Providing organic farming products and their ecosystem services at different spatial scales: insights from economics

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Abstract
In spite of growing social demand for organic products and their capacity to enhance ecosystem services, organic farming remains largely short of the targets. Agronomists and economists try to understand this gap, crossing yields' issues with the efficiency of public subsidies. Economic tools still face spatial scales issues due to the economic nature of organic products. Actually, assessments of organic farming impacts differ with the scales considered. From plots, fields, landscapes, regional scales and broader ones, yields of organic production vary, representing a challenge for the design of public policies. We propose an analysis of the status of organic farming in standard economics highlighting the contribution of the spatial scale issue to understand related market failures and the current challenges faced by this market. One of these current evolutions is the growing number of imports from other countries, notably developing ones which are less studied. This article underlines key issues about public policies design to challenge the under-production, raising the question of the optimum between local and global one.

Keywords
Spatial scale issues; organic farming; market failures; local and global optimum

JEL codes
Q15, Q18, Q57

Introduction

Agriculture provides a wide range of ecosystem services that evolve with the type of production, the location, and farmers' practices. These ecosystem services have benefits at different spatial scale: local public goods, with generally impure economic characteristics (non-rivalry on private farms), the protection of certain species (small, relatively non-mobile ones), soil quality, and cultural landscape conservation; at an intermediate scale, the protection of water quality, the genetic diversity of plant or animal species, biodiversity (mobile species), the maintenance of open landscapes, and city waste management; and at a global scale, the air quality issue, the limitation of parasites' diffusion, and sustainable energy production. Overlapping scales between ecosystem service provision, synergies and competition between this provision and the production of agricultural goods raise economics issues that are currently being tackled by the literature (Cash et al., 2000; Ewert et al., 2006; Ewert et al., 2009).

Faced with these issues, the European Union promoted a different production model among many other options: organic farming. Organic farming is presented in a number of agronomic and economic studies as a major supplier of agro-ecosystem services (Stolze et al., 2000; Acs et al., 2005; Bengtsson et al., 2005; Dale et al., 2007), and a good way to improve the sustainability of food production. Thus, the European Union sets the target of 20% of agricultural land under organic management by 2020, with an intermediate level of 6% by 2012 (Fisher et al., 2009). However, in 2012, in spite of a growing consumer demand for organic products and a European policy in favor of organic farming development, this intermediate target has not been reached (only 4.5% at the end of 2011) (Zhang et al., 2007).

In this article, we attempt to understand the mechanisms that can explain the gap between the initial target and the current situation, and the consequences for the agro-ecosystem services provided by the European agriculture. More specifically, the objective of this paper is to underline the contribution of the concept of spatial scale issues to the economic analysis of organic farming. Here, spatial scales issues refer to the gap between the scale at which most agro-ecological information is available and the scale at which policy decisions on agriculture are made (Gibson et al., 2000; Dalgaard et al., 2003; Ewert et al., 2006). First, we propose a definition of the status of organic farming in standard economics. To do so, we explain the risk of market failures in the light of the issue of overlapping scales. We then present the implications of these market failures for producers, focusing on a scale that is given less attention, that of the farm. In a third section, we describe methods of evaluating consumers' willingness to pay. We stress the influence of scale issues on results. Finally, we present the current development of the organic market and hence the provision of its related ecosystem services in front of the issue of a local versus a global optimum.

1. The status of organic farming in standard economics

1.1 Understanding organic market failures and their consequences: combining ecosystem services and spatial scale issues

The capacity of organic farming to enhance ecosystem services has been put forward by different policies as a tool of the European agro-environmental policy, especially since the implementation of the regulation No EEC 2078/92. This has resulted in a growing public policy interest in organic products, particularly due to their ability to protect the environment[3] (Gil et al., 2000). In spite of this, the production of organic goods remains insufficient. The gap between demand and supply could lead to increased imports. Nevertheless, as organic products are more than simple goods as they could also create positive externalities, imports provide ecosystem services in other parts of the world. This point will be developed later.

Economic science could contribute to design a cost-efficient organic production policy. This means ensuring sufficient production to satisfy demand at minimum cost in order to reach the optimal level of social welfare. Yet a cost-efficient allocation of resources implies a definition of criteria and indicators in monetary terms with prices clearly identified. But if this is not the case, prices will not send the right signal of scarcity, leading to market failures. Organic products are especially consumed for their environmental benefits and health qualities (see Appendix 1). However, some difficulties exist in terms of correctly assessing the environmental and health impacts of farming in general, and of organic farming in particular on the production and consumption sides (Acs et al., 2005). Nevertheless, the assessment of the impact of human activities is considered as the first condition for an efficient management of the environment (Hein et al., 2006). For instance, as the landscape[4] aggregates cultural identity, livelihoods, nature and economies, defining an assessment of the environmental impact of organic farming at this level remains to be resolved.

In spite of the ecosystem approach, which produces a holistic view of the impacts of a given type of agricultural management (Lillywhite et al., 2009), the difficulty of measuring ecosystem services (Bockstaller et al., 2003) creates potential "scale clashes". This refers to the gap between the level of agro-environmental data collection and the level of agricultural management decisions.

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3 Results about environmental concerns may vary in significance as quality is the most important reason for purchasing, before health concerns, which come in second position, and environmental concerns, which lag far behind (Griffith, et al., 2007).

4 According to the European Landscape Convention, landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.

Indeed, biodiversity and species populations evolve following non-linear processes within plots and from plots to landscapes, etc. (Belfrage et al., 2005; Bengtsson et al., 2005; Kroeger et al., 2007). The non-linear processes and stochastic characteristics of environmental issues set the challenge of capturing ecosystem service interactions (Gabriel et al., 2010). For example, diffusion of pollutants could occur primarily at the city level, or at the district level (Zuindeau, 2005). Although agro-economic models may vary in terms of data resolution (Koning et al., 2005; Giller et al., 2009), they still show limitations in the aggregation and disaggregation of data. Leclère et al. (2013) insist on the necessity to develop high spatial resolution to really capture heterogeneity characterizing agriculture, for instance crop yields. It represents a challenge in works trying to have continental assessment of linkages between agronomic choices and global changes. In spite of an extensive literature (Costanza et al., 1997), the levels at which data are collected are different to the level at which most decisions are made. This could therefore produce a misleading interpretation of data generated at different levels, from plots to landscapes. These different examples of "scale clashes" between global or for instance European management levels and biophysical ones (Cash and Moser, 2000; Dalgaard et al., 2011) introduce a first problem of information asymmetries for producers, consumers and public policies, leading to sub-optimal equilibrium in the Pareto optimality approach.

This issue also refers to the *Modifiable Areal Unit Problem* (MAUP). According to (Dolan et al., 2000), "the modifiable areal unit problem pertains to the fact that statistical measures for cross-sectional data are sensitive to the way in which spatial units are organized. Specifically, the level of aggregation and the spatial arrangement in zones (i.e., combinations of contiguous units) affects the magnitude of various measures of association, such as spatial autocorrelation coefficients and parameters in a regression model". As a consequence, it appears necessary to conduct studies on organic farming with different aggregation schemes. Indeed, statistical and econometric analyses are not immune from the aggregation of spatial units, differing by their size and shape. One may thus wonder whether results found in empirical studies do reflect economic phenomena or whether they are sensitive to changes in the level of aggregation (Bignebat et al., 2009).

1.2 The plural dimension of the economic nature of ecosystem services

As ecosystem services are public goods, they offer benefits across a wide range of spatial scales, whether local, global, individual or collective. These different scales have consequences on prices formation, providing another reason for market failures. In fact, ecosystem services produced by organic products could be defined as public goods, being non-rival and non-exclusive (Gereffi, 1999).

Challenges then remain regarding the valuation of the production costs and benefits of ecosystem services. For instance, markets cannot give a value to carbon sequestration, making prices a weak signal of social opportunity costs. This explains why prices do not send the right signal of scarcity, leading again to a risk of sub-optimal provision. Yet their remuneration is encompassed in the premium price of an organic product.

As such, the price issue still faces the plural nature of the ecosystem services provided by organic farming. The private nature of organic products can also be seen in purchasing choices, giving some components of ecosystem services a private nature and raising in this way the subject of property rights.[5] In fact, individuals primarily purchase a private good that, first, provides them with health benefits without spillover effects for other consumers (Centre for Rural Economics Research, 2002), and which has secondly a direct use. This refers for example to the possibility of recreation. Organic agriculture enhances landscapes, since farmers may plant trees, with shelterbelts giving their surrounding area aesthetic value. In the case of direct sales on farms, farmers may also propose recreational possibilities for buyers (Sandhu et al., 2008). But these amenities are also composed of passive values. Although direct use could find a good response through markets, there is no market available for passive use as their existence and bequest's characteristics need other responses than markets.[6]

Aside from that, organic products can also be considered as quasi-public goods. These quasi-public goods may have spatial limitations as benefits are provided in a non-rival way to individuals who are relatively close to the production place of the good. For instance, due to spatial spillovers, a neighboring conventional farmer may benefit from organic production as the enhancement of soil quality may cross organic plots (Sutherland et al., 2012). Nonetheless, in organic farming, local public goods cohabit with services with high potential for transferability. Costanza et al. (1997) compare, about conservation agriculture, the costs of adoption and maintenance at farm scale and all the benefits captured by society.

Ecosystem services are then described as functions and processes[7], and so cannot be defined in geographical terms. Scale overlapping is at the core of the nature of ecosystems. At a local scale, the production of biodiversity protection by an organic farmer could present this impure public good dimension and be considered as a local public good. But it also encompasses a global public good dimension, making its

[5] Two options could be chosen: if producers are remunerated for good practices, they could be considered as the landowner. On the contrary, in case of the production of external effects the land could be considered as belonging to society.

[6] Because of the exclusion issue, there is no market for them.

[7] In spite of the distinction between ecosystem end-products and the processes including ecosystems that contribute to producing these products (Boyd, et al., 2007).

economic tools difficult to manage for its conservation (Perrings et al., 2003). Moreover, the value of biodiversity that could be captured in a private way remains a poor proxy for the value of biodiversity conservation. Consequently, prices only reflect the value of the extraction activities for a resource, or its exploitation, and not the resource itself.

However, public policies are necessary because of multiple scales of ecosystem services, in order to avoid the sub-optimal provision of organic products.[8] This makes a specific regime of exclusion impossible to define. As a result, the provision of organic farming faces the risk of sub or under-evaluation and the difficulty of restoring functional agro-ecosystem diversity. But as organic products are the result of conversion by private farmers, incentives could be established to organize these conversions.

2. Implications of market failures for producers

2.1 Understanding the factors of conversion: limits to the rationality concept

Financial, technical or institutional incentives[9] exist to support conversion and maintenance in organic management. Farmers try to maximize their production, including these supports but also others factors.

First, organic production has to address the notion of risk as it is subject to a price risk. Due to the guidelines for organic products, they also face higher production costs due to food availability and the crucial seasonability parameter (Gil et al., 2000). In addition, the economic and environmental performances[10] of organic farming remain at stake (Park et al., 1996; Söderbaum, 1996) despite the numerous studies dedicated to the econometric analysis of ecosystem service values (Costanza et al., 1992; Boyd and Banzhaf, 2007). Yields could be smaller than in conventional systems, integrating uncertainty in the conversion. If organic farming appears as a way of diversifying production (Lauwers et al., 2010), it should integrate the costs of transition and the period during which farmers do not receive premium prices. Moreover, if this production mode shows a lower need in fertilizer generating savings, mechanical needs should not be minimized. Farmers have to be sure that the compensation will be not be lower than the profits for intensive margins[11] (Just et al., 1990). Even though they

8 They carry out a trade-off between the provision of public goods and farm incomes.
[9] Some of these schemes are detailed in the third part.
[10] The stochastic production frontier model is generally the econometric method used.
[11] It should be noticed that due to their more or less strong environmental concerns, organic farmers could present a more or less strong risk aversion (Acs, et al., 2009, (Vincq, 2010).

classically fluctuate with demand and supply[12], the definition and control of standards imply high transaction costs. This is stressed by some organic farmers' critics about insufficient subsidies to convert and maintain their production, notably for smaller productions (Lancaster, 1966). Then transaction costs that have to be taken into account (Blanc et al., 2012) need a maximum reduction of uncertainty and the most accurate definition of service values possible. In the absence of clear markets, linked, as shown previously, to the complexity of scales overlapping (Arshad et al., 2002), these transaction costs cannot be efficiently established.

Second, beyond the maximization of utility and the minimization of costs, conversions are linked to civic engagement.[13] This idea refers to the neoclassical vision of utility and disutility. Some ecological economists reject neoclassical views about human-centered phenomena constraints by a methodological individualist position (Gibson et al., 2000).[14] In fact, people could invest environmental consciousness in their production and purchasing choices (as we will see later). The economy of conventions, notably inspired by Keynes (Dufour et al., 2011), is therefore adapted to environmental concerns (Méral, 2007). Cazals (2012) studies the diversity of economic coordination in French agriculture in the light of the economics of conventions. This diversity of conversion motivations leads to a complexity of the nature of markets (Desclaux et al., 2009) to which farmers belong, from an artisan-like production to a more industrialized one (Buck et al., 1997). To understand this diversity, collective action and particularly researches by Elinor Ostrom, (Ostrom, 2012) highlight the importance of small scales. For instance, geographical or organizational proximity between people (facilitating their capacity to share knowledge, etc.) are considered as being able to impact actions taken at an individual level with a neighborhood effect (Hamilton et al., 2003). Again, spatial scales issues are at the core of economics or institutional and sociological approaches.

2.2 The production scale in front of global changes

Let us now focus on the idea of the production of externalities, highlighting a scale that is given less attention in the literature (Leclère et al., 2013), the farm level. Agronomic diagnostic and environmental assessments try to understand linkages between this scale and global changes at others ones. For instance, farms adaptations' have demonstrated a capacity to alleviate negative impacts from climate change, or on

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[12] Results vary across cases and cannot be generalized, so arguments of higher prices are not the same for all crops. All these elements introduce uncertainty into the decision to convert or not.

[13] Sylvander propose a typology of organic farming development models underlying this plurality of motivations (Sylvander, et al., 2005) and therefore a diversity of organic farming systems. Conception of a new system in this typology corresponds to the co-construction of markets, possibly linked to collective actions based on territories or chains. Farmers are not in the strict respect of guidelines but develop a reflection on varieties' choice, trying to diversify existing organic markets.

[14] They criticize a narrow view considering environmental stakes as an exogenous issue.

the contrary to increase it (Leclère et al., 2013). The fact that farms scale is at the core of the different spatial scales helps to understand the determinants of organic farmers' agronomic choices and so to enrich our economic analysis.

First, farmers are engaged in more or less extensive or intensive production based on a calculation of margins and on their appreciation of price, production, financial and technical risks. That raises the crucial role of national but also regional policies in providing financial support, organizing market opportunities, which naturally differ from one region to another. About the design of regional support, Gabriel et al. (2009) show that this support also depends on geographical and environmental characteristics as less-favored areas in agriculture need less level of incentives than others one, and do not imply the same stakes.

The example of Auvergne, a region in central France, highlights another point. It shows that geographical constraints make an organic market difficult to develop. Indeed, certain types of production, such as livestock, have to reorganize their production systems, trying to integrate cereals crops. However, livestock rearing in the low mountains does not allow a high level of autonomy in farms, forcing producers to import cereals and protein crops. This increases the production costs for buyers and producers and may encourage them to establish an intensive production system. Regional variables appear as significant constraints in the choice of farmers' production and practices (Eichner et al., 2009).[15] The regional scale could also impact on farm production through pedo-climatic characteristics (Aznar et al., 2003).

The production scale embedded in economic networks invites to replace farm scale in a larger system integrating economics actors (Amemiya et al., 2008) with important agronomic impacts. Actually, in this broader scale, linkages are better established between farmers who could contract with retailers to sell their products on supply chains of varying lengths. Retailers try to maximize their margins, raising combinations of long and short supply chains, imports and local markets. In this local equilibrium, organic practices could be modified by private actors. This is linked to the fact that in organic farming, a gradient exists between different levels of intensive or extensive production, in strict conformity with guidelines and based on a simple input-substitution (Gupta et al., 1998) or proposing a conception of a new system (Sylvander et al., 2006). The choice of varieties, but also of the types of fertilizers, crop rotations and other significant practices influenced by commercialization (Navarrete, 2009) have impacts on some ecosystem services. For instance, Desclaux et al. (2009) demonstrate the impact of markets on choices of varieties at the farm scale though contracts design. As well, De Wit et al. (2007) demonstrate that the growing part of conventional agro-

[15] This article develops other significant variables, but less linked to spatial issues.

food commodities chains impact on current practices in organic farming in a negative way. The production scale is impacted by economic actors through private guidelines and different types of contracts (Daniel et al., 2010) highlighting the necessity to integrate market constraints and opportunities to understand agronomic and environmental impacts at farm scale and at broader ones.

Organic prices also run the risk of losing integrity along long supply chains (Buck et al., 1997; Goldberger, 2011). Froger et al. (2003) show that commercialization could represent a risk to sustainability in organic farming. This refers to the current conventionalization of the organic market (Allen et al., 2000). It particularly corresponds to the convergence of less control of inputs in organic farming and greater emphasis on sustainability in the conventional supply chain. This leads to a downward effect on organic prices, to an increase in the share of added value for retailers and firms[16] but also to changes in farm processes. As mentioned before through B. Sylvander's works, Allen and Kovach (2000) show a difference between one type of organic farming choosing a simple input-substitution from chemicals to organic ones, evolving towards mono-cropping and others, with deeper reflection on varieties' choices or including a strict respect of period of fallow.[17] Therefore national and international production prices in the conventional system could impact farmers' trade-offs between economic and agro-environmental stakes. To sum up, we see the overlapping between organic farmers' practices and the type of market, and between one farm-level and a plurality of levels in the different markets structuring the supply of organic products.

3. Environmental instruments for the provision of organic farming

3.1 Classical instruments to address externality issues

To address the optimal provision of organic products and their associated ecosystem services, economists have proposed various solutions. The choice of instruments is a crucial step in achieving environmental goals. First, the response to market failures could depend on regulatory instruments. These are based on the definition of norms and on inspections. Emissions norms or best available technologies steer pollution below a maximum level (for the former), or impose the use of technologies to reduce pollution (for the latter). Because organic standards define a number of requirements in terms of management practices, prohibited products or minimum acceptable levels, the European standard could be considered as a regulatory tool. Thanks to standardization, certification labels also help to reduce information

[16] The share of added value in organic production is moving closer to what is observed in conventional farming.
[17] These examples should not been generalized to every production.

asymmetries. With a standard-setting body, inspections have been made to guarantee consumers compliance with the organic principles. Since agricultural products are judged on appearance, organic ones could suffer from the absence of chemical inputs to better conserve products' freshness in their appearance.[18] What is more, some controversies remain, particularly concerning the protein content in organic cereals (Trewavas, 2001; Hole et al., 2005). This highlights the crucial importance of quality signals and certification labels.

On the other hand, organic farming benefits from economic tools. Economic instruments are aimed at correcting the possible differences between private costs and public benefits, especially in the presence of externalities (Chiroleu-Assouline, 2007). The agro-environmental measure on organic farming (AEM), *"support to organic farming"*, is based on the voluntary participation of farmers and in particular on regulation through prices. The AEM designed to help the conversions incites farmers to accept conversion in organic production in spite of the potential obstacles listed before. Market price supports as tariffs, are one main economic instrument implemented in the EU market, helping products to be sold at a higher level than in free markets. Direct payments to farmers are another measure, notably implemented to lower the gap in support to conventional farms. They cover compensatory payments, set-aside payments or special premiums, etc. Some of these subsidies could be combined. For instance farmers can both receive payments for set-aside land and direct ones.

Organic premium and conventional prices greatly differ with products and countries. Indeed, some products could receive a more important support if their growth is considered too slow. The definition of the incentives' level depends on countries showing a diversity of institutional schemes in Europe to conserve biodiversity (Whittingham, 2006; Boisvert et al., 2010). But globally, it appears that price support benefits more to conventional products (Stolze et al., 2009). Otherwise, some quotas have been proposed in order to ensure organic products sell and to help the structuration of some supply chains. It is notably the case for milk in the UK. Some subsidies also exist to support organic exports. Through action plans, countries have developed national and regional initiatives within the European Action Plan implemented in 2001. These national or subnational plans aim at creating more trade-offs between the different policies tools, and to ease the integration of European decisions. In organic farming, no tax and direct instruments have been implemented. Nonetheless, studies show that in an organic schemes, reduction of fertilizers and pesticides is more costly with subsidies than with taxing their use (Jacobsen, 2002).

[18] This shows the limits of this traditional theory of organic consumer's purchasing, since it deals with intrinsic qualities that are difficult to identify because of the set of characteristics that determine these products' performance.

3.2 Monetary valuation of organic farming consumption

To implement public policies, the social value of organic farming has to be assessed. Standard economics proposes the monetisation of ecosystem services[19] through the use of various methods among which the Contingent Valuation Method (CVM), Choice Modelling (CM) and Hedonic Prices (HPs).

The CVM, based on stated preferences, makes it possible to define the willingness to pay (WTP) -or the willingness to accept (WTA)- for an environmental change thanks to a hypothetical scenario. HPs are based on revealed preferences. Amenity values are defined thanks to actual behaviours of individuals on related markets. CM and conjoint analysis also belong to stated preferences, but WTP is inferred from different scenarios. Product prices, which are determined in particular by WTP, appear as the main barrier to increasing production (Vindigni et al., 2002). According to the theory developed by Wainger et al. (2010), individuals do not value a good itself but its characteristics. Since agricultural products are judged on appearance, organic ones could suffer from the absence of chemicals inputs to preserve their appearance, showing some limits to this traditional theory of organic consumer purchasing. As a consequence, the CM and HP methods should be recommended. Nevertheless, the CVM –relying on a unique alternative- remains largely used in economic valuation.

The results of the survey presented in the appendix 1 highlight three main factors that positively influence consumers WTP. The first factor is the impact of the consumption of organic products on health through their nutritional potential. The second one is the environmental contribution and capacity to ensure a sustainable production system. These two elements, not always ranked in the same order of importance, are linked to consumers' perception of products as being of higher quality, which is the third factor. Prices, access to information about products and their availability are the main obstacles to higher consumption. This availability issue is coherent with the problems of market structure detailed before.

Information about valuation should be used with caution because in the same case study, the results also show variations according to evaluation methods (Alevy et al., 2010).[20] In spite of some attempts to correct CVM limits through a second dichotomous choice (Hanemann et al., 1991), stated preferences could exhibit a higher WTP than revealed approaches. First, CM shows advantages by avoiding co-linearity between the attributes of products, which is interesting for organic products that have potential multi-assets (Hanley et al., 1998). Thus, contrary to CVM, CM goes beyond the

[19] Among these, benefit transfer makes it possible to derive values extracted from one or a group of studies to a policy site, integrating potential geographical variations (Brookshire, et al., 1992).
[20] In this article, some explanations have been proposed. First, there is a possibility of flawed CVM instruments and possible failures of respondents. The importance of a substitute scenario is also considered as a possible reason for such gaps, as respondents could forget or undermine them.

evaluation of specific situations. On the other hand, stated preferences do not show the same risk of a possible "compliance bias" leading to an excessive WTP (Boxall et al., 1996). In addition, contrary to CM, which alleviates concerns about informational efficiency thanks to the range of scenarios proposed, CVM is more dependent on respondents' understanding of the existence value of goods. However, as previously stated, organic farming still faces uncertainty in terms of its health effects, etc. Indeed, as explained by Hanley et al. (1998), CE and CVM reveal both assets and limits generally linked to uncertainties about the goods concerned.

3.3 Data (dis)aggregation and scale issues as the main outcomes of different approaches to economic valuation

Some studies try to overcome the drawbacks of classical methods by integrating new considerations. Vindigni et al. (2002) choose a dynamic approach to analyse possible scenarios integrating current and past motives. The contribution of their paper to the spatial scale issue is its capacity, thanks to the multi-agent technique, to extrapolate from micro-level actions some macro-level phenomena and, in this way, to go from heterogenic individual preferences to higher levels of aggregation. As with every social process, it becomes difficult to aggregate isolated values because the value is superior to a simple aggregation. According to (Arrow, 1951),[21] it is not possible to scale up from individual preferences to a public choice function. But if this article takes a step towards the integration of data aggregation issues, it substantially remains at the level of individual preferences.

In their comparison study to understand different empirical findings using a multidimensional classification method, Travisi et al. (2006) also raise scale issues. They point out that the collective dimension of environmental choices could be neglected when farming practices are analysed.[22] Even if respondents are consulted on global policies, they usually make a judgment according to the value they give to a good, and not according to society globally (Sagoff, 1998).[23] Questions to farmers are rarely built to address both individual and collective risks simultaneously. Besides, Clinch et al. (2001) report other criticisms[24] of the difficulty for CVM studies to integrate the fact that

[21] He explains in his "impossibility theorem" the limits to the aggregation of individual preferences in order to find a general will.

[22] Beyond the case of pesticides discussed here, organic consumption valuation could also incorporate the collective dimension in analyzing preferences.

[23] The difference relies on the fact that they could consider themselves more as members of a community responsible for these goods, leading them to formulate a collective response.

24 Criticism also concerns the lack of accuracy of economic valuation. This seems to be linked to controversies concerning the environmental impacts of organic farming as the outcomes of these valuations are based on ecosystem risk characterization.

some externalities could produce both costs and benefits, depending on individuals. This is not far from the spatial scale issues, as we could consider that differences in effects on people could be related to the spatial situation of the respondents. Again, the question of the switch between one scale and another is at stake.

Beyond debates about the methods, the discussions are still on-going. WTP studies still have to address the question of how to integrate the broader scales encompassed in a product from its production to its diffusion. We can see that WTP mentions only "environment", but not what this means precisely about the maintenance of aesthetic value or biodiversity. This is the first blurring of spatial scale issues in the valuation of organic products directly linked to the difficulty of scientifically evaluating the contribution of agro-ecosystems to the ecosystem services mentioned before.

Second, there are spatial variations in amenity values, which differ according to the location and the degree of urbanisation, showing that the location of respondents should be integrated (Cho et al., 2008).

Third, this coincides with the current development of local organic production, stressing the proximity between producers and consumers and the territorial identity of products along with their organic composition. This presents a challenge for the measurement of WTP for organic products in order to consider this spatial dimension (Adams et al., 2010). The paradigm of localism combined with environmental issues (Dupuis et al., 2005) raises certain types of consumers' sensitivities.

4. Organic products, ecosystem service provision and social optimum issues: at a crossroads between global and local optimums

4.1 Implication of a quantitative target for agricultural sustainability

Setting a target of 20% of land under organic farming in 2020 raises both economics and agronomists issues. Economists stress the questions of its competiveness with conventional agriculture and consequently its productivity. As organic yields seem to be lower than conventional ones, this target will imply to dedicate more land to agriculture, decreasing semi-natural areas even if agricultural ones could show better soil quality or biodiversity (Gunningham et al., 1999).

On the other hand, advocating for this target could impact on the choice of particular types of productions. Actually, as cereals represent higher areas than orchard or small grains, regions could be encouraged to develop the first type of production. Though, cereals crops and mono-cropping in general show less rotations and varieties' diversity which remain important to enhance soil quality and biodiversity (Aznar, 2002). In this type of scenario, the particular challenge of organic farming to maintain nutrient availability must be stressed. For instance, in the Paris region (*Département* Ile de France), cereal crops remain the main production with very few breeding, two types of rotations, with alfafa or not (Amemiya et al., 2008) raising questions about soil fertility in the long-term. With large profit on field crop in a rotation, the switch to more rotations could be discouraged.

This target tries to meet the growing demand of consumers, which also implies imports from other European countries, eased by the European standard, but also from developing countries which raises another interesting spatial scale issue, and a clear confrontation between consumption here, and externalities located elsewhere. This justifies the focus on developing countries as growing exporters of organic products (Gibbon, 2006).

4.2 European consumption and tropical biodiversity protection: the importance of public policy design

As seen before, there are differences between production and consumption, leading to increasing imports referring to the globalization of the organic market. Public policies could act on supply[25] or on demand sides, with important environmental implications. By focusing on demand as a lever for action, no distinction is made between domestic production and imports. On the contrary, to protect soil quality, biodiversity and ecosystem services in general, policies should target an increasing supply.[26] A policy based only on consumers could in turn lead to an increase in imports, especially from developing countries, for several reasons: notably the refusal of consumers to increase their spending ; the strategies of firms to maximize their profits thanks to minimizing their costs ; and the fact that some increase their purchasing of exotic products and indeed imports. This is consistent with recent results showing that imports from developing countries are growing (the number of agreements increased by about 13% between 2010 and 2011 in France) (AgenceBio, 2011).

Agronomic and economic researches point out the capacity of organic farming to both ensure food security and protect biodiversity in developing countries stressing that some biodiversity hotspots are located there. The running question about the capacity of organic farming to feed the world finds another echo in these countries since to face poverty issues emphased by its demographic trends, especially the food productivity, they have to ensure their soil fertility and soil quality (Daily et al., 2009). Though, some

[25] Especially through the obligation to provide a share of products from organic farming for collective catering.
[26] Both are possible, as a temporary measure (Guyomard, 2009).

studies notice the increasing development of chemicals inputs used by smallholders in bad ways with health and environmental risks (Girardot, 2008). As such, increasing European imports of organic products could be a way to protect biodiversity in developing countries while also ensuring higher incomes for smallholders. This could appear as a win-win scheme. Long distance shipments are generally pointed out for their use of fossil fuels and contribution to air pollution. With these potential global impacts on climate change, the idea of a win-win scheme is firstly undermined. Besides some studies temper the promotion of organic production in developing countries as a way to reduce poverty (FAO, 2002). Studies demonstrate that conversions of subsistence crops into wide-scale monoculture for export could threaten biodiversity while making smallholders more vulnerable (Bacon, 2005; Fold et al., 2008). Again, transformations of economic markets, notably their extension at international scales, show possible impacts on the scale of agricultural production. The best way to protect biodiversity remains at stake: is this through the development of a market, an integrated scheme based on trade in value-added agricultural products; or is it through different policies, one dedicated to biodiversity and the other targeting economic development? The possibility of creating complementarity is clearly the question raised by the development of this market.

4.3 A new type of scale issue: the overlapping of a plurality of actors in the new global organic market

Spatial scale issues correspond to the growing dialogue between different types of actors around biodiversity protection and soil quality conservation, etc., in northern and southern contexts. Because these issues confront institutional frameworks and local knowledge, political stakes and smallholder issues, agricultural goods and their contribution to sustainable development should mobilise political economy to understand these interrelationships. The globalization of organic products has been studied in the light of the mobilization of international movement of civil society against a massive political-economic orientation of agro-food networks (Chavagneux, 1998). Thus, this market's extension implies new actors structured at different levels, around international NGO and national civil societies.

In the strict economics approach, the international organic market has been studied at a macroeconomic level by Melitz (2002), showing the exit of small-scale farmers and the penetration of large agricultural business producers based on industry performance, with consequences for local biodiversity. The development of long supply chains at a global scale has impacts on smallholders' participation in agricultural sectors, their capacity to sell for export or for local markets, and hence their vulnerability. This confirms that the current evolution of agriculture in developing countries is composed of interactions between large-scale farmers, commercial enterprises, and smaller producers. This underlines the withdrawal of states, leaving room for large-scale industries and exporters.

On the contrary, these small-scale producers may appear to be less vulnerable because of the development of organic markets for certain products in some developing countries (Bacon, 2005). European demand for organic products could thus enhance ecosystem services a long way from European consumers. While European consumers may not directly benefit from the soil quality of farmers producing their fruit, compliance with organic guidelines should enhance soil quality, thereby enabling better carbon emissions storage, which is a public good. Here, the global optimum of very distinct places of consumption and production occurs, raising the question of the roles of social, political, and economic actors in consolidating international trade.

Conclusion

Organic farming has not reached the objective of 6% of agricultural land under organic management by 2012. In spite of increasing recognition of its benefits for ecosystem services, challenges remain, notably the differences between conventional and organic yields.[27] Mainstream economists explain the existence of risks for ecosystem services notably by economic failures, which are, as highlighted in this paper, linked to the integration of scale issues. Indeed, the combination for the same products of both public and private goods sets the challenge of organic farming provision. Moreover, beyond biological data, values are given to nature by different actors, at different scales and in different cultures. So this is also a cross-cultural issue. Choosing between targeted policies to tackle these market failures is challenged by the necessity to design a cost-efficient policy able to integrate the global dimension of this market for organic products. This questions the pertinence of designing a policy in quantitative terms as trade-offs between local and global optimums go beyond a national target of 20% of land under organic management. This target is also questioned by the lack of means to tackle, at different scales, a wide range of territories and their characteristics. This is a particularly accurate issue, as organic farming is mainly supported through higher prices by consumers and producers who both face considerable uncertainties and asymmetries of information.

[27] With variations according to the crop and the region

Appendix 1. Survey of economic valuations for organic food products: factors influencing the WTP

	Authors	Economic method	Insights
Stated preferences	(Gil et al., 2000)	Contingent value	Consumers concerned about healthy diet and environmental degradation show a higher WTP.
	(Williams et al., 2000)	Contingent value	Organic buyers show a higher WTP for risk reduction.
	(Batte et al., 2007)	Contingent choice with a double-hurdle model	Consumers have little knowledge about organic markets, but their understanding increases with repercussions on WTP. Products with less than 100% organic ingredients find a demand that could reduce the prices for higher organic content products.
	(Rodríguez et al., 2007)	Contingent value	Factors that play a part in organic consumption are: their quality and nutritional benefits, and their availability in markets. Concerns about health and risks are influenced by consumers' income levels.
	(Xia et al., 2009)	Contingent value	The considerable lack of knowledge about the meaning of "organic" shows the potential of labelling. Consumers have positive consideration of green food.
	(Travisi et al., 2008)	Choice experiment	The article evaluates monetary values of the negative environmental impacts linked to pesticide use. There is a substantial WTP for organic products because of the environmental context of their production.
	(Janssen et al., 2012)	Choice experiment and structured interviews	Important variations can be observed, showing the subjective nature of consumers' choices and the importance of logos. The article underlines the critical role of information.
Revealed preferences	(Griffith and Nesheim, 2007)	Hedonic prices	The top three factors influencing WTP are: quality, health and environment.
	(Huang et al., 2006)	Hedonic prices	Household incomes, younger and more educated heads of household have a positive impact on prices paid for organic fresh tomatoes. Packing is also a factor increasing WTP.
	(Boland et al., 2002)	Hedonic prices	Consumers positively value first the price, then the tenderness and leanness of beef.
	(Bernard et al., 2006)	Auction experiments	Non-GM is an important characteristic purchased by organic consumers. Non-GM products have development potential, especially for consumers not willing to pay extra for organic attributes.
	(Tagbata et al., 2007)	Experimental economics with auctions	Some consumers give more importance to prices than to ethical or organic values.
	(Napolitano et al., 2010)	Experimental economics	Ranking shows that prices are the first factor determining purchasing. The ethical dimension of an organic product could help to increase WTP.
	(Mutlu, 2007)	Survey method	Health and the sustainability aspect are at the top of the list of motivations. Age, households' characteristics, the number of children, gender and the level of education

			matter. These duration of the organic products' consumption also play a role in an increased WTP.
	(Giannakas, 2002)	Model of vertical product differentiation	Mislabelling leads to a lower WTP. This article demonstrates that misrepresentation has clear implications for market efficiency.
	(Chen, 2009)	Statistical methods	Health and environment are respectively the first and second motivations for organic product purchasing. In particular, they influence consumers towards a healthy life. This way of life acts as a factor increasing WTP for organic products.
	(Williams and Hammitt, 2000)	Regression models	Trust in organic product composition (risk of contamination by pesticides) matters, as do vegetarian values.
	(Armand-Balmat, 2002)	Surplus theory, variation of consumers' surplus	An estimation of a demand function including socio-demographic characteristics helps to determine the impacts of product prices. Region, profession and income are the main factors determining WTP.
	(Vindigni et al., 2002)	Multi-agent simulation models	Early or late adoption matter in the diffusion process, particularly because they impact consumers' risk adverse profiles. More globally, the critical mass of consumers and the attributes of the innovation also play a role, as does the environment to which consumers belong.
	(Radman, 2005)	Statistical methods	Organic products are considered as healthy, good quality and tasty. These act as the primary motivations for consumers.

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