

# Revealing strategic conversations around future visions of agriculture to improve the debate on transformation pathways towards sustainable farming systems

Sarah Lumbroso<sup>1,3</sup>, Sébastien Treyer<sup>2</sup>, Philippe Martin<sup>1</sup>, Xavier Poux<sup>3</sup>

<sup>1</sup>UMR SAD-APT, AgroParisTech, INRA

<sup>2</sup>Institute for Sustainable Development and International Relations (IDDRI)

<sup>3</sup>AScA

**Keywords:** future-oriented debate, strategic conversation, transition pathways, future studies, expectations, agro-food systems, water quality, Seine river watershed

## Abstract

To address sustainability of agro-food systems, different innovation models are proposed, which carry underlying pathways for change. Making explicit the divergences between these visions for the future could give more visibility to alternative visions, which otherwise could be dismissed by visions of the dominant regime. The generation and discussion of future visions for agro-food systems can open up or close down options for radical change. Therefore, we aim at analysing the cross-relations between the representations of pathways for change carried by actors and their strategies for change. We follow future-oriented debates, consisting both of a corpus of future representations, and of a community of actors associated to their discussion. We focus on one case study: the future-oriented debate on agriculture and water quality, in the Seine river watershed in France (between 2000 and 2016). We organise the materials from documentary sources and interviews through a narrative of the links between the future-oriented debate and strategies. Our results highlight three types of strategies: (i) opening the map of options for change; (ii) promoting radical change for agro-food systems; (iii) using the future-oriented debate to build an intervention strategy. We identify a gap in this debate: very few explicit transition pathways exist, while it may improve their credibility. We show that some alternative visions integrate performance criteria of the dominant narrative to strengthen their credibility. We conclude by suggesting that another strategy could be to embed future visions in a consistent alternative narrative, revealing the social dimension of water management by agriculture.

## 1. Introduction

European farming systems are currently urged by society to reduce their environmental impacts, while the mere economic viability of their activity is endangered. Change in farming systems seems necessary, to identify and adopt innovative models able to perform jointly on the three dimensions of sustainability. There are different proposals for such models, on very different scales: from one innovative practice (such as combined crops), to low-input production systems (such as organic farming), to territorial innovative organizations or to the complete redesign of whole food systems. Those proposals carry underlying pathways for change, which are more or less explicit. Innovation

research has identified two different general patterns of innovation: system optimization and system innovation which differ on the nature and extent of change (Barbier & Elzen, 2012). The first trajectory of change relies on an optimisation of existing systems, putting a strong emphasis on the role of technological progress to achieve it. The second one aims at redesigning the entire systems, tackling not only technical dimensions, but also organisational, economic, social ones. In the field of sustainable agriculture, these two patterns can be recognised in diverging visions of agricultural innovation, identified for instance by Levidow et al. (2013) as the Life sciences vision vs. the Agro-ecology vision, which are embedded in competing socio-technical paradigms. In broad terms, the Life sciences vision relies on more efficient inputs, while the Agro-ecology vision aims at reducing the dependence on external inputs. Those two pathways for change imply diverging strategies regarding research and development, knowledge and actors' networks mobilisation... and different societal consequences. Many dimensions that contrast these different strategies remain implicit, particularly more hidden dimensions of a narrative. For instance, some pathways for change actually reinforce the neoliberal productivist narrative highlighted by Levidow (2015) as the underlying basis for the dominant food regime, while others contest it. Levidow (2015) concludes that making these divergences explicit could clarify the different trajectories promoted for agro-food transitions.

Indeed, actors use the generation and diffusion of expectations for the future in order to pursue their own interests (Berkhout, 2006). Therefore, it is likely that alternative visions, aiming at transitions towards more sustainable systems, will be dismissed by visions produced by the dominant regime actors (Garnet, 2015). If the transition management literature has highlighted the role expectations and visions could play in order to align innovative actors around a shared objective (Smith, Stirling, & Berkhout, 2005), the strategic context in which those visions operate (what are the competing existing visions?) should be considered to design them in a more performative way. We therefore propose to follow the processes of generation and discussion of visions of the futures for agro-food systems, as they contribute to framing problems and solutions, potentially opening up or closing down options for radical change. Our research question is to analyse the cross-relations between the representations of future pathways for change carried by actors of the agro-food system and the strategies for change of these actors. We consider that debates on the future of agro-food systems can be analysed as a strategic conversation (Van der Heijden, 1996), from which collective action can emerge. To identify the links between these conversations on future and strategy building, in the light of sustainability objectives, we follow the future-oriented debates, which consist both of a corpus of representations of the futures of agro-food systems, and of a community of actors associated with their discussion (Treyer, 2009).

## **2. Methodology**

### **2.1. A case study approach: following the future-oriented debate on agriculture and water quality in the Seine river watershed**

Multiple visions on the future of agro-food systems exist, as well as arenas where they are discussed, on very different scales, from a local group of farmers, to a small rural territory or national, EU or global levels. The way sustainability issues are addressed also varies greatly according to the visions and actors. For the purpose of analysis, we have chosen to reduce the scope of investigation to one case study, consisting of one territory and one sustainability issue. We focus on agro-food systems of the Seine river watershed territory in the north of France, and on the issue of water quality related to agricultural practices. The Seine river watershed, covering 75 000 km<sup>2</sup>, is an interesting territory because its main agricultural systems (cereal, oil and industrial crops) have been following for decades a trajectory of high intensification and specialisation, creating a typical example of a lock-in situation, making it difficult to imagine alternative pathways. The choice of focusing on water quality lies in the existence of a regulating water authority for the watershed, the Seine Normandy water agency (AESN), which deals, on the financial and technical levels, with every issue regarding water and aquatic environments quality, including agricultural impacts. The water agency's programs are voted by a basin committee, a deliberating body gathering all the stakeholders of the river basin (State representatives, local municipalities, industries, farmers, consumers, NGOs...). This organisation (water agency - basin committee) offers an entry point as

a collective, building a strategy for addressing the impact of agriculture on water quality, and as an arena of debates. It is obviously only a convenient starting point, as many other actors and levels deal with the issue of agricultural impacts on water quality.

To analyse the generation and discussion of future representations of the Seine river watershed's agro-food systems and link them with strategies for change, we study the future-oriented debate on water quality issues linked with agricultural practices, in the Seine river watershed specifically but also in the wider framework of debates and strategies regarding agriculture and water at the French and EU level, as they have great influence on the Seine watershed level. We adopt a retrospective analysis, in order to follow changes of the future-oriented debate in a broad timeframe.

When studying the future-oriented debate on agriculture and water quality, we consider that production or discussion of visions for the future is a strategic intervention in this debate (Treyer, 2009). We do not focus only on explicit future representations, such as scenarios resulting from foresight studies. We also pay attention to more implicit visions of the future, as they contribute to framing agendas and solutions. Those implicit visions are embedded in different types of discourses or plans addressing the change of agro-food systems (e.g. a general trust in high technology for solving environmental problems). For instance, a public policy program contains a form of expectation for the future, as it defines objectives, institutional settings to meet these objectives, and means to achieve them, which are characteristic features of future visions according to Berkhout (2006). This generation of a future vision contributes to making explicit a strategy for change. We follow those processes of "making explicit" strategies for change, in different settings and at different levels: (i) public policy programs regarding agriculture and water quality, (ii) strategic studies and evaluations, as they express a framing of the problem to solve and - most of the time - propose different solutions through recommendations; (iii) explicit foresight exercises, as they explore different possible future changes.

## 2.2. Materials

We follow an iterative analysis between documentary sources (documents making explicit strategies for change as the three types outlined above) and interviews with stakeholders involved in the future-oriented debate on agriculture and water quality. This paper presents the results of the analysis of twelve interviews, with stakeholders from the water agency, research institutes, NGOs, administration, agricultural development institutes.

The paper focuses on the most salient period and actors that stand out from the analysis of these interviews. We chose to focus on the most recent period, for which the memory of interviewees is obviously better. We also focus on a specific set of actors, due to our entry point by the Seine river agency organisation. Widening of the time frame and actors analysed will be addressed in further stages of the research work. The first interviews led to focus on:

- a specific period of time: 2000 – 2016. We choose as a starting point the beginning of the years 2000, as the Water Framework directive explicitly sets targets and deadlines for water policies at the European level. At the Seine watershed level, at the same time, future representations change the debate on agriculture and water quality, showing that business-as-usual in agriculture is not compatible with water quality objectives.
- a limited number of actors, mainly: (i) the Seine water agency; (ii) a scientific program on the watershed (PIREN Seine); (iii) the French National Agronomic Research Institute (INRA); (iv) the national administration, addressed through the public policies' changes on the period.

We first present an intermediate result that has been produced to organise the material: a narrative of the co-evolution of (i) the future-oriented debate on water quality and agriculture in the Seine river watershed; (ii) strategies to address this issue in terms of objectives and means. This form of narrative is useful to present a first stage of the results, as it allows capturing the systemic dimension and the complexity of interactions of the processes studied (Ricoeur, 1983). Secondly, we present the results coming from the analysis of this narrative.

### **3. An intermediate result: a narrative to follow the links between the future-oriented debate and strategies regarding agriculture and water quality in the Seine river watershed**

When our story begins, in 2000, the problems caused by diffuse agricultural pollution on water quality exist in the French political agenda, thanks to alarms that have been rung since the 1980s, mostly by scientific works (Hénin, 1980). Policy instruments already exist to address this issue, such as the Nitrates Directive, enacted in 1991 and implemented from 1998. The Seine river agency, even though it recognises non-point source agricultural pollution as a major issue, lacks the skills and policy instruments to tackle it efficiently, as its intervention has until then been centred on urban water treatment with technical approaches based on equipment (Narcy, 2004).

#### **3.1. 2000-2007: building the evidence of the need to change agricultural practices to reach water quality objectives in the Seine river watershed**

In 2000, the water policy undergoes an important change, coming from the EU level, with the adoption of the Water Framework Directive (WFD). It makes explicit a strategy for change, with setting objectives for water quality (“good status” for all European waters) and clear deadlines to reach them (through three management cycles ending in 2015, 2021 and 2027). This results-based approach reveals the needed changes to meet the objectives. The WFD thus introduces “future-oriented” thinking in water management.

In the Seine river watershed, also at the beginning of the 2000s, evidence is gathered on the future deadlocks for water quality of the current agricultural systems. A research program, called the PIREN Seine (*Programme Interdisciplinaire de Recherche sur l'Environnement* on the Seine river), which has been working on water quality in the basin since the end of the 1980s, plays a key role in building this evidence. The issue of agriculture and water quality gradually enters the program’s work, as pollution from urban water decreases, making clear that the next big challenge for reaching water quality lies in diffuse agricultural pollution. Thanks to sophisticated models elaborated in the program, some researchers show that the continuation of current agricultural trends, even with the adoption of good agricultural practices, is not compatible with water quality objectives (Thieu et al., 2010). If this work provides sound evidence for the water agency to argue in favour of a deep change of agricultural practices, the means and policy tools to promote those changes are still lacking.

#### **3.2. 2007: a turning point: ambitious objectives and deadlines for agro-environmental policies are set at the national level, opening options of change for agriculture**

In 2007 the French government organises a conference on environmental issues (called “Grenelle de l’Environnement”), which includes a working group on agriculture. Several measures are taken after the conference, among which three ambitious policy objectives regarding agriculture: (i) reducing the use of pesticides by 50% by 2018 (with a “if possible” condition added after pressure from the agricultural sector); (ii) developing organic farming, to reach 6% of the agricultural area on the national scale in 2012, then 20% in 2020; (iii) protecting 500 water catchments threatened by diffuse agricultural production in 2012.

Even though we know today that those objectives have not been reached, they represent an important moment of making explicit visions for the future of agriculture. Regarding organic farming, it gives it legitimacy as a solution considered by national authorities, undermining its opponents’ attempts to dismiss it as a credible alternative. The pesticide reduction objective (labelled under the “Ecophyto” policy) also introduces a vision of a future agriculture using way less pesticides. Even though those two policies are not directly linked with territorialised water quality objectives, they can both contribute to reaching them. By contrast, the water catchment policy protection for drinking water is less explicit: it targets a number of areas under protection, but only sets objectives at the catchment level in a means-based approach (e.g. indicators such as the area rate under agro-environmental schemes).

### 3.3. 2008-2016: looking for strategic objectives and tools: defining levels of change and levers of action to reach the policy objectives

We can follow some contributions to the future-oriented debate or strategic moves that have been taken by some actors after the setting of the Grenelle objectives. Regarding the pesticides reduction policy (Ecophyto), the French Agriculture and Environment Ministries had asked INRA, simultaneously with the Grenelle, to launch a study on the feasibility of pesticides reduction (called Ecophyto R&D (Butault et al., 2010)). This was useful to address counter arguments on the impossibility of this vision for change. The study results contributed to specifying the pathways of change compatible with different levels of reduction objectives. Simulation scenarios were realised, showing two thresholds of change: (i) an option leading to a decrease of 30% in pesticides use, through significant changes in terms of agricultural practices but with moderate changes in terms of production systems, and maintaining equivalent economic results; (ii) an option leading to a 50% decrease that would entail a deep redesign of production systems and associated food chains.

At the Seine river watershed level (as well as at the national scale), a lot of efforts were focused on the water catchment policy, as the pressure from the State to reach the administrative objectives, labelled in number of catchments to engage, was strong. But concerning the implementation on the ground, the level of changes required and the assessment of their efficiency on water quality were vague, a lot of action plans established at the catchment scale were mainly paper plans, lacking ambition, with no long-term guarantee of success. To address this unsatisfying situation, the Seine river agency searched for means of action to secure significant and long-term changes of production systems. It launched in 2009 an evaluation of its policy for long-term land use control on water catchments areas (Epices, ASca, 2011). This study proposed two scenarios for the implementation of the Seine river agency's strategy. The first strategy consists of working with the dominant agricultural actors, while the second option consists of finding new alliances at a territorial level, for instance with municipalities (responsible for drinking water protection). The Seine river agency also launched reflexions on other levers of action. Notably, they launched an experimental program of measures to bring financial support to economic projects based on low-input production systems.

In parallel, on the Seine river watershed, the PIREN Seine researchers were pursuing their work on agriculture, by producing an image of radical change for the agriculture of the watershed, consistent with water quality objectives. In this image, the entire agricultural systems of the basin are organic, with a significant role of livestock for fertility reasons (while livestock systems are currently marginal), and a shift to a diet with reduced meat consumption (Billen et al., 2012). The building of this image has been backed by an important research program on the performance of organic farming regarding water quality. This work draws a radical image for change, which has led to numerous debates in the water authority bodies or in agricultural organisations. Even if it does not give a systemic image of what the agriculture of the basin would be under these assumptions, it represents a step further in the future-oriented debate.

In 2011, a special Seine basin committee on agriculture was organised, highlighting a moment of policy debate on agriculture issues on the watershed scale. Different dynamics of the future-oriented debate converged, as were presented, among other interventions: (i) the radical image produced by the PIREN Seine program; (ii) the evaluation of the long-term land use control on water catchment areas; (iii) the results of the Ecophyto R&D study. Despite this convergence of arguments in favour of a radical change, the effects of this basin committee are difficult to identify while this committee encompasses different groups of interests, reflecting society at large. According to interviewees, this meeting can be considered as a further step in an accumulative process on the definition of objectives and means regarding agriculture and water quality in the watershed.

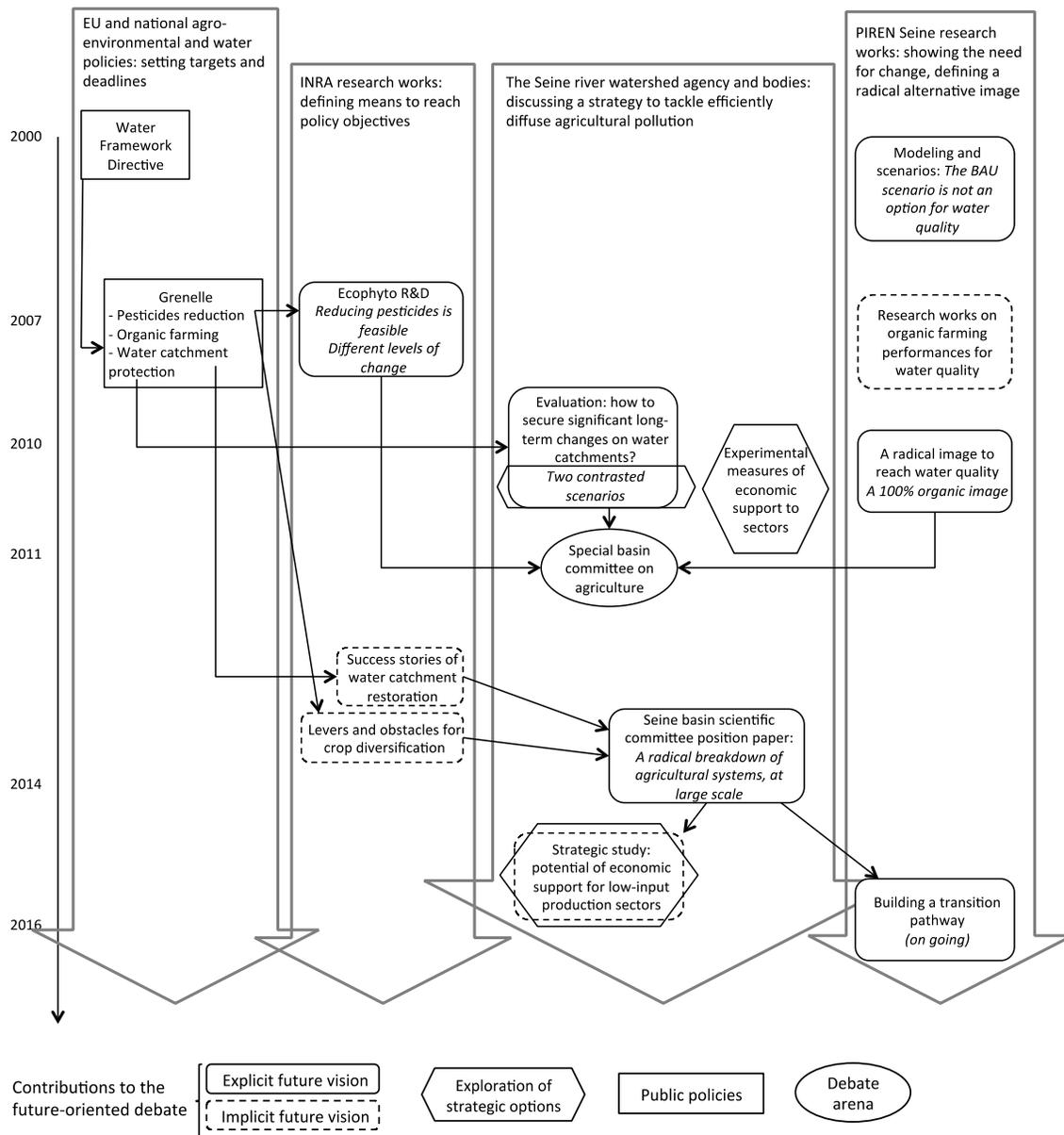
More recently, we can identify another moment of convergence of different studies, more directly aimed at providing an opinion on the direction the future of agriculture should take. In April 2014, the scientific committee of the Seine basin committee published a position paper on the issue of agricultural transitions for restoring water quality (Conseil scientifique du Comité de bassin Seine

Normandie, 2014). It relies on several studies, such as the PIREN Seine work and the evaluation on water catchment outlined above, but also on more recent works by INRA, on success stories of water catchment restoration (Benoit, Merle, 2013), or on levers for crop diversification (Meynard et al., 2013). This position paper calls for a breaking scenario at the scale of the entire basin. It presents the involvement of food sectors as a strategic lever to reach large-scale results. Following this position paper, the Seine river agency launched a strategic study to see how it could encourage low-input production systems through support to the structuration of economic sectors, which represents a further step in the dynamics of the future-oriented debate and its strategic outcomes. In parallel, the PIREN Seine keeps working on a new foresight project, aiming at introducing food chains and territorial issues in the scenario building, and at designing a transition pathway towards a socio-economic image compatible with water quality, as it was a blind spot of the previous scenarios.

#### **4. Results: highlighting the strategies emerging from the dynamics of a strategic conversation on agriculture and water quality in the Seine river watershed**

The narrative outlined above, organising the most salient elements from the interviews analysed, shows the future-oriented debate cannot be restricted to water quality issues but should also consider interventions on agro-environmental issues. The forms of interventions in this future-oriented debate identified are mostly: scenarios and modelling exercises on the Seine watershed, scientific works on input reduction or water catchment protection (some of them using simulation scenarios), strategic studies or evaluations.

Through the analysis of the narrative we identify different dynamics around agro-environmental issues (including water quality issues) that contribute to a strategic conversation on the means to change agro-food systems to decrease their negative environmental impacts. We organise them around four dynamics: (i) the setting of public policy objectives regarding agriculture and environment; (ii) the research works of INRA addressing the feasibility and consequences of those objectives, (iii) the PIREN Seine works trying to define images for the agro-food systems of the Seine watershed compatible with water quality; (iv) the building of an intervention strategy on agriculture by the Seine river agency. Figure 1 represents those dynamics and where contributions to the future-oriented debate on agro-food systems take place. We can identify three types of intervention strategies in the future-oriented debates through the analysis of these dynamics and their links.



**Figure 1:** Links between the dynamics of agro-environmental public policies, the future-oriented debate on agriculture and environment, and the intervention strategy on agriculture and water quality in the Seine river watershed (BAU: Business As Usual)

#### 4.1. Different types of intervention strategies in the future-oriented debate on agriculture and environment

##### 4.1.1. Opening the map of possibilities: showing the feasibility of alternatives to the intensification trends, defining levers of action

The works from INRA represent this strategy, which are closely linked with public policies. Indeed, the works presented in Figure 1 were commissioned by state authorities to contribute to policy design and implementation. Based on sound academic evidence those works contribute to strengthen a line of argumentation defending alternative options to the business-as-usual scenario (pursuit of intensification and specialisation trends), therefore widening the scope of options for the

future. Indeed, Ecophyto R&D (Butault et al., 2010) shows that a significant pesticides reduction (-30%) is possible without dramatic production and economic losses, which is a powerful counter-argument to claims of the impossibility of changing practices. The research on crop diversification represents another step, by studying in depth the conditions for developing an important technical level for pesticides reduction. It shows the importance of working on technical levels (producing references for diversification crops for instance) but also on other levels, notably the structuration of food chains. The work on success stories of water catchment restoration also identifies conditions for success on various dimensions.

Those research works do not frontally oppose the dominant agricultural systems, but the way they explicit the needed changes if environmental objectives are to be reached questions this latter (redesign of production systems for a 50% pesticides reduction, reorganisation of the food chains for crop diversification, local conditions on water catchments).

#### ***4.1.2. Promoting radical change for the agro-food systems of the Seine river watershed***

In the Seine river watershed, we can identify intervention strategies in the future-oriented debate more directly aimed at contesting the current dominant trends of agro-food systems, as illustrated by the PIREN works dynamics. Trying to figure out an adequacy between agro-food systems and water quality, they first demonstrated that a business-as-usual scenario on practices was not consistent with quality objectives. They therefore launched several works to define a “water-friendly” image, which resulted in the 100% organic image of the basin (Billen et al., 2012). If their work was first aimed at showing the environmental efficiency of such an image (through modeling), they also progressively enriched the dimensions covered by the image, notably by adding insights about the food supply. This widening of the scope aims at improving the desirability and credibility of the image. Next steps of the PIREN work consists of a new foresight exercise relying on qualitative scenario building, which will add more socio-economic elements on the food chain, and will design a transition pathway towards a future image, to strengthen arguments on its feasibility.

The intervention of the scientific committee of the Seine basin committee also aims at reinforcing arguments in favor of a radical change. For this, it does not build a new image, but relies on the one built by the PIREN, and on different works on changes of agro-food systems. This type of intervention strategy, synthesizing different future representations rather than producing new ones, had been identified by Treyer (2009) and Labbouz (2014).

#### ***4.1.3. Using the future-oriented debate to build an intervention policy***

We here focus on the way the Seine river agency takes part in the strategic conversation. The narrative shows how the agency has integrated different results from interventions in the future-oriented debate (the PIREN Seine argument on the deadlocks of the BAU scenario, its radical image, the Ecophyto R&D results...) to strengthen a line of argumentation in favor of significant changes of agro-food systems. It has also produced its own contributions to the debate, in order to identify strategic levers for its intervention policy on agricultural issues. Those explorations of strategic options contribute to the future-oriented debate as they explore potential changes for agro-food systems (through the development of low-input sectors) or for water catchment protection measures (through land use control measures). Those interventions can be interpreted as means to widen the scope of the debate on agricultural impacts on water, which tends to be focused on very technical issues, framing the search of solutions mostly on an optimisation of practices. Introducing measures on the structuration of economic sectors or on landscape management helps avoiding this framing. It also contributes to working with other actors than the usual ones; municipalities, water companies, marginal agricultural sectors are allies to mobilise for actions towards water quality.

#### ***4.1.4. A gap in the future-oriented debate? Very few explicit possible transition pathways***

The visions for the future of agro-food systems we have identified take different forms. Some are explicit future images (the BAU and 100% organic scenarios of the PIREN Seine) or at least explicit directions for the future (the call for systemic radical change of the scientific committee of the Seine basin). Others are more implicit, but still carry a vision for the change of agro-food systems,

identifying different levels of change and conditions to achieve them (the study on crop diversification is typical in this respect). However, we do not identify explicit consistent transition pathways, combining different levers of action to reach a specific image. Obviously, building this kind of transition pathways is not an easy task, but opponents of radical changes strategically use this absence to contest their feasibility. This has led the PIREN Seine to include the building of such a pathway in the next step of its work. However, it would be naive to consider it would be enough to address criticisms, as the strategic conversation on agriculture and environment takes place in a wider and contradictory debate.

#### **4.2. Replacing the strategic conversation in the wider debate on the future of agriculture: how to deal with the dominant paradigm?**

Indeed, the narrative presented in section 3 does not mention a crucial dimension of the future-oriented debate: the future visions of actors from the agricultural sector. This is due to our entry of analysis by the water quality issue and the actors involved in its management. However, the performative effect of the visions produced in the future-oriented debate on agriculture and environment can only be understood by linking them to other debates, encompassing a whole range of issues on the future of agro-food systems and actors addressing them, from the agricultural sector but also others (e.g. the health sector).

The scope of this paper was not to provide a large overview of the future-oriented debates on agriculture. However, some links between the debate on water quality and other debates stand out of the interviews and deserve a specific analysis as they are also markers of strategic choices. First of all, the issue of food security is omnipresent in any discussion on the future of agriculture. For instance, Ecophyto R&D assesses the impact of pesticide reduction in view of its consequences on production volumes. The PIREN Seine works integrate this issue when it shows that the 100% organic image allows the food supply of the basin (if coupled with a decrease in the share of animal products in the human diet). But it lacks the consequences of the scenario on EU and global markets, which is the level of playing of the Seine basin agriculture. Besides, when asked to identify significant foresight exercises (as markers of future-oriented debates), the interviewees fail to identify some on the water quality issue, but quote exercises of the food security debate. Indeed, the overarching objective of feeding the world in 2050, omnipresent in this debate, is used to hinder any target of input reduction in the name of production. Some actors declare referring to exercises proposing counter-arguments (such as the Agrimonde exercise (Paillard et al., (2010))). The arguments around production are often coupled with concerns on economic aspects. Ecophyto R&D also assesses pesticides reduction in view of farms' economic results; the capacity of the 100% organic image of the basin to maintain a significant amount of cereal exportation is put forward. The reflexions of the Seine river agency on financial support to economic sectors supporting low-input production systems follow the same line. The issue of competitiveness is therefore integrated as a concern in the generation of visions on agro-environmental issues.

This importance of production and competitiveness is not surprising, as they are defining features of the dominant neoliberal productivist narrative (Levidow, 2015). The power of actors supporting this discourse leads any designer of a future vision to position it with respect to this narrative, either reinforcing or contesting it. We can highlight different ways of handling this positioning in the future visions analysed in this paper. Most of those visions contribute to proposing an innovation pathway rather than an optimisation one, this latter being at the core of the productivist paradigm. The different visions presented above show the need to redesign systems, and widens the scope of change compared to a technically focused lens. By showing that solutions can lie in reorganisation of the food chains or territorial projects, they undermine the predominance of technological innovations as the only solutions for the future. They do assume the potential decrease of production caused by changes in practices, but some of them argue that this decrease is consistent with the maintenance of good economic results or cereal exports for national competitiveness. Thereby, they adopt some performance criteria of the dominant paradigm, giving them more credibility in the policy debate where those criteria dominate. The positioning towards the dominant productivist narrative mixes contestation and integration of some of its features.

## 5. Discussion and conclusion

The analysis of generation and discussion of future visions produced around agriculture and water quality reveals some strategies of actors involved in the debate around this issue. Some strategic consequences in terms of policy intervention measures have been identified for the Seine river agency. The choice of this paper has been to study rather precisely the content of the future visions produced to see what options for change they carried, however it has led to focus on a limited number of actors. Further work should be pursued to widen the scope of analysis towards other actors, notably the agricultural sector. Applying the same approach to the study of strategic conversations around the neoliberal productivist narrative or alternative narratives would allow to have a more complete view of how the generation of expectations plays a role in the dynamics of sociotechnical regimes. Our identification of different dynamics in the intervention strategies is close from the notion of “multiple streams” used by Elzen et al. (2011) to study the effects of normative contestations in transitions in progress.

Our analysis is focused on debates and strategies taking place at a collective level, and does not analyse how an individual farmer designs its strategy regarding external conditions. It rather addresses the level where frames that shape individual actions emerge and evolve. We can refer to the concept of single, double and triple-loop learning, used for instance by Pahl-Wostl (2009) to argue in favour of this level of analysis: a radical change of actions require a change in the frames (i.e. goals, problem framing and assumptions on how goals can be achieved) and the structural context that influence those actions. Future visions can contribute to changing the frames of reference (for instance visions that give a new credibility to organic farming as a credible option for the future). It is likely to influence how a farmer designs its strategy, even though further work is needed to study this process. We have also shown how performance is a crucial feature of the future-oriented debate, as alternative visions position themselves regarding performance criteria of the dominant regime, but can also propose new performance criteria (such as health, good living conditions for farmers, lively rural territories...). We believe that analysing performance at this level where it is built can help analysing how an individual farmer considers the performance of its own systems.

Finally, we have shown how proposals for change in agricultural systems to reach water quality objectives deal with the dominant neoliberal productivist narrative. This process is obviously not one-sided, as the rise of environmental concerns in public opinion leads the dominant food regime to adapt, moving towards a “corporate environmental food regime” (Levidow, 2015). Debates on expectations for the future do contribute to redefining strategies and performance criteria. A strategic move for water actors in the Seine river watershed could be to base their images for change in consistent narratives proposing alternatives to the dominant one on a more general level, revealing the social dimension of water management by agriculture.

## References

- Barbier, M., & Elzen, B. (2012). *System Innovations, Knowledge Regimes and Design Practices towards Transitions for Sustainable Agriculture*. INRA.
- Benoit M., Merle (2013). *Actions réussies de protection agronomique des captages d'eau potable en France depuis 1990*. Action ONEMA - INRA.
- Berkhout, F. (2006). *Normative expectations in systems innovation*. *Technology Analysis & Strategic Management*, 18(3-4), 299–311.
- Billen, G., Garnier, J., Thieu, V., Silvestre, M., Barles, S., & Chatzimpiros, P. (2012). *Localising the nitrogen imprint of the Paris food supply: the potential of organic farming and changes in human diet*. *Biogeosciences*, 9(1), 607–616.
- Butault J.P., Dedryver C.A., Gary C., Guichard L., Jacquet F., Meynard J.M., Nicot P., Pitrat M., Reau R., Sauphanor B., Savini I, Volay T. (2010). *Ecophyto R&D. Quelles voies pour réduire*

*l'usage des pesticides ? Synthèse du rapport d'étude, INRA Editeur, France.*

Conseil scientifique du Comité de bassin Seine Normandie (2014). *Transitions agricoles pour restaurer la qualité de l'eau : Obstacles, freins et leviers d'action.*

Elzen, B., Geels, F. W., Leeuwis, C., & van Mierlo, B. (2011). *Normative contestation in transitions "in the making": Animal welfare concerns and system innovation in pig husbandry.* *Research Policy*, 40(2), 263–275.

Epices, ASca (2011). *Evaluation de la politique de l'agence Seine Normandie en faveur de la maîtrise de la gestion des sols a long terme sur les bassins d'alimentation de captage en eau potable.* Rapport final pour l'Agence de l'eau Seine Normandie.

Garnett, T. (2015). *Gut feeling and possible tomorrows.* Oxford: Food and Climate Research Network, 2015, 27.

Hénin, S. (1980). *Rapport du groupe de travail Activités Agricoles et Qualité des Eaux.* Ministère de l'Agriculture et Ministère de l'Environnement, Paris.

Labbouz, B. (2014). *Sécurité alimentaire et futurs de l'agriculture mondiale. Comprendre un forum prospectif international en émergence et réfléchir aux façons d'y intervenir.* Thèse de doctorat, AgroParisTech.

Levidow, L. (2015). European transitions towards a corporate-environmental food regime: Agroecological incorporation or contestation? *Journal of Rural Studies*, 40, 76–89.

Levidow, L., Birch, K., & Papaioannou, T. (2013). *Divergent Paradigms of European Agro-Food Innovation The Knowledge-Based Bio-Economy (KBBE) as an R&D Agenda.* *Science, Technology & Human Values*, 38(1), 94–125.

Meynard, J.-M., Messéan, A., Charlier, A., Charrier, F., Fares, M., Le Bail, M., & Magrini, M.-B. (2013). *Freins et leviers à la diversification des cultures. Étude au niveau des exploitations agricoles et des filières.* Synthèse du rapport d'étude, INRA.

Narcy, J.-B. (2004). *Pour une gestion spatiale de l'eau: comment sortir du tuyau?* Peter Lang.

Paillard, S., Treyer, S. & Dorin, B. (2010). *Agrimonde - Scénarios et défis pour nourrir le monde en 2050.* Versailles, Quae.

Ricoeur, P. (1983). *Temps et Récit.* Paris, Le Seuil.

Smith, A., Stirling, A., & Berkhout, F. (2005). *The governance of sustainable socio-technical transitions.* *Research Policy*, 34(10), 1491–1510.

Treyer, S. (2009). *Changing perspectives on foresight and strategy: from foresight project management to the management of change in collective strategic elaboration processes.* *Technology Analysis & Strategic Management*, 21(3), 353–362.

Van der Heijden, K. (1996). *Scenarios: the art of strategic conversation.* Chichester: Editions John Wiley and Sons.