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Moving away from business as usual in agriculture

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TOWARD SUSTAINABLE AGRICULTURE?

There is an increasingly common assumption that all kinds of agriculture will ultimately work together to achieve sustainability and that policies should not pit models against each other or choose between them. This leads many reports and researchers to advocate a "pick and choose" approach in which the best parts of all agricultural models will be taken on board, and together address sustainability challenges.

THE CONTINUED RELEVANCE OF AGRICULTURAL PARADIGMS

This assumption is highly problematic because it chooses to ignore fault lines and cleavages among agricultural models. Agricultural debates are still structured around opposing paradigms, which have evolved from an earlier opposition between conventional and alternative agriculture to the current agroecology *vs* new green revolution debates. These paradigms structure coherent discourses, yet their influence goes beyond the world of ideas. They are translated into investment decisions, in what and how farmers farm and how they market their products. As such we need to study, not ignore, these paradigms and their resilience.

THE NEED FOR TRANSITION MANAGEMENT STRATEGIES

In terms of policy recommendation, this vision that "all agricultures are necessary for sustainability", and that policies should not choose between models, is particularly dangerous as it negates the difference in financial resources, institutional support, and general path dependency that favours the incumbent model (or dominant regime) over its alternatives. Refusing to choose between models exposes us to the risk of *de facto* rooting for business as usual. Instead, we need policies that allow alternatives to develop and that actively manage transition toward sustainability.

AGRICULTURAL POLICIES REFORMS ARE NOT SUFFICIENT

Our two case studies (EU and Malawi) highlight the need for a reform in agricultural policies, yet we need to be aware that changes in agricultural policies will not be sufficient: to move away from business as usual in agriculture will require the involvement, and evolution, of the whole food system, from inputs producers and R&D down to consumers. This can only happen if we develop and support wide-reaching transition strategies.

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INTRODUCTION

Our current food systems are unsustainable. Not only do they fail to deliver food security for all, with nearly 1 billion going hungry (FAO, 2011) and over 500 million obese (WHO, 2011), but they do so at great costs to our environment (Rockström*et al.,* 2009)[1]. This lack of sustainability is a global problem: it concerns all kinds of farming and food systems, from conventional agriculture in the OECD, Asia and Latin America, to traditional farming in Sub-Saharan Africa (Herren *et al.*, 2010), yet for different reasons and to various degrees.

Our food systems can be understood as bringing together all the links of the food chain from inputs producers and R&D to farmers, agro-industries, supermarkets all the way down to the consumers themselves. Yet, even though food systems as a whole fail to deliver global sustainable food security, analysts tend to pay more attention to one of its component – namely farming systems. Thus, many organisations have followed in the wake of the International Assessment of Agricultural Knowledge, Science and Technologies for Development's (2009) conclusion that in agriculture 'Business as Usual (BAU) is not a solution'. They are asking for change in agricultural practices, stressing that *"without fundamental changes in the way we practice agriculture and manage our natural resources, ensuring food and nutrition security for all will not be possible"* (UN Rome-based institutions, 2011). This paper starts from the discussion of farming systems and links it to the bigger picture of changing food systems.

Beyond this apparent consensus on the need for agricultural change (Conway & Waage, 2010; British Foresight, 2011, IAASTD, 2008; Herren *et al.*, 2011) lies a major controversy on the direction of change and the sort of agricultural models we should move towards. This controversy is fed by the absence of a silver bullet in our current toolkits. The heydays of the Green revolutions, when a package of seeds, irrigation and inputs were seen as a miracle solution, are long gone and amid the criticisms directed at this former model (on social and environmental grounds mostly), no equivalent solution has appeared (even though some have touted GMOs or conservation agriculture as new silver bullets). In the absence of a silver bullet, the questions of what is needed to change our system and to foster transition are particularly important, and controversial. Yet, despite the importance of this issue, there is a gap in current literature on agricultural systems on what moving away from BAU implies. This paper contributes to answering this question by discussing what appears to be the new mainstream in agricultural debates, namely that we should not pit systems against each others and should leave no options out.

This opinion is very common, and can be found for example in the US National Research Council report, *Toward sustainable agricultural systems in the 21st century,* which states that "all types of farming can potentially contribute to achieving different sustainability goals and objectives" (BANR, 2010, p.17). Similarly the works of Jules Pretty, notably for the British Foresight report, consider that "sustainable agricultural systems cannot be defined by the acceptability of any particular technologies or practices" (Pretty, 2011, p.3). Underpinning this idea is that, considering the challenges we face, turning our back on one set of options (be it biotechnologies or traditional knowledge) would be dangerous. Gordon Conway and Jeff Waage contend that we need to overcome our prejudices and decide on technologies based on their appropriateness, that is "not about where innovation comes from but about how useful it is" (2009, p.377).

1. Their seminal paper showcases agricultural impacts on climate change, biodiversity loss and the disruption of the nitrogen cycle.

This paper argues for another approach. It considers that transition implies coordinated efforts to change and priority settings. Refusing to choose and prioritise risks to doubly undermine transition, first by hindering the development of alternatives and second by fostering the continuation of BAU.

In a first section, it argues that technologies should not – as it is the case in the works of Pretty or Conway and Waage – be understood as components of a common tool box from which we can pick and choose, depending on the context. Conversely, technologies are embedded in opposing agricultural paradigms based on a coherent set of beliefs and attitudes toward farming that cannot be ignored. These paradigms not only frame discussions on agriculture in scientific and policy circles, they also shape actions of actors in the food systems. Yesterday's debates on agriculture were structured on an opposition between conventional and alternative agriculture, but as this paper will show, despite some important evolutions, cleavages remain prevalent in today's debate, organised between two new poles: new green revolution and agroecology.

In a second section based on transition management literature, it will contribute to the study of what sort of changes and transition management is required in order to move away from BAU in agriculture. By looking at two case studies (in the EU and in Malawi) it will highlight how in the absence of a clear political choice to change agriculture, a mildly reformed business as usual will prevail and undermine sustainability.

1. ARE WE OVER PARADIGMS IN AGRICULTURE?

Agriculture has made an impressive come back on international agendas since the end of the 2000s. This new recognition of the importance of agriculture, Illustrated by the World Bank 2007 World Development Report, and reinforced by the food price surges of 2007-2008 and 2010-2011, goes hand in hand with the idea of a necessary change in agriculture. This debate on the future for agriculture and the required transformations of current agricultural models is particularly active in Sub-Saharan Africa (SSA). Green revolution failed to take root in Africa (Diao *et al.*, 2008), and as such African farming systems are still overall low-input "traditional (subsistence) smallholder agriculture" (Herren *et al.,* 2010, p.38), that, despite increased yields over the last 50 years (over which they nearly doubled (Petit, 2011, p.19)), are not currently responding to the food needs of the continent. The dire needs for investment and political commitment for agriculture in Africa has led to a burgeoning of public and private initiatives such as the Abuja declaration whereby African heads of State pledged to increase nutrient inputs or the Alliance for a Green Revolution in Africa, AGRA. This renewed will for investments in SSA agriculture renders the questions of what type of agricultural model is sustainable, and whether we need to choose between techniques, policies, and research priorities, particularly crucial in an SSA context.

In order to understand the debates of the day, it is important to take a step back to review previous debates on agricultural models. These have deeply changed since the second half of the 20th century, a period that witnessed a modernisation and industrialisation of agricultural systems, at first in the USA and Europe, and later on, with the Green revolutions in Asia and Latin America. But in the late 20th century this "conventional" model of agriculture was opposed by contenders of an "alternative model" illustrated notably by the growth of organic and ecological agricultures.

The debate between these two models has been presented in a seminal paper by Beus and Dunlap (1990) as an opposition between two contending paradigms. This section will present the two paradigms then categorised and put them in the perspective of current discussions on sustainable agriculture for Africa, straining between two poles, on the one hand a new green revolution (as fostered by AGRA), and on the other hand agroecology (De Schutter, 2010).

Current opponents have definitely learned from the former conventional *vs* alternative debate. For instance, we have since the 1970s and the development of alternative agriculture gained a better knowledge on negative externalities of certain intensive agricultural systems and current discussions try to integrate their resolution into the agricultural model they put forward. But contexts also widely differ. While the earlier debate was mainly located in regions having gone through an industrialisation of agriculture (the USA, Europe, India etc), and opposed one mainstream model, conventional agriculture, to a marginal model, alternative agriculture, current discussions on the future of African agriculture pit two modernisation projects against each other while SSA agriculture remains mostly dominated by traditional systems (Herren *et al.*, 2010). Thus we cannot expect contemporary debates to mirror earlier ones, but the following development shows that neither can we assume paradigms have lost their explanatory power, and in the wake of the British Foresight or the work of Gordon Conway, analyse

agricultural models as composed of a number of solutions from which to pick depending on the context.

1.1. Are the six dimensions opposing alternative and conventional agriculture still relevant?

In 1990, Beus and Dunlap theorized the two agricultural paradigms as being organized around the following 6 oppositions:

Table 1. The two original paradigms

Conventional agriculture	Alternative agriculture
centralization	decentralisation
dependence	independence
competition	community
domination of nature	harmony with nature
specialization	diversity
exploitation	restraint

Source: Reproduced from Beus, Dunlap 1990:598

These 6 defining cleavages pit alternative against conventional agriculture. But are these oppositions still operational, and can they help us identify new paradigms, adapted to the current Sub-Saharan African challenges?

1.1.1. Centralization *vs* decentralization

Beus and Dunlap (1990, p.598) put under this categorization two different phenomena: first, the centralization of land resources and capital in the hand of few farmers, with a small farmer population (economic concentration of farming production); and second, a production geared toward national and international markets. The alternative proposed is a more dispersed farming system (amongst more farmers, on smaller farms) targeting local and regional markets. Is this divide still operational? The development of alternative agriculture in Europe runs at least partly counter to these trends, as even though organic farms in Europe tend to be smaller than their conventional counterparts (chambres d'agriculture, 2009), and are often linked to buy-local schemes, recent years have also witnessed a great development of commercialisation of "alternative" products in "conventional" distribution systems such as supermarkets. Similarly, current debates on African agriculture do not seem to fit this separation well. Indeed, apart from a few sceptics (e.g. Collier and Dercon, 2009) there is a broad consensus on the key role of smallholders farmers in the upcoming agricultural revolution, as well as a growing agreement on the need to develop local and regional markets. Yet even though there is a consensus on the need to target smallholders, the wished-for outcome of this policy differs: whereas for some, small farms should be sustained and are considered as an important part of the future of agricultural production (Third World Network, Holt-Gimenez, 2008), for others targeting small farms today is necessary, but over time their replacement by bigger farms is expected (Patel *et al.,* 2009).

1.1.2. Dependence *vs* independence

Under this key divergence, Beus and Dunlap (1990, p.598) outline for the conventional side a *"heavy reliance on external sources of energy, inputs and credits", "capital intensive production units and technology", "dependence on the market"* and *"a primary emphasis on science, specialists and experts"*. On the alternative side the emphasis is put on *"low-capital", "self-sufficiency"* and *"local wisdom"*. From these many dimensions, two questions are especially acute: the relation to inputs and the relation to knowledge: both question how farmers interact with the upstream of farming production.

Conventional agriculture relies on external inputs (fertilisers, herbicides) and modified seeds. Early development in alternative agriculture were based on *reduced* external inputs (LISA program in the USA), or *refusal* of these inputs, and especially of chemical inputs (organic agriculture movement around the world). In the Northern debate, we have progressively seen what Beus and Dunlap characterised as an *"appropriation of progressive symbols by [conventional] institution when it is politically expedient to do so"* (*Ibid.*, p.610-611). Indeed, the need to reduce levels of fertilisers and herbicides is now commonly accepted by proponents of a "productive and sustainable" agriculture such as Michel Petit (2010). Yet even though partisans of a new green revolution agree on lesser levels of inputs, they still consider policies facilitating access to inputs (through input subsidies (as seen in Malawi), or development of private dealers networks (as promoted by AGRA)) a priority. On the other end, agroecologists may agree that a certain level of inputs can be beneficial, but they consider it should not be a priority of public spending (De Schutter, 2010). Conversely, the continued importance of this cleavage is found in seeds politics: whereas new green revolution partisans see agriculture as an industry which should buy the best seeds possible from its suppliers so as to increase its production, illustrated by the large dissemination of GM maize in India (Petit, 2010) or seeds reform in SSA, on the other side agriculture is seen as an activity that should retain or maintain as much as possible its independence, using seeds from local biodiversity (ACB, Third World Network), locally

produced inputs, in order to shield against markets fluctuations (GRAIN, 2010).

Alongside the question of inputs, the question of the production of knowledge is central to this opposition between dependence and independence. With the IAASTD (2009), traditional knowledge has come back on the agenda. Has it, like low-input agriculture, been integrated in renewed conventional research practices?

Conventional agricultural research can be described as a three-step process, in which first researchers develop innovations, second development actors and extension services disseminate them and third farmers apply them (Goulet, 2008, p.293): it relies on a *"division of labour between innovation and execution"* (Bonneuil, 2000, p.276). It is this division of labour that is criticized by "alternative" calls for participation in research (Morgan, Murdoch, 2000). The recognition of the validity of farmers' knowledge in agricultural research has been on-going (with difficulties) since the 1950s (Bonneuil, 2000, p.279). Yet what farmers' participation to knowledge production entails in practice is still far from consensual. Indeed behind what appears to be a universal understanding of the importance of participation by farmers, differences between conventional and alternative research designs hold fast, on what "knowledge intensive" agriculture is, on the sort of knowledge held by farmers and on the kind of changes needed in research designs to accommodate farmers' participation.

There appears to be a consensus that the agriculture of tomorrow should be "knowledge intensive" agriculture. Yet what this enticing catchphrase actually means is quite debatable. Whereas M.S. Swaminathan considers "knowledge intensive" agriculture as an alternative to "cash intensive" agriculture (2003), in which knowledge "is a continuum" (2000) from farmers to research labs, Aalt Dijkhuizen (2011) from Wageningen UR contends that "knowledge intensive" means "high tech agriculture", an agriculture using the best of biotechnologies (notably GMOs) and IT.

Regarding farmers' knowledge, the cleavage is even more striking. Whereas conventional research considered farmers as recipients, and not holders, of knowledge, the new green revolution does recognise that farmers hold specific knowledge. But this knowledge is limited to idiosyncrasies, and often stuck in the past: farmers are considered to be recipients of a traditional, local, knowledge that should be respected by extension services (Petit, 2010). In opposition to this vision of farmers as recipient of a tradition, Doré *et al.*, (2011) contends that farmers are "lay experts", with great experimental knowledge and knowledge of the agroecological conditions of their farm. And this rich knowledge of farmers is at risk, farmers in conventional farms have for most lost their "tacit local knowledge" and become dependent on external sources of knowledge (Murdoch and Morgan, 2000).

Finally, for authors on the new green revolution side of the debate, participation by farmers in research is guided by a wish to increase farmers uptake of innovation and may lead to consultation of research priorities, but is often limited to consultation of farmers on how to best apply research results to their fields (Delgado, 2008; Dijkhuizen, 2011). On the other hand, participation is understood by agroecologists as a constant co-construction of knowledge with exchange not only before and after the research process, but during the research itself (Delgado, 2008; Pimbert *et al.*, 2010). In that respect agroecology does posit an increased dependence (compared to alternative farming) to research institution. But, this dependence can be understood as a co-dependence between partners in innovation.

Thus, the *dependence* vs *independence* opposition is still central. Looking beyond the farming system at the whole food system, this opposition between dependence and independence informs the whole upstream of food production: both models are built on different perceptions of the role and knowledge of farmers, researchers and extension officers, and thus different models of research, input production, extension services, access to finance etc., are needed to accompany each model of agriculture.

1.1.3. Competition *vs* community

For Beus and Dunlap, this opposition was about seeing farming as business only, or as a way of life, in a rural close-knitted community. Alternative farmers in Europe and in France especially with the alternative farmers union *Confédération paysanne*, embodied this by reclaiming the name of peasant (by opposition to farmer or agriculturalist). This consideration of farming as a lifestyle incompatible with certain techniques remains, even though it is marginal. In the North, where some organic farmers refuse to sell their produce through conventional distribution lines such as supermarkets and favour farm gate sale and other forms of buy-local schemes meant to revive rural communities (Morgan, Murdoch; 2000), or in the South, where for some, in the words of farmer quoted in IIED *et al.* (2010, p.17): *"GM crops are associated with the kind of farming that marginalizes the mutual help and co-operation among farmers and our social and cultural life."* But this cleavage does not seem to hold as much weight as it used to. In the North, the discussion on the

multifunctionnality of agriculture in the 1990s have fostered the idea of farming as a unique sort of activity in how it relates to rural societies and provide public goods (European Commission, 2010). More interestingly, the context in which alternative agriculturalists emerged in developed countries is so different from the one faced by farmers in the South currently taking up agroecological practices. For Northern farmers adopting alternative agriculture was a way of embracing "post-productivism" and abandoning a modernisation pathway (Wilson, 2008). For farmers in the South, the adoption of agroecology is *a contrario* very "productivist" in that it is thought to yield great promises in terms of increased yields and a significant growth of their economic activities (Guei *et al.,* 2011).

1.1.4. Domination of nature *vs* harmony with nature

For Beus and Dunlap, conventional perspectives consider agriculture as a machine, an industry, with Nature sometimes standing in the way of its efficiency, thus needing to be controlled. By contrast, alternative farmers see themselves as being deeply connected with mutually-beneficial exchanges.

Terms of the debate have changed with over the last decade growing discussion of "ecological intensification" or "sustainable intensification". Ecological intensification, defined by Chevassus au Louis and Griffon as "intensification in the use of the natural functionalities that ecosystems offer" (Doré *et al.,* 2011, p.198), is very similar to the definition of sustainable intensification used in the UK Foresight exercise of "producing more output from the area of land while reducing the negative environmental impacts and at the same time increasing contributions to natural capital and the flow of environmental services" (Pretty, 2011, p.3). Ecological intensification is not agroecology, as contrary to agroecology, it strives to bridge the gap between conventional agriculture and alternative farming. It epitomises the vision of a global agricultural model which could bring together the best of both worlds: high production, and respect for the environment.

Yet with regard to the dichotomy domination of nature *vs* harmony with nature, ecological intensification seems to firmly stand on the domination side, thus bringing it close to a new green revolution agenda. The "ecological intensification" message, especially the definition by Chevassus au Louis and Griffon, implies that natural functionalities can be incorporated alongside other industrial processes in the search for more production, benefiting both farmers and their environment. Thus we move from industrialising agriculture *vs* nature to industrialising nature to benefit farming. But at the heart of the concept remains the idea of agriculture as an industry. This proximity in attitudes toward farming has meant that ecological intensification has been picked up as a new concept by conventional farmers (e.g. by the French FNSEA). This industrialisation of nature may lead to a better recognition of the benefits of an interaction between different species in an ecosystem, but it can be questioned that biodiversity in general – the species not "useful for production" in particular – may not benefit from this move, as illustrated by the "green deserts" of conservation agriculture in Latin America (Serpantié, 2009).

Agroecology abandons this vision of agriculture as an industry that dominates, or works with, nature. Olivier De Schutter (2010, p.6) argues that *"agroecology seeks to improve the sustainability of agro ecosystems by mimicking nature instead of industry"*, while Ulrich Hoffman proposes to *"transform the uniform and high-external-input-dependent model of quick-fix industrial agriculture (whose health and environmental externalities are largely not internalized) into a flexible approach of 'regenerative' agricultural systems (…) with minimal external inputs (including energy)"* (2011, p.16).

Thus, positions have changed but the debate is far from being over. The previous debate of "farming as a partnership with nature *vs* farming as industry" is instead evolving into a new dichotomy of "farming as mimicking nature vs farming as industrialising nature".

1.1.5. Specialization *vs* diversity

Specialisation is often key to industrialisation, and it has become central in conventional agriculture, characterized by the separation of livestock and crops, the narrowing down of the genetic base of cultivated crops cultivated in monocultures without rotation (Beus and Dunlap, 1990: 606). By opposition, alternative agriculture has thrived on the reintegration of livestock, fallows, intercropping and rotation.

This cleavage has not changed deeply, and current talks on what sort of agriculture should be developed in Africa rehearse similar arguments. On the one hand, the "agroecological" side of the debate promotes integration of crop and livestock (ILRI), crops, trees and livestock (World Agroforestry Centre), and an increase in farmland biodiversity in order to *"achieve higher productivity and profitability of the system (not necessarily of individual products)"* (Hoffman, 2011, p.16), arguing that such agroecosystems are more resilient to extreme climates (De Schutter, 2010).On the other hand, proponents of a new green revolution such

as the French foundation FARM, or Michel Petit (2010), may pay lip service to intercropping and agricultural biodiversity, but continue to focus on a few number of crops (cotton, maize etc) and monocultures. This is illustrated by the Bill and Melinda Gates Foundation support to the CGIAR. Of the many research centres composing the CGIAR, funding from BMGF has been targeted to centres focusing on the main staples (rice, maize, wheat), not for example on biodiversity, agroforestry, etc. (CGIAR, 2010), with the intent to "put crop improvement back on the agenda" (Sharma, 2010). Similarly, the G20 agricultural agenda fostered under French G20 presidency in 2011 most striking outcome in terms of agricultural research is the launching of an International Research Initiative for Wheat Improvement.

1.1.6. Exploitation *vs* restraint

Beus and Dunlap characterize the "exploitation" side as ignorance of negative externalities, high consumption of non-renewable inputs and a high confidence in the capacity of science and technology to solve arising problems. Alternative agriculturalists are characterized by "restraint" and "voluntary simplicity" taking into account externalities and long-term issues. The gradual greening of agricultural policies debate in Europe and in the US (Reganold *et al.*, 2011) and the green revolution *aggiornamento* on social and environmental impacts of the first green revolutions in Asia and Latin America (Swaminathan, 2003) means that negative externalities cannot be ignored anymore.

But the degree to which negative environmental externalities are taken into account is very different. For some, working on a more efficient use of resources is sufficient, as it should stall environmental degradation. Yet, in case of continuing increase in demands, even an efficient use of resource can lead to further degradation, thus necessitating restraints on the demand side. This dichotomy, presented in the third EU SCAR foresight exercise under the opposition between productivity and sufficiency narratives highlight how important questions of restraint remain (Freibauer, Mathijs *et al.,* 2011).

Interestingly, the two sides also differ strongly in how they relate to science. A common misconception is that alternative farmers are opponents to science. But alternative farming, and especially agroecology – named after a science bringing together ecology and agronomy – simply has a different relationship to science than conventional agriculture and new green revolution. The two different sides favour different research priorities: for example, while conventional agriculture considers seed-level improvement a priority, agroecologists consider that work needs to be done at the level of the farming ecosystem and on the interaction between its different components. They also differ in how they rely on science to provide them with a solution to their current and future problems, with proponent of agroecology stressing the importance of proactive, and not reactive ecosystem management, and demanding the right to refuse the use of certain types of technology (e.g. GM). Both sides require research and innovation, but of a different kind.

1.2. Paradigms changed but retain strong explanatory power

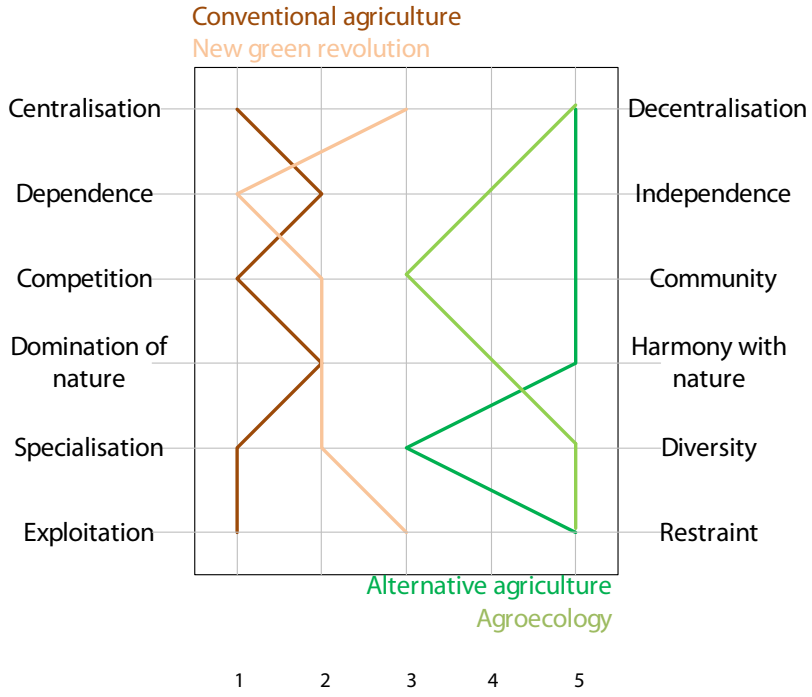
The previous development on the 6 different cleavages identified by Beus and Dunlap (1990) highlights that if not all cleavages have retained the same robustness, most of them still hold explanatory power. These cleavages run deep, and cannot be ignored completely: a common toolbox approach, as supported by the British Foresight or the US BANR report, fails to embrace this diversity, in terms of relationship to nature, knowledge, and production of food, although these cleavages have clear divergences in the way they translate into action.

Just as the cleavages were used by Beus and Dunlap to define two paradigms of agriculture in 1990, we can use them today to define two 'new' paradigms, new green revolution and agroecology.

Figure 1 compares the four paradigms along these 6 dimensions. The grading is based on the previous literature review of how models of agriculture posit themselves on these dimensions, and highlights how each model is located *vis-à-vis* the 6 sets of opposing principles (e.g. centralisation *vs* decentralisation).

This figure illustrates that even if cleavages remain strong, lines have moved and that current discussions are not simply mirroring earlier debates. Questions of agricultural diversity, negative externalities or decentralization – as illustrated by support to smallholders in Africa –, have been taken into account by proponents of a new green revolution in a way that former stands for conventional agriculture did not. Yet, new green revolution is not to the right of conventional agriculture on these scales: on independence, the importance of high tech agriculture in the new green revolution paradigm amplifies the lack of independence of farmers, especially when talking about innovation. Interestingly, on independence, the co-construction of innovation in agroecology implies a greater dependence on research (compared to autarkic tendency of alternative agriculture). On harmony with nature, we have moved from a belligerent

Figure 1. Schematic representation of the evolution of paradigms in agriculture (author own grading)



ignorance of nature to an industrialization of nature: both are at ends with views proposing farming in harmony with nature. Similar differences are also found between agroecology and alternative agriculture. While alternative agriculture rejected productivism in a context of overproduction in developed countries, agroecology is striving to increase agricultural production in SSA. Agroecology is presented by Hoffman as a solution for food security and development. As such it gives more importance to economic aspects of development and is further apart from the "community" end of the community-competition opposition. On the other hand, agroecology proposes much more diverse agro ecosystems than early alternative agriculture developments, and as such is closer to the "diversity" end of the specialisation-diversity opposition.

2. OPERATIONALIZING PARADIGM SHIFT: THE NEED FOR TRANSITION MANAGEMENT

The first section questioned the relevance of an approach considering that all models of agriculture could work alongside, each contributing to attaining "sustainable agriculture". Such an approach, found notably in the US BANR 2010 report or the UK Foresight exercise (2011), fails to recognise the continued relevance of opposing paradigms in agriculture. Even though lines have moved, the cleavages *per se* remain relevant, highlighting that agricultural practices belong to different coherent models not only in terms of attitudes of farmers or priorities of research, but also grounded in investment patterns, transformation of products, marketing processes, locking farmers in certain ways. This second section, building on literature on transition management, highlights that ignoring these differences and refusing to choose between the two paradigms is likely to preserve current mainstream, BAU agricultural models, and hinder the development of alternatives.

2.1. Theoretical framework to analyse transitions

In the North, the question was of how, and if the "alternative" paradigm could replace the "conventional paradigm". Even though the green revolution, and its reformulation as "new green revolution" is globally the dominant model of agriculture, this domination is contested in Sub-Saharan Africa, where due to failure of green revolution extension, "traditional agriculture" remains the prevailing paradigm (Herren *et al.*, 2010). Thus, both "new green revolution" and "agroecology" strive to replace "traditional agriculture".

In order to understand how paradigm shift takes place, and what actions are likely to foster them,

this paper proposes to use the rich literature on transition management and socio-technological regimes. The different agricultural paradigms we have identified in this paper can also be analysed as socio-technological regimes, that is, *"cognitive routines that blind [actors] to developments outside their focus regulations and standards, adaptation of lifestyles to technical systems, sunk investment in machines, infrastructure and competencies"* (Geels and Schot, 2007), and paradigm shift can be operationalized in terms of transition from one regime to another.

Regime theory analyses transition as "outcomes of alignments between developments at different levels", macro, meso and micro. The macro level is that of "landscape": it concerns major trends regarding macroeconomy, demographics, the environment, or deep-seated cultural attitudes. Change at the landscape level takes time. Climate change can be theorised as a sort of change taking place at landscape level (Geels and Schot, 2007, p.413). The meso level concerns socio-technical regimes *per se*. Finally, niches are found at the micro level, they are unstable, innovative "socio-technical configurations" that usually come from fringe actors and try to compete with the socio-technical regime trying either to be combined with it, or to replace it (*Ibid.,* p.400).

As Bergman *et al.* (2008, p.3) argue, regimes, because they shape "practices, rules and shared assumptions" and preclude thinking "outside the box", focus on system optimisation, not on system innovation. This means that most innovation will arise outside of the dominant regime: they will start as niches that may be integrated in the dominant regime, or may develop into a contending regime, perhaps becoming over time the next dominant regime. Of the different paradigms of agriculture we have identified in this paper, some are in a dominant position (e.g. conventional agriculture in the North, traditional agriculture in Sub-Saharan Africa) while others are contenders for such a position (alternative, agroecological and to some extent, new green revolution). Less well established, they lack the support of regulatory measures, habits, and techniques.

Studying how these two sorts of paradigms, or socio-technical regimes, interact implies looking at whether challenging innovations will be incorporated in the prevalent regime, or whether they will replace it, at what pace, in what manner etc. In this perspective, Geels and Schot (2007) outline different transition pathways in which, depending on the support for the dominant regime, the solidity and unity of the competing regimes, the sorts of shocks (frequent, rapid, strong…), the current dominant regime stands on, is reformed, or replaced.

Table 2. Different transition pathways

Transition pathways	Landscape and niche level	Regime change?
Transformation	Moderate external (landscape) pressures, absence of well-developed niches	Dominant regime adjusts to external pressure. A new regime grows out of the old one.
Reconfiguration	Moderate landscape pressure. Well-developed niches, symbiotic with dominant regime	Regime gradually integrates niche. A new regime grows out of the old one, combining old parts and new ones.
Technological substitution	Strong landscape pressures and well-developed niches.	Competition between the old and a new regime which may lead to the replacement of the old by the new regime.
De-alignment and re-alignment	Strong sudden landscape pressure, developing niches	Old regime slowly erodes as it loses support; niches compete among themselves to replace it.

Source: Author's own table, based on Geels and Schot, 2007 and Bergman *et al.*, 2008.

Reganold *et al.* (2011) argue that two types of changes are especially relevant to agriculture: incremental and transformative changes. Incremental changes focus on techniques and technological fixes (ex: no-till agriculture when confronted to erosion). With respect to Geels and Schot terminology, these incremental changes cover transformation and reconfiguration: the dominant regime adapts to new issues, but retains its position. Reganold's transformative changes can be linked to Geels and Schot's last two transition pathways: technological substitution and de-alignment/re-alignment.

From Table 2, we can infer that the different transition pathways yield different outcomes in term of regime change: the earlier dominant regime can be removed, it can stay unchanged, or have to evolve in order to retain its position. We do not have the opportunity to choose between all these transition pathways the one that would better fit a given purpose. Instead, depending on the development and strength of niches, the state of the present regime – is it openly and frequently contested at landscape level?, etc. –, different pathways are possible, leaving options open, e.g. in a de-alignment/re-alignment pathway we cannot know in advance which niche will replace the dominant regime.

There is a debate on whether incremental changes such as those due to a reconfiguration of the dominant regime can rise to the challenges of the day. Geels and Schot consider that in a sector such as agriculture, characterised by "the interplay of multiple technologies" (2007, p.411), incremental changes can lead to sea change, whereas

Reganold *et al.* (2011) on the other hand consider that incremental changes are "inadequate to address multiple sustainability concerns" as the gradual integration of parts of the contending regime will be partial, focusing on the parts easiest to integrate and hence less subversive. Hence for Reganold *et al.*, what is needed to change agriculture is transformative changes which imply "whole-system redesign" (Reganold, *et al.,* 2011), but this sort of radical change can only happen when farmers are faced with important external pressures (such as exposition to new research, policies, economic hardship) which enables them to set aside their systems' memory and its lock-in in a certain trajectory (Wilson, 2008).

These debates on the existence of different transition pathways and their ability to bring on new regimes can inform discussion on paradigm shift. They illustrate that paradigm shift – the dawn of a new dominant regime – can happen through different pathways. They furthermore highlight that new ideas will not always replace old ones: they can also be integrated in the current dominant regime (reconfiguration pathway). Armed with this theoretical hindsight, this paper proposes two case studies of transition: the greening of the EU Common Agricultural Policy and the "success story" of the Malawian green revolution. What sort of transition pathways do these reforms illustrate? What do these cases tell us on the relative merits of incremental *vs* transformative changes in achieving sustainability?

2.2. 20 years of greening the CAP

Through both agricultural and environmental policies, the question of the sustainability of agriculture has been addressed for nearly 20 years in the EU. How can we characterise these evolutions? How can we characterise this transition, in terms of transition pathways and in terms of achieving greater sustainability?

Two trends have been at play in the EU regarding the sustainability of agriculture: first, the choice in CAP reforms to start to support alternative agriculture (e.g. funding for organic agriculture through the CAP 2nd pillar) alongside continued support for conventional agriculture (the dominant model); second, the choice to increase environmental pressure on all sorts of farming with an increase in agro-environmental legislation either inside (conditionality of direct CAP payment after 2003) or outside the CAP (such as the 1991 Nitrates directive or the 2000 Water framework directive). This movement has gained momentum over the last 15 years, and "greening the CAP" is widely considered as one of the objective of current CAP reform (European Commission, 2010)

In terms of transition, what has been attempted is hence both a development of the alternative regime and an evolution of the dominant conventional regime toward more sustainability. But data on the development of alternative agriculture in Europe show that alternative agriculture may be a striving niche, but it is far from being able to replace the dominant regime of conventional agriculture. Thus organic agriculture is at the forefront of alternative agriculture in Europe, where conservation agriculture is only starting to emerge (Serpantié, 2009). Organic agriculture occupied, in 2008, 4.3% of European utilised agricultural area (UAA), twice more than a decade before. But despite positive evolution, organic farming remains a niche in Europe (except from certain member States, in Austria for example, 15.5% of UAA is farmed according to organic principles) (Agence Bio, 2010).

Hence, the model that has emerged from nearly 20 years of "greening the CAP" is based on the transformation of the old regime, along a path that Geels and Schot characterise as reconfiguration. In response to mounting landscape pressure (increasing environmental societal demands), the dominant regime integrated parts of the alternative agriculture toolkits, such as input reduction, ecological fallow or ecologically intensive agriculture, but doing so without changing position on the necessary increase of production or the imperative of competitiveness, etc. (Xavier Beulin, 2011[2]). This old – and holding fast – regime was born in the aftermath of WW2 which saw the mechanisation of agriculture in Europe, illustrated in France by the Pisani laws (1962) setting a modernisation agenda for French agriculture. Alongside agriculture, our consumption patterns changed with the rise of supermarkets. These two trends have reinforced – and still reinforce - each other and are now underpinning the dominant regime of conventional agriculture.

Changes that we have seen over the last 20 years have been along the line of "system optimisation" that is reducing the losses and pollutions of the dominant regime, and not "system innovation" and thinking outside the box (Bergman, 2008). This lock-in in favour of the dominant regime of conventional agriculture is not only found at farm level: it is also located both in the upstream and downstream sectors hereby strengthening the

2. « Produire une agriculture écologiquement intensive? C'est un slogan qui nous a été emprunté, donc il me va très bien. », X. Beulin, « Ca vous regarde », LCP, 13/04/2011 LCP http://lcp.fr/13387

lock-in on farming practices (Vanloqueren, Baret, 2009; Hubert, 2010). Morgan and Murdoch (2000) argued that conventional and organic upstream differed radically. European upstream facilities remain as of now mostly conventional, in terms of research focus (even if the third EU SCAR exercise (Freibaeur, Mathijs *et al.*, 2011) highlights that debate on paradigm shifts exist at EU level). Similarly, extension services remain deeply connected to agriculture cooperatives selling conventional inputs: for farmers to change model of production *en masse,* their advisory body have to be taken on board (Labarthe, 2010). What is true for research and extension services is also true for commercialisation: for farmers to be convinced to change techniques and vision of their work, they need to be sure they will be able to sell their production at a decent price. Yet even though current CAP post 2013 discussion breach this topic and talk notably of a better share of the added value along the food line for farmers, it is doubtful the results will be sufficient to enable EU farmers to live from market prices (European Commission, 2011).

Hence the "greening of the CAP" did not until now achieve a regime change, but an adaptation of the dominant conventional regime through incremental changes. Renagold *et al.* (2011) on US agricultural policies contented that such a sort of incremental change does not deliver in terms of sustainability. Does the EU case infirm or confirm their finding?

With regard to the environment, the policies put in place have shown mixed results. In 2010, the European environment agency considered that *"increasing attention to environmental issues within the framework of the Common Agricultural Policy during the last 50 years has not yet delivered clear benefits for biodiversity"* (EEA, 2010), and that *"despite improvements in some regions, diffuse pollution from agriculture remains a major cause of the poor water quality currently observed in parts of Europe"* (EEA, 2011).

Addressing water pollution from agriculture (fertilisers, herbicides, pesticides, organic matter) in order to meet the Water Framework Directive (WFD) objectives of good chemical and ecological status is putting a great pressure on European farmers. For example in England, Bateman (2006) argues "*that to meet the requirements of the WFD by simply reducing inputs and production might require large-scale changes in agricultural land use including reductions in fertiliser application rates to crops and grass by 50%, halving sheep stocking rates and cutting cattle stocking rates by 25%. Such major changes are serious for an already economically fragile rural economy and appear to clash with other official priorities for supporting the farming sector*".

Yet European agricultures have changed over the last 20 years: reduced fertilisers use, pesticides use, development of agri-environmental practices. But for all the effort it has consented, European agriculture is still far from meeting the goals that an increased environmentally-aware society is setting. Furthermore, the important changes in practice among older member states may be counterbalanced by a demand for agricultural inputs that is exploding among new Member States (Figure 2).

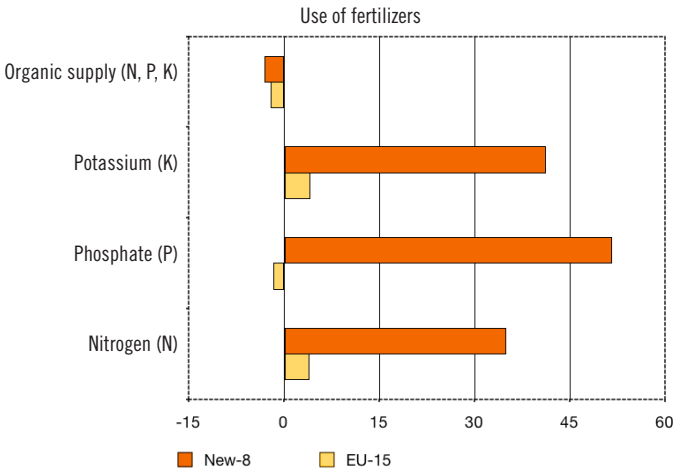
Furthermore, making European agriculture sustainable has been intimately linked to "greening the CAP", at the expense of the social and economic dimension of sustainable development (Hermelin, 2002). This choice of focusing on one aspect of the agenda favours a conventional agenda which looks for technological fixes to environmental issues *vs* an alternative agenda which proposes a model that attempts to address all dimensions of sustainability coherently.

Stéphane Le Foll, French member of the European Parliament, argues that *"the problem in Europe today is that we think in terms of correcting the negative effects of old models, and are incapable to support the dynamics leading toward new models"*. He explains this incapacity to favour alternative models by the way European law-making is built: for each specific problem comes a specific directive, but these new models need systemic changes, and this addition of norms fails to foster transition.[3]

As Bateman (2006) highlights, if we are thinking in terms of "simply reducing inputs and production" current environmental pressures cannot be addressed without jeopardizing farming in Europe (or at least the livelihoods of farmers). This means that these environmental challenges cannot be addressed through business as usual solutions (Herren, 2011), nor with a marginal adaptation of BAU. It confirms that Reganold *et al.* (2010) findings for US agriculture, that is, that

3. Stéphane Le Foll, "Quel est le problème européen aujourd'hui ? C'est qu'on raisonne par correction des effets négatifs des anciens modèles et qu'on est incapable de penser les dynamiques nouvelles des nouveaux modèles. Toutes les techniques nouvelles (conservation des sols, logique de couverture, rotation agroforesterie, etc.), c'est des éléments systémiques. Ça ne se prend pas mesure par mesure, c'est l'idée de modèle qui se met en place. Mais là, l'Europe elle a un problème, car à l'échelle européenne on a une administration, qui pour traiter des questions, on les traite de manière simple : j'ai un problème sur l'eau, je fais une directive sur l'eau ; j'ai un problème sur les sols, je fais une directive sur les sols, j'ai un problème sur les phytosanitaires, je fais une directive sur les phytosanitaires, etc. Mais une fois que ça s'ajoute tout ça, est ce que ça fait sens ? Est-ce que ça donne une dynamique ? Est-ce que ça permet d'aller vers cette transition et cette mutation ? Non ! C'est bien là qu'est la question… », Conférence Sciences Po Proléa 14/02/12.

Figure 2. Agriculture - Environmental pressures 2020/2001



Source: European Environment Agency (January 2002), http://www.eea.europa.eu/data-and-maps/figures/agriculture-environmental-pressures-2020-2001
Note: "EU-15" represent the 15 "old" Member States, "New-8" represent 8 of the 12 new Member States : Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia.

regime adjustment are not sufficient to address the sustainability challenge, are also relevant for EU agriculture.

Twenty years of CAP greening offer a cautionary tale for promoters of sustainable agriculture. Lock-in in agricultural development is hard to override, and as of now European agriculture has failed to do so. This case has showed us firstly, that a combination of both models in Europe continued the domination of conventional agriculture over alternative agriculture and led to solely incremental changes, unable to meet the sustainability challenge. In particular, it illustrated that limiting sustainable development to addressing environmental challenges favoured technological fixes over systemic solutions addressing all facets of sustainable development. Secondly, those paradigms go beyond farm level and inform the whole value chain: as such, it is the whole value chain – comprising research and advisory systems - that has to be targeted if radical changes are to be obtained as agriculture cannot change on its own, if the rest of the food systems – where the demand for agricultural products, but also the offer for inputs is located – remains the same.

2.3. A new "green revolution" in Malawi

Malawi is characterised by a "culture of maize", and food security is mainly thought of in terms of availability of maize (Dube, 2011; Chisinga, 2011). Malawi has known on and off maize input subsidies programs for over thirty years. These programs have overall been considered costly, leading to only temporary improvement, as their discontinuity led to plummeting yields (Douillet, 2011, p.13). The years with no, or low, input subsidies since 1990 are also those in which the country faced high food insecurity: 1991, 1993, 1996, 2002 and 2004. In 2004-2005, the production failed so much that food aid had to be imported for close to a million USD (*Ibid.*).

It is in this context that the proposal of presidential candidate Mutharika in 2005 to launch new input subsidies was welcomed with clamour from voters and dismay from donors who feared an expensive, cost-ineffective program. But this program, compared to previous ones, was supposed to be "smart", and "targeted" at those that most needed it. Its distribution is decentralised: village chiefs, aided in later years by extension officers, identify the farmers in their community that fit governmental guidelines (middle-range farmers who would make the most of cheaper inputs in term of productivity increase). Its voucher-based system enables farmers to choose between different products (e.g. open-polinisation seeds or hybrid seeds) depending on their availability, and makes it easier to run (Denning, 2009). Since 2006, private agro-dealers have been brought on board: not only through the public procurement of inputs by the state on international markets, but also in their distribution on the ground.

Since the start of the programme, Malawi has known bumper harvests. Whereas the government considers there is a strict causality between the policy and increased harvests, Dorward and Chirwa (2011) argue that an important proportion of production increase can be explained by other factors (notably the absence of droughts).

The Malawian case *"provides a unique opportunity to examine a green revolution in progress and test the scalability of sustainability principles"* (Snapp *et al.*, 2010, p.20840). This section proposes to analyse what sort of transition is going on in

Malawian agriculture, and what are the expected results in terms of food security and sustainable food systems.

The intermittent nature of input subsidies in Malawi, as well as the importance of maize monocultures means that, even though the country has not formally moved toward a conventional, high input, industrialised agriculture, nor can it be said to remain a country of "traditional agriculture". Furthermore, alongside the government-sponsored input schemes, international organisations such as the World Agroforestry Centre are conducting large scale developments in agroecology: thus, over 5% of Malawian farmers follow agroforestry methods (Garrity *et al.*, 2010). Hence, Malawi seems to be in the middle of a de-alignment/re-alignment transition pathway: the old dominant regime – traditional agriculture - is losing steam, and opposing niches – new green revolution techniques, agroecology – are competing to replace it.

Within this competition, the Malawian government has taken the side of a new green revolution: the input-subsidies programme, the opening of the national seed market to international seed companies (Monsanto controls 50% of the market) as well as the grand scale "green belt" irrigation initiative all go in the direction of an industrialisation of agriculture. Indeed, the path taken seems closer to an "old" green revolution pathway of conventional intensification than to a new-fangled ecological intensification. Even though the Malawian government is participating in a pilot scheme financed by the World Agroforestry Centre and Irish Aid (World Agroforestry Centre, 2011), hopes expressed by Olivier De Schutter (2010) and the World Agroforestry Centre (Garrity, 2010) that the government would choose a transition toward agroecology as an exit-strategy for its input programme (e.g. by making trees seedling qualify for the voucher scheme) seem unlikely to realise as President Mutharika planed, not an exit-strategy (Nisku, 2008), but a generalisation of his current policy across Sub-Saharan Africa, in order to make Africa food secure by 2016[4]. The recent death (April 2012) of President Mutharika and his replacement by Vice-President Joyce Banda may impact agricultural policies in Malawi, but it is as yet unclear what direction the new President will favour.

The favoured input-subsidies programme is not radically different from previous attempts, even though it has until now proved more successful at increasing agricultural production than its predecessors. Thus we are faced here, as with the EU case, with an incremental transition.

How does it fare in terms of achieving sustainable food security and food systems? Earlier major food insecurity phenomenon took place when governments had to discontinue input subsidies (Douillet, 2011). This costly programme depends on donor support, and this support is very fragile, as illustrated by DFID decision to freeze aid to Malawi in the spring of 2011 in reaction to bad governance[5]. Thus, a drop in food security in case of programme abrupt termination can be foreseen, especially as the government has not yet thought of an exit, phasing out, strategy (Dorward and Chirwa, 2011). But the programme in itself – not only its potential abrupt termination – is questionable on grounds of food security. Its focus on maize is deeply problematic. Malawi is stuck in a "culture of maize" (Dube, 2011) in which food security is often reduced to availability of maize. This shortcut is damaging in terms of nutrition, another vital aspect of food security, as maize does not provide the required micronutrients. Maize is also increasingly criticised as an unsustainable culture in Malawi. Maize monoculture farms are common over Malawi. These farms incur the expected detrimental impacts of prolonged monoculture (soil mining, nutrient depletion) which has seen maize yields drop by 25% from 1 ton to 750 kg between the 1980s and 1990s (Akinnifesi & Kwesiga 2002). According to Makunike (2011), it is only a question of time before climate changes makes it impossible to cultivate maize in this part of the continent, making the development of maize culture a risky choice in terms of sustainable food security. Finally, its focus on middle-range farmers, who are the intended recipients of vouchers, may be the most efficient choice in terms of increasing production, but it may not be the case in terms of food security more broadly, especially in terms of access to food.

Hence, despite the calls for a Sub-Saharan success story, the Malawian case is not without negative sides. It is a marginal adaptation of a model that has shown its limits in Malawi over the last 20 years. Other options exist on the ground and have demonstrated their results in terms of sustainable food production (Garrity, 2010), but as of now the Malawian government is gearing Malawian agriculture toward an old fashioned green revolution, and more business as usual. In terms of sustainability, the results obtained by the programme appear very fragile: the food security

4. http://www.malawivoice.com/latest-news/mutharikas-african-dream-of-self-sufficiency-could-become-a-reality/ (accessed 26/01/12)

5. http://www.guardian.co.uk/global-development/poverty-matters/2011/may/25/malawi-aid-freeze-could-harm-dfid-good-work(accessed 26/01/12)

results are mostly down to increased production – not necessarily access, nutrition, stability – and this increase in production is focused on a crop which will be increasingly hard to cultivate.

Interestingly, in Malawi as in the EU, the impediment to regime changes seems to be located not only in the farming system, but in the food system in general : the debate in Malawi is limited to how to produce maize (with agroforestry and intercropping, or with external fertilisers) and does not focus on what really characterizes the dominant regime in Malawi, and does not seem likely to change soon : a "culture of maize" making maize availability the Malawian definition of food security (Dube, 2011; Chinsinga, 2011).

CONCLUSION

This paper set out to highlight the weaknesses of the increasingly common approach proposing that all kinds of agriculture are needed to reach sustainability and that we should not oppose models, nor choose between them. It has done so in two ways. First by underlining the continued prevalence of paradigms in agriculture: agriculture debates are built around this opposition between models, an opposition that should not be ignored, but studied.

Paradigms hold fast and bind together farming techniques, practices and attitudes in a coherent vision. Moving away from the old opposition between conventional and alternative agriculture, active in the 1970s onward, current debates on the future of global agriculture are articulated between two poles: on the one hand a new green revolution which seeks to further the green revolution model and reduce its negative social and environmental impacts, on the other hand agroecology, whose advocates (De Schutter, 2010; Hoffman, 2011, Herren, 2011) propose a new sort of farming, mimicking nature, not industry.

These paradigms do not affect the sole world of ideas, or opinions, over agriculture. They are embedded in social relations, education of farmers and extension services, investment patterns. They are at the core of the divergence between models in agriculture. These models characterize agricultures that differ not only in the way farmers farm their land, but also how they market their products, in choosing what to grow etc.

Second, this paper has stressed the importance of transition management. Not all models are in the same position: some are what regime theory calls *niches*, that is either more recent or marginal models, which try to develop in the shadow of the dominant regime. These regimes are dominant not only because a majority of farmers farm according to their ways, but because they have become entrenched in policies, and in the way the whole society relates to food and farms.

As such the best models for achieving sustainability may not be the better equipped in terms of support and resources. And refusing to choose between contending models is *de facto* a choice in favour of perpetuation of a dominant regime of business as usual or of a mild variation on this theme.

Conventional agriculture (the "old green revolution") is the current dominant regime worldwide, found under different guises in all OECD countries, Latin America and Asia. It is now conventionally admitted that this regime is problematic in terms of sustainability. But what it should be replaced with is contentious, and while some support marginal changes and a "new green revolution", others ask for more radical changes and a move toward agroecology.

On the ground, policies are often not as clear cut, and propose to support both changes to the dominant regime and support to its alternative. This tendency is epitomized by our first case study, European Union CAP reforms which, over the last 20 years, have tried to do just that. In terms of development of alternatives, organic agriculture has doubled its scale in Europe, yet it remains a niche. More importantly, in terms of sustainability, the dominant regime of European agriculture, despite its reforms, still dramatically fails to reach its requirements (EEA, 2010).

In the Malawi case, national policies are pushing both for the development of a green revolution agricultural model and for the development of agroecology (through support to agroforestry). But out of these two policies, it is the former, not the latter, that the government pledged to scale up. Thus agricultural policies push for the establishment of a type of culture, maize monoculture, with external inputs whose sustainability is highly contestable, but which is firmly embedded in Malawian perceptions of food security as maize availability.

From these two very different cases two common lessons stand out. First, the importance of domestic policies into gearing agricultural changes: as long as dominant models of agriculture will retain the crux of funding and regulatory support, they will plod along, hindering the development of alternatives, even though there is an increasingly strong case for the sustainability credentials of these alternatives (Egal, 2012). Yet, even though this change in domestic agricultural policies is necessary, it may not be sufficient. These two cases have underlined that for all the changes that farmers are willing to make in the way they farm (on their own, or through policy incentives),

radical changes cannot happen solely at farms levels: levers and obstacles to sustainable food systems exist all along the food chain, from inputs producers and retailers down to consumers themselves. This stresses that "changing agriculture", and moving agriculture away from business as usual is not only a question of agricultural practices, but requires changes along the whole food chain. There is a need for further research encompassing the whole food system, especially as, even though an opposition between paradigms may be less important at a food system level, the necessity – and complexity – of transition management may be even greater.

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