and this new trend of 'urban agriculture' may be seen as a re-ruralisation of urban space (Woods 2011a).

The question is then, how public policy and planning are responding to this new urban-rural relationship. A general answer is that these policies have not responded (Primdahl, forthcoming). But more specifically three approaches that can be distinguished. First, there is a spatial planning approach, which focuses on land-use regulation and design. This approach has mainly regulated urban areas and special rural landscapes (Primdahl, forthcoming). Second, an ecosystem approach has developed focusing on the integrated management of land, water and living resources to promote their sustainable use. Third, the agricultural policy has liberalised and de-coupled agricultural production, and a rural development policy domain has evolved. However, the three approaches are not integrated and each has its limitations, thus hindering the understanding about the quality and potential in a region, which become especially apparent where the natural and the built environment meet and overlap. Indeed, as a result of the different approaches and understandings, much policy and practice remains rooted within sectoral inertia and myopia, while more inclusive, adaptive and integrated structures for planning and managing interactions across economy, society and environment would be needed (Scott et al. 2013).

Case study questions: How is the 'rural' being redefined by 'urban' needs and values in your case study? Which uses for land are competing with agricultural use? How will you take into account the different needs and pressures by the different social groups? To what extend and in what ways do the new urban-rural relationships offer opportunities for rethinking farm modernisation and rural development?

4. Global change dynamics: a renewed pressure to RETHINK modernisation

In 2009, the UK's Chief Scientist described the issues of food, water, energy and climate as a 'perfect storm' facing the world (Beddington 2009). To this list we might add the 'Euro crisis'[21], as it constrains the ability of governments to fund measures that might contribute to redirecting agriculture or paying for public goods. How these various issues – which we will briefly characterise below – will interact and play out is yet to be seen. However, they make it unlikely that the next decades will be 'smooth sailing'.

4.1 Interactions between local solutions and the global context

While in RETHINK we focus on local case studies, the interdependence of the local solutions and the **global resource flows** must be taken into account. Indeed, many intensive farming systems heavily depend on imported inputs (e.g. fossil fuels, animal feed, fertilizers). Conversely, intensive farming systems tend to produce commodities for world markets, thus contributing to transport emissions and being vulnerable to wasted food during transportation (Verburg et al. 2013). At the same time, systems which are unlikely to make a large contribution to food supply (e.g. urban agriculture) may lead to displacement of production to other places, even if they fulfil niche markets and provide important functions such as social cohesion and education. It is thus important to keep in mind the trade-offs that any system implies at the local level, and the global resource flows that are needed to sustain the local system. In other words: we need to understand what is required to maintain the specificity of the local agricultural system.

Globalization can be understood as a dynamic and multifaceted process of integration and interaction that enrols localities into networks of interconnectivity organized at the global scale and facilitating the global circulation of people, commodities and ideas (Steger 2013). In his review, Woods (2007) points out that within rural research, globalization has been studied primarily within a commodity chain perspective, which highlights the shifting flows and networks of production, supply and consumption of various commodities. While some studies have shown that globalization can open up new opportunities for local-based rural development that exploit niche-markets, other studies point out that globalization is associated with depeasantization, i.e. the standardization and modernization of productions systems. Given the complex interactions, and the different aspects of globalization (economic, political, social, cultural and ideological), and how these are negotiated, the implications for different localities are uneven. The aim is thus to understand locally specific engagements with and responses to globalization. As Woods (2007:487) points out, the impact of globalization on rural localities is "revealed not as domination or subordination but as **negotiation**, manipulation and hybridization, conducted through but not constrained by local micro-politics". Thus the diverse discourses of both rural place and globalization are contested by local actors (De los Ríos-Carmenado et al. 2011), and the various elements reconstituted to suit the local needs, preferences and contingencies.

Case study questions: How is agriculture in your case study dependent on global flows of goods? How is globalization perceived, negotiated and reconstituted in your study region?

[21] The 'Euro crisis' or 'Eurozone crisis' is a combined sovereign debt crisis, a banking crisis and a growth and competitiveness crisis, which the EU Member States have been struggling with since 2009.

4.2 The role of the state

The state has played a key role in promoting the modernisation of agriculture both in Western and Eastern Europe, e.g. by establishing institutions such as Chamber of Agriculture, by funding agricultural research and providing extension services, by regulating markets or by subsidising specific farming systems (Barrera et al. 2010). However, in line with the neo-liberal ideology, the role of the state is being questioned in some countries. As a result, the provision of free **farmer advisory services** is being reduced in favour of private advisory services. While some point out that this shift allows the spread of more participatory approaches, it is at the same time linked with reducing the access to information by smaller farmers and part-time farmers (Cristóvão et al. 2012).

Similarly, the relationship between the state and **farmer organisations** are under debate in some countries. While this has positive effects as part of support policies and tools, it may also have negative effects in terms of the independence of the organisations.

But especially in view of the prolonged 'Euro-crisis' and the increasing level of national debt, governments may have reduced leeway to fund initiatives that may be desirable. The **financial crisis** has also meant that some EU farmers faced difficulties in credit access (Petrick and Kloss 2013). Combined with the dominant neo-liberal ideology, the role of private actors (e.g. transnational corporations) is increasing. As a result, there is a trend towards the private sector setting standards and defining quality assurance schemes, so that increasingly it is supermarket-chains that define and sanction farming practices and processing of farm-derived outputs (Campbell et al. 2006).

Case study questions: Is your case study affect by a retreat of the state in favour of actors of the private sector? How does it affect the 'room for manoeuvre' of various actors?

4.3 Climate change

Climate change[22] **affects agriculture** in Europe in regionally very uneven ways (Olesen et al. 2011). In some regions it might actually enhance agricultural productivity, e.g. through earlier planting, reduced frost risks, extended growing seasons or new arable lands in northern Europe. Increased atmospheric CO_2 concentration could increase the photosynthetic rate in crops. However, these potential gains could be cancelled out by increased survival and pests and pathogens in winter, change in their dynamics and range which could generate new and unexpected threats, increasing temperature variability could negatively affect critical germination or flowering periods and speeding growth cycles could actually result in less time for the food portions of cereal crops to fill out. Additionally the already severe soil erosion problems in monocultures could be magnified by heavier and more intensive precipitation and wind events, while greater intensity and frequency of heatwaves and droughts would increase evaporation, reduce soil moisture and place greater water and heat stress on livestock and crops in some areas (Howden et al. 2007, Schmidhuber and Tubiello 2007, both in Weis 2010).

[22] A 2°C increase in the average global temperature is widely treated as the 'safe' upper limit beyond which there is likely to be mutually amplifying feedback effects, such as reduced albedo as land is exposed by melting ice; thawing of permafrost and release of large stores of frozen carbon and methane; weakening of thermohaline circulation (the 'ocean conveyor belt') which is driven by Artic sea ice and is an important physical control on climate. What is worrisome is that what is treated as 'safe' is partly based in science, and partly in politics.

Despite the uncertainty surrounding the impact of climate change, it is undeniable that modern, industrialized **agriculture contributes** heavily to greenhouse gasses through animal production (esp. livestock that is cereal-fed in confinement), and through its dependence on oil for industrialized production systems. And yet, there are only limited efforts to change agricultural production methods or patterns of resource use. Weis (2010) points out that this inaction may partly be rationalized through the hope that climate change might enhance productivity. However, the inaction is problematic, not least given the ethical challenge of the globally uneven responsibility for – and uneven vulnerability to – climate change.

Case study questions: How is climate change relevant for your country/case study? What positions do stakeholders in your case study take? What strategies do they endorse?

4.4 Agriculture's dependence on fossil energy, mineral resources and natural systems

While historically agriculture transformed solar energy into calories that were usable by humans, through modernisation it has become a net consumer of energy[23]. Indeed, the modern agro-food system is heavily dependent on fossil energy, esp. **cheap fossil fuel**, which has allowed rising 'food miles' from field to plate, the globalization of commodity exchanges, the use of synthetic nitrogen fertilizer and use of energy-intensive technologies such as refrigeration. It has also allowed the globalization of commodity exchanges, where resources are withdrawn from some regions and accumulated in others[24].

The looming scarcity of fossil fuel ('peak oil'[25]) has contributed to the volatility of oil prices over the last decade – and these are likely to persist – and is expected to lead to increases in prices over the long-term. It is thus likely that if modern production methods are maintained, costs of production will rise (e.g. through higher costs for the manufacture of synthetic nitrogen fertilizer), as will transportation costs, which may reinforce the 'cost-price squeeze' for farmers and/or lead to rising food prices.

The impending scarcity of fossil fuel (especially liquid fuels), combined with the general increase of energy demand has faced agriculture with both the demand to reduce energy consumption and at the same time the demand to produce energy in the form of biofuels or other forms of alternative energy.

Biofuels (bioethanol and biogas) are being hailed as the first big step into a bio-based economy. This is somewhat surprising given that first generation biofuels can have a very poor biophysical budget: when the fossil energy used in producing and transporting inputs, running farm machinery and irrigation systems, transporting

[23] One estimate is that industrial agriculture requires an average 10 calories of fossil fuels to produce a single calorie of food (Manning 2004, McCluney 2005, both in Weis 2010), which grows further in the case of industrially reared livestock.

[24] An example is the intensive dairy production systems in Europe, which are based on large-scale production of soybeans in South America. The low cost for global transport allows both systems (soybean and dairy) to be profitable. The primacy of economic profitability in production and the perceived 'right to cheap food', allows issues such as social decay in rural regions, landscape degradation, erosion of ecological systems, increasing CO_2 emissions and poor animal welfare to be ignored.

[25] There is a wide-spread acceptance that conventional oil production will soon or has already peaked (Heinberg 2005), and the recovery of oil from tar sands or through 'fracking' are good examples of this rising dependence on harder-to-extract oil. All this points to the dependence on fossil energy, which currently generates roughly four-fifths of the world's total primary energy supply, with oil the largest and most indispensable source.

grains and oilseeds, and processing the biofuels are all aggregated – and set against the energy contained in the biofuel outputs – the balance is very thin at best, and negative at worst (see Patzek and Pimentel 2006 in Weis 2010). This points out that the scale at which biofuels might substitute for oil is extremely limited[26,27]. Also, based on output per land area, it is estimated that roughly two-fifths of all cropland in the USA and EU would need to be devoted to biofuels to substitute only 10% of current oil consumption (Weis 2010). In other words: rather than providing a partial fix for the crisis in liquid energy, the current biofuel boom threatens to worsen rather than reduce anthropogenic climate change. Weis (2010) points out, the promotion of biofuels "at once fortifies the operative logic of industrialist capitalist agriculture and exaggerates its contradictions". What seems clear is that the particular utilization pathway matters a lot (Knickel 2002).

Another 'side-effect' of the promotion of biofuels is the intensifying **competition for food, feed and fuel**: just under half of the world's total grain production (48%) is directly consumed by humans, while 35% is fed to livestock and 17% to biofuel production (Halweil 2008a in Weis 2010). The emphasis in Europe on the 'knowledge based bio-economy' (KBBE) might worsen this trend, given its emphasis that agriculture should supply raw materials needed for bio-energy, bio-fuels and bio-based materials (Kitchen and Marsden 2011, Olsson and Bångens 2012). This entails a fundamental ethical issue as in effect it leads to a competition for land between motorists who want to maintain their mobility and poor people who want to eat.

Agriculture also depends crucially on **mineral resources** and **natural systems**. Data published by the European Environment Agency (EEA) provide some indications: In Europe as a whole, 22% of freshwater abstraction is used by agriculture. In southern Europe, agriculture accounts for more than half of total water national abstraction, rising to more than 80% in some countries. 36% of European subsoils are having high or very high susceptibility to compaction. 32% of soils are reported as being highly vulnerable and 18% moderately affected. Salinization affects approximately 3.8 million ha in Europe. Agro-ecosystems in Europe have a total annual economic value of around EUR 150 billion. Thus, despite the efforts to address the environmental impact of agriculture, substantial challenges remain.

These unresolved challenges also point towards the vulnerability of the food systems in Europe. Indeed food security is not just an issue in developing countries. When taking into consideration the dependence on imports (of energy, of feed) and inputs (of chemicals, water, ecosystem services), food security is also an issue in Europe.

Case study questions: What role does agriculture's dependence on energy, mineral resources and natural systems play in your case study? Where are the weak links? How is the input-intensity of modern agriculture being seen in your team?

4.5 Demographic growth and dietary shift

In 2009 the FAO projected that by 2050 the world's population will grow to around 9 billion, and as a result the global demand for food, feed and fibre is expected to nearly

[26] Not to mention that the energy contained in the annual combustion of fossilized biomass far exceeds the annual net primary production of all biomass (i.e. the chemical energy derived by photosynthesis not used in respiration) (Dukes 2003; Field et al. 2008; both in Weis 2010)

[27] While 'second generation' biofuels (which use non-edible grasses, woody biomass, straw) hold some promise, they are not currently commercially viable (and investments in first generation plants for ethanol and biodiesel may cause a 'lock-in'), and there are still many uncertainties about their potential energy budgets (Weis 2010).

double. Combined with observations of dietary shifts, it has led to question how to 'feed the world', especially if at the same time other competing uses of agricultural land are taken into account, e.g. energy production, environmental protection, preservation of ecosystem services, or the need to store carbon from the atmosphere to mitigate climate change (Godfray et al. 2010, Chappell and LaValle 2011, Bos et al. 2013).

The most widespread answer is: *intensify production* and increase yields (see the section 2.1. on 'ecological intensification'). Others point out that on a global level we produce enough food to feed everyone, i.e. the failure lies in **access and distribution** (BeVier 2012). Indeed, in a world where "obesity and hunger co-occur it seems beside the point to argue about yield increases" (Chappell and LaValle 2011: 17). There is thus a debate on whether we really need to 'produce more', or whether a question of adapting diets, addressing (economic) power issues that impair fair distribution and reducing wastes (Collins and Chandrasekaran 2012). As Kummu et al. (2012) estimate, around one quarter of the produced food supply is lost within the food supply chain (i.e. from agricultural losses to waste at household level). This is an ethical dilemma given prevalence of hunger and malnutrition. Indeed, if the food losses were halved, there would be enough food for one billion extra people (Parfitt et al. 2010, Kummu et al. 2012)[28].

Similarly, the assumption of a continued **dietary shift** – i.e. the 'meatification' of diets – indicates an unquestioned acceptance that the consumption of *animal-derived proteins* will rise[29]. This is unsettling given the mounting evidence that (1) it is an inefficient use of calories[30] so that an increase in meat consumption leads to an increase share of grain and oilseeds used for feed rather than food; and (2) animal production contributes substantially to greenhouse gasses which drive climate change. This unquestioned acceptance is closely linked to the belief in markets, i.e. if consumers want it, producers should provide it.

Thus, while feeding 9 billion people doubtlessly represents a challenge, it would seem that a *systemic approach* that takes a broad range of aspects into account and derives regionally-specific recommendations would be more fruitful than the blind call for 'more production' (Godfray et al. 2010).

Case study questions: Will you take the global dimensions into account, especially those linked to the need to feed 9 billion people? What measures could be taken to e.g. shift livestock production to grassland areas or reduce meat consumption?

4.6 The knowledge based bio-economy (KBBE)

The recognition of the link between fossil fuels and climate change, as well as the realisation that fossil fuels may become scarcer, have led to a search for ways to shift from a carbon-based economy towards a bio-based economy. The concept of the **bio-**

[28] Food waste is also a large burden on the environment. Grizzetti et al. (2013) estimate that on average in the EU 12% of nitrogen water diffuse pollution from agriculture is related to food which is wasted. Yet, while reducing food waste could lead to a significant improvement of water quality, this is not appealing for the economic system, which has an interest in maintaining elevated consumption rates.

[29] For example: China has increased per capital meat consumption from 20 kg in 1980 to 50 kg today and plans to approach developed-world levels in the coming decades (Nierenberg 2005, Halweil 2008a, both in Weis 2010).

[30] A unit of protein from factory-farmed meat requires eight times more energy input than a unit of protein from industrial grain (WorldWatch 2004; Nierenberg 2005, both in Weis 2010). Note that it is important to distinguish between grass-fed and cereal-fed livestock production, as much of the world's pastureland cannot be cultivated.

economy refers to a broad range of technologies that use renewable, biological materials. These include improved healthcare technologies drawing on genetics, genomics and proteomics (e.g. new vaccines and replacement tissues), cleaner and more eco-efficient biofuels, stronger nano-materials, higher value-added food, or bio-based plastics.

Through the bio-economy, the European Commission is seeking to pursue competitive advantage under conditions of growing resource scarcity and growing demand. Reference is for example made to a **sustainable intensification** of primary production, a cascading use of biomass and waste streams as well as mutual learning mechanisms for improved resource efficiency (EC 2012). Through an analysis of the literature, Schmid et al. (2012) show that there are tensions among different definitions, concepts and emphases of the bio-economy, even within documents from the European Commission. Freibauer et al. (2011: 7) point out that "in the KBBE concept, the human factor disappears, industry is considered the main player of the bio-economy and rural territories are only mentioned as beneficiaries."

As with many concepts, various networks strive to use the discussions for promoting their own vision of a future in the name of the KBBE. Levidow et al. (2012) distinguish between a **'life science' vision** and an 'agro-ecological' vision[31]:

- The *life science vision* focuses on bio-, nano- and information technologies as a way to ensure higher productivity in agriculture, on global value chains, especially linking agriculture with energy production, and it focuses on capital-intensive knowledge production, and on knowledge that can be privately owned.
- The *agro-ecological vision* focuses on organic short-loop recycling processes, on shorter agro-food supply chains that relocalize food and energy production and consumption, and on designing agricultural systems that minimize the need for external inputs, relying instead on ecological interactions, based on farmers' collective experimental knowledge of biological resources, ecological processes and product quality.

These two contending definitions thus mirror the dichotomy between (continued) modernisation and alternative approaches to addressing contemporary challenges. Indeed, the industry-based bio-economy relies on science that is privately owned, thus leading to new forms of corporate control over knowledge, techniques and practices. It can be seen as a continuation of the modernisation paradigm, not least in its search for a deeper control over nature through science. It perpetuates the technocratic and instrumental approach, i.e. a 'business as usual' overlain with green considerations and credentials (and a lack of social and spatial considerations). Kitchen and Marsden (2011) have labelled this as the 'bio-economic paradigm'[32], and see it as an illustration of capitalism's enduring capacity to reinvent itself by accommodating criticisms and co-opting them with its logic.

In spite of these different perceptions it seems realistic to assume that the bio-economy will redefine the role of rural areas as they tend to possess and abundance of ecological

[31] This distinction is similar to the one proposed by Kitchen and Marsden (2011) who differentiate between the concepts of ‚bio-economy' and ‚eco-economy'

[32] They contrast it with the 'eco-economic paradigm', which builds on ecological processes and spatially embedded production-consumption chains that capture local and regional value. It focuses on small and medium-sized businesses which use ecological resources in a sustainable and ecologically efficient way, e.g. through renewable energy production, agri-tourism, food processing and catering, and social enterprises.

resources, which can be turned into a variety of embedded ecological goods and services.

Case study questions: Which understanding of the bio-economy dominates in your country? How does this influence the framing of both problems and solutions?

5. Systems thinking: understanding complexity and dynamics

Many of the problems linked with the modernisation of agriculture are linked to a **mechanistic world-view**, which was derived from and reinforced by reductionist approaches in research. Indeed, with the one-sided focus on increasing yields, modernisation focused on specific aspects of crop production and animal husbandry, with little attention on how the recommendations would impact the whole (family) farm (e.g. work flow, knowledge, autonomy, meaning), the social context (e.g. social networks, local food chains, culture and traditions) or the environment (e.g. nutrient loses, energy use for inputs and transport, water use, production of greenhouse gasses). Many of the current 'remedies' for the recognized negative impacts of intensive agriculture follow the same reductionist approach by seeking to find a solution to a narrowly defined problem (e.g. increase production to 'feed the world').

Many of the ills of modernisation can thus be linked to a lack of understanding of the complex interactions that characterise social-ecological systems, and a lack of understanding of their dynamics.

5.1 Reductionism vs. complex system thinking

Rogers et al. (2013) characterise the usual, reductionist approach to science as one that seeks to isolate phenomena from each other and their environment and apply a process of reduction, simplification and clarification, usually based on a logic of either/or. This thinking pattern rejects any form of integration, ambiguity or paradox. The **reductionist** mindset thus seeks to understand the world as a collection of separable and thus independent units and assumes linear cause-effect relationships between these units, and assumes that these relationships are reversible (i.e. time plays no role). As Carolan (2013, building on Whitehead 1934) notes, this method of analytically dicing up the world creates conceptual (abstract) constructs, which then tend to be mistaken for reality[33]. While we need abstract concepts to think and talk about the world, we need to be sensitive to the "unsettledness of these 'things'" (Carolan 2013: 5).

The reductionist mindset leads to the belief that reality is ultimately knowable. Thus it legitimizes the notion that we can 'get it right' (and if we do not get it 'right', we can always fix it later). Good science thus provide decision makers with *objectively knowable* – and by implication, certain – facts and answers. The majority of professionals, scientists, stakeholders and decision-makers build (often implicitly) on this model (Morin 2008, Ison 2010, Rogers et al. 2013). As a result they expect to come to 'know' the problem and experts are expected to objectively find the 'right' solution. They will expect – consciously or unconsciously – that once 'the' solution is implemented, the problem will go away. Moreover, they will now have an 'evidence based' recommendation that can be applied again, should the problem resurface.

[33] An example is the abstraction of a 'deterministic gene' that underplays or ignores the influence of the body in which this gene is functioning, and the environment in which this body lives. Epigenetics has highlighted that it is not only the DNA sequence that matters, as a variety of factors determine whether genes that are present are expressed, and how much.

Building on Morin (2008), Rogers et al. (2013) contrast this to the **complexity** frame of mind, where variability and uncertainty are givens. The aim is thus to understand systems in the heterogeneity of their structure, relationships and properties that emerge from interactions. In a complex system, many elements interact dynamically in a 'causal thicket' (Wimsatt 1994, in Rogers et al. 2013). Complex systems are characterised by the fact that there are many direct and indirect feedback loops, so the scale of the effect is not related to the scale of the cause. As a result the behaviour of the system cannot be predicted based on previous changes, nor can the effect of implementing a 'solution' be predicted. The consequences of actions are never entirely predictable, no matter how good our knowledge, not least because there is a great sensitivity to initial conditions (i.e. 'history matters').

The behaviour of a system is influenced primarily through the nature of interactions, rather than by the character of the components, implying that it is the *relationships* that are fundamental (not the components in and of themselves). As a result, temporal and spatial contexts codetermine interaction outcomes. In other words two similar-looking systems with different histories – or in different places – are not the same.

Under a complexity perspective of reality, most **problems are 'wicked'** (Rittel and Webber 1973), where each 'solution' is likely to have unintended consequences that are likely to spawn new problems. A complexity frame of mind needs to consciously accept notions such as *ambiguity, unpredictability*, serendipity and paradox, which will compete strongly with knowledge, science and fact (Rogers et al. 2013). Indeed, there are multiple legitimate ways of *framing* each issue. Since 'wicked problems' cannot be solved, the aim is more to loosen, to widen the problem space, to reframe the question so that a wider range of options for action can emerge (Rogers et al. 2013).

Researchers, decision-makers and stakeholders can *engage with a situation* as both facilitators and learners (Ison 2010). Choosing a path of action is an entry into more learning, from which to make new and more relevant choices in an iterative way. In other words: action becomes a form of diagnosing and learning about the dynamics of the system, about the interactions between elements.

Case study question: What type of recommendation do you – and your national Stakeholder Group – expect from your case study? How will you take ambiguity and different framings into account?

5.2 Static vs. complex adaptive systems

Complex adaptive systems are characterised by non-linearity and often non-equilibrium patterns, with high levels of uncertainty about likely outcomes and impacts. Yet, these **dynamics** are often ignored (Scoones et al. 2007). Indeed, much mainstream social science, policy and management thinking is traced to the 18th and 19th century traditions which saw balance, patterns and equilibrium as essential to progress, and this thinking has persisted in professional practice, even as science moved on. Diverse, dynamic contexts are often ignored as the underlying models assume that practices can be transferred to different places without a problem.

However, we need to build on an understanding that (1) systems are diverse, complex and multi-scaled. This means that attention needs to be put on the intertwining of social, technological and ecologic dynamics in particular sites and settings, and across

scales; and that (2) **uncertainty** (and ignorance[34]) is everywhere and has different dimensions: requiring an appreciation of the fact that often both the range of outcomes and their respective probabilities are unknown, and of *ambiguity* where situations and the consequences of choices can be viewed differently.

Most social systems are not only complex; they are also 'adaptive'. **Complex adaptive systems** are systems that involve many components (agents) that adapt (learn) as they interact (Holland 2006). This is distinct from systems where interaction between components is fixed, i.e. where 'rules of the game' remain the same over time (as in a game of chess). In complex adaptive systems the linkages between elements change and agents change their perception as a result of learning; as a result the 'rules of the game' change. Farming systems thus continuously evolve as a result of endogenous and exogenous processes, they are in a continuous process of 'becoming' (Scoones et al. 2007, Armitage et al. 2008, Schiere et al. 2012). This constant unpredictable change may be a nuisance for administrators who like stable and predictable conditions, but it is necessary for survival of the farming system. Indeed, a system that 'works' well today is unlikely to do so a few years later in a changed context, e.g. because there is less family labour available, because markets require quality assurance schemes, or because new opportunities for cooperation have emerged.

In complex adaptive systems order *emerges* 'bottom-up' through the independent yet coordinated action of many individuals, who are of course also embedded in a net of structural elements. Through a network of feedback mechanisms, and interpretation by the agents, the system is constantly evolving in response to real, perceived or anticipated changes in both the internal and external conditions (Elzen et al. 2004a). The construction of an emerging change, the interlinkage of different novelties, is not driven from one single 'locus of control'. It is nurtured during interactions in multi-agent networks who negotiate new meanings and co-construct new frames in response to dynamic reality and reproduce their behaviour accordingly (Tisenkopfs et al. 2014). As van der Ploeg (2009:300) points out, social change is "grass-root driven, spontaneous and, to a degree, guided by an unfolding 'narrative' that links the many initiatives and experiments into a self-propelling process. Because it is not planned, it allows for unexpected outcomes". Thus change in farming systems, as an alignment of actors with their individual goals, perceptions, knowledge and values, technological possibilities, institutional settings, infrastructure, etc. emerge over time, through a mix of conscious design and processes of self-organization (Holtz et al. 2008).

Studies of *change* within agricultural systems often rely on comparisons of stabilised situations (for example, in the case of conversion to organic farming, between organic and conventional farming, between before and after conversion, or between the conversion period versus a few years later), and lack a **dynamic approach**, one that studies the trajectory (Lamine and Bellon 2009). At the farm scale, many studies have pointed out the need to acknowledge the diversity of initial situations and the diversity

[34] To raise awareness of the nature of scientific certainty (and thus its ability to inform policy), three concepts can be distinguished (Stirling 1998:15, EEA 2001: 170, 192): *risk*, as formally defined in probability theory. This is where all possible outcomes are known in advance and where their relative likelihood can be adequately expressed as probabilities. Under conditions of *uncertainty*, the potential impacts are known, but there is no basis for assigning probabilities to these outcomes, e.g. because of the novelty of the activities concerned, or because of the complexity or variability in their context (e.g. antibiotics in animal feed and the associated human resistance to those antibiotics). While scenario or sensibility analyses can be useful, they do not provide a way to adequately assess the impact of different options. The condition of *ignorance* is when the potential impacts are unknown, and there for the probabilities are also unknown. Decision-making is then continually faced with surprise.

of trajectories as well as the multiple dimensions of these trajectories (Darnhofer 2005, Darnhofer et al. 2010a, Knickel et al. 2011), which is of course also true at the larger scale of territories and/or agri-food systems (Lamine et al. 2012a).

Case study question: How will you integrate the fact that systems undergo permanent and unpredictable change in the analysis of your case study?

5.3 Implications for research practice: reflexivity and participation

Reflexivity has a key role to play in coping with on-going change and uncertainty of co-evolutionary processes. Reflexivity allows taking into account learning and unforseen developments, as well as reflects on whether the on-going processes are adequate or should be improved in some dimension. As Scoones et al. (2007:35ff) point out, the reflexive turn: has two implications: (1) Things look differently depending on who you are. There are always going to be very **different interpretations** and valuations of dynamics and outcomes which reflect different people's lives, perspectives, politics and priorities: 'framing' of the system is critical. In other words: systems (i.e. both their structures and their functions) need to be understood as simultaneously 'objective' (things, and their interactions, existing in a context) and 'subjective' (relating to different framings under divergent perspectives on the system and its contexts). (2) We need to be aware of how *science*, methods, management and policy approaches are *co-constructed* by different people with different views, and these processes can *exclude* alternative visions and development pathways (Santos 2004).

Reflexivity thus needs to tackle the question of whether an approach or a participatory process reinforces existing power relationships or whether it ensures broad-based participation (Woodhill 2009: 284). Empowerment of a particular stakeholder group may often be a precondition for any effective *multi-stakeholder engagement*. Such empowerment relates to capacities for engagement (i.e. capacity for communication, conceptual analysis, self-reflection, leadership and facilitation) or to the group's power in a wider societal context. However, this empowerment should undergo reflexive monitoring, so as to make transparent e.g., what values are given precedence, which groups are excluded from the process and assess whether adjustments may be conducive for the way forward (Poppe et al. 2009).

Such reflexive processes enhance *adaptiveness* since they are built on the recognition that taking action will lead to new insights and the willingness to revise assumptions, goals and strategies based on these insights. The process should also include reflections on such issues as whether the current institutional framework allows for participatory and adaptive processes.

Case study question: How will you select the members of the Stakeholder Partnership Group? What implications will this choice have: whom do you exclude? Whose power do you reinforce?

6. RETHINKing modernisation

The persistent problems linked to modernisation of agriculture seem to indicate that 'business as usual' is no longer an option: magnitude of the problems are increasing, as is their global reach (MEA 2005, IPCC 2007, IAASTD 2009, Freibauer et al. 2011, OECD 2012). Also, various interacting global dynamics renew the pressure to RETHINK the meaning of agricultural modernisation and question its basic assumptions. Indeed, it is doubtful whether further 'technical fixes', i.e. marginal

changes which are equivalent to 'tinkering at the edges' will be sufficient to address key challenges.

Within the RETHINK project, the focus will be on rethinking the links between farm modernisation, rural development and resilience. The overarching question is how a new understanding of modernisation – that builds on resilience – will contribute to prosperous farms and rural areas.

Firstly, this builds on a **systemic understanding**, i.e. changes at farm-level cannot be considered independently from the organisation of the (global) food chains and the modes of coordination within them, or from the prosperity of rural areas in which they are embedded, or from the host of challenges which societies face (Knickel et al. 2013). Indeed, the key to RETHINK, is to understand that the problems of modernised agriculture, are not so much specific, local, clearly definable problems that can be tackled individually by identifying 'technical fixes' (e.g. fight the varroa mite which affects bee colonies; identify measures to reduce the nitrate levels in groundwater). Rather they are inherently linked to the underlying logic of the system. This does not deny that technical and topical 'solutions' will be helpful in specific cases (esp. to alleviate the symptoms). The point is that their wider ramifications need to be taken into account when assessing their suitability.

Secondly, this builds on understanding that change is ubiquitous, often rapid and unpredictable. Change causes economic, environmental or social risks for the farms and rural enterprises (Kruzmetra et al. 2010). Farming systems thus need to be **resilient**, i.e. can buffer shocks, can adapt and transform as new threats or opportunities arise, both in the broader context and on the farm itself. In RETHINK we thus challenge the understanding whether questions such as 'How to mitigate the environmental impact of agriculture?' or 'How to cope with increasing energy prices?' are the right questions to ask. Resilient approaches go further, shifting the attention to the dynamics of processes and interactions rather than finding the 'right' answer. The challenge is thus not so much to define how resilient farms and prosperous rural areas look like, but how to enable and guide change processes. In this context, change is framed as an opportunity for renewal, for reorientation, an opportunity to make the farm's projects evolve into new directions, to reconfigure resources, to renegotiate understandings.

This points out that in RETHINK we primarily seek new ideas through the case studies, rather than being directed (and limited) by the available models. Indeed, each model limits also the factors taken into account for rethinking modernization and may thus limit the search for new, locally appropriate approaches. The case-studies may be useful to collect insights, ideas and knowledge about hitherto neglected factors for rethinking agricultural modernization. In many cases we expect that a locally appropriate approach will can include **combinations** or simultaneous **co-existence** of several strategies, both at farm and at regional level.

The aim in RETHINK will thus be to **open the opportunity space** and contribute to an understanding of 'modernisation' that is more suitable to our turbulent time. The aim is to enlarge the spaces of possibility through engaging with them. We will look for novelty, look how actors' experiments, for ways in which networks expand 'the possible' and 'the doable' (Carolan 2013). Through giving attention to hidden and alternative ways to farm, to novel combinations between modernised and alternative practices, we can make them visible as potential objects of policy (Gibson-Graham 2008). Not only will we highlight the diversity of practices in the case studies, we will also build on the many experiments farmers are engaged in. We will explore how they question modernisation and what ways forward they propose. We will thus seek to identify ways

how the fundamental, core logic of modernisation could be adapted to enable us to adequately address the challenges we are facing at the beginning of the 21st century, which are vastly different from those of the early 20th century when agricultural modernisation emerged.

To achieve this, we face both the challenge to change the way in which we *generate knowledge* around agriculture, and the challenge to *generate new understandings* of alternative and experimental farming, allowing us to highlight new ways of making meaning and value out of farming (McMichael 2012).

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