LARGE DISCREPANCIES BETWEEN AGRICULTURAL OUTLOOK PREDICTIONS AND REAL TRENDS: IGNORANCE OR UNCERTAINTY?

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LARGE DISCREPANCIES BETWEEN AGRICULTURAL OUTLOOK PREDICTIONS AND REAL TRENDS

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Abstract. Agricultural international policies still base their decision-making process on tools that consider the agri-food system rather stable or, at most, as facing uncertainty conditions. Used tools to support international agricultural policies include future projections of agricultural prices and production– e.g. Agricultural Outlook projections-, which are designed for scenarios where we face risk or uncertainty. However, comparisons between predictions and reality indicate that these approaches are limited. Given the relevance of agricultural international policies for the life of millions and the impact on the environment, including initiatives linked to global environmental change, the framework used to develop such policies has to be clearly defined. We argue that ignorance could be a more appropriate framework in which to base international agricultural policies. This implies that the element of surprise shall be considered as an intrinsic, rather than exceptional, component of the system, and other principles should be introduced.

Keywords: uncertainty, governance, agri-food system, participation, international policies

Resumé: Les politiques agricoles internationales supportent encore leur processus de prise de décision sur des outils qui considèrent le système agroalimentaire peu stable ou, au moins, en rencontrant des conditions d'incertitude. Quelques unes de ces outils, qui supportent les politiques agricoles internationales, inclurent des projections futures des prix et des productions - p.e. Agricultural Outlook projections-, qui sont dessinés pour des situations où l'on se met en face des risques ou incertitudes. Par contre, les comparaisons entre les prédictions et la réalité, ainsi que les divergences nous montrent les limitations de ces perspectives. Compte tenu de l'importance des politiques agricoles internationales pour la vie des millions de personnes, et l'impact sur l'environnement (inclues les initiatives associées au change climatique global), le cadre utilisé pour développer ces politiques doit être bien défini. On argue que l'ignorance est le cadre le plus approprié sur lequel baser les politiques agricoles internationales. Cela implique que l'élément surprise doit être considéré comme une composante intrinsèque, plus qu'exceptionnel, du système, et que d'autres principes doivent être introduis. Comme résultat, des nouvelles actions dirigés vers des changements structurels du système agroalimentaire, inclue la démocratisation du savoir associé à la production et les mécanismes de prise de décisions dans l'agriculture, doivent être adoptées.

1. INTRODUCTION

The existence of incertitude in some political decisions, or in the use of some technologies, is well recognized by scientific and political actors involved in policy and scientific assessments. While the acknowledgement of the existence of incertitude is well recognized in the technological approach of some agricultural policies (Böschen, 2009; Haslberger, 2000; Marjolein van Asselt and Vos, 2008), in our view it is not yet well incorporated in the macroeconomics assessment of agricultural policies. This occurs even if, as shown in this paper, there are some elements suggesting that the recognition of this fact might be interesting to develop alternative policies. In fact, main stream positions at the international level remains using "reductive-aggregative" tools typical of risk assessment. When these tools are used, generally linear deterministic explanations arise to explain the effects of policies on a given system, where causality is well known and there is a perception of "certitude" about the effects of the macroeconomic agricultural policies on prices or production. But the increasing complexity of the agri-food system suggests that certitude is not the right paradigm to work at the international agricultural policy level and develop the predictions models and that incertitude should be deeply considered (Thompson and Scoones, 2009).

In this paper we compare the Agricultural Outlook international prices and production predictions in the period 1999-2008 with the real market prices in the same period. The comparison is used to analyse the limits of using projection models as central pieces of information to develop international agricultural policies, in an increasingly complex agri-food system. Together with some additional information, we used these data to propose some new principles for international agricultural policies that may fit better with what we consider to be an ignorance situation.

We first present a theoretical framework of what we identify as incertitude, what the different types of incertitude exist, and the description of some of the techniques used to tackle with each of them. The theoretical framework is then followed by a data analysis section where the differences between Agricultural Outlook projections and real prices and production are calculated. We continue with a discussion of the results and a proposal of some new principles that derives from the recognition of the ignorance state.

2. THEORETICAL FRAMEWORK

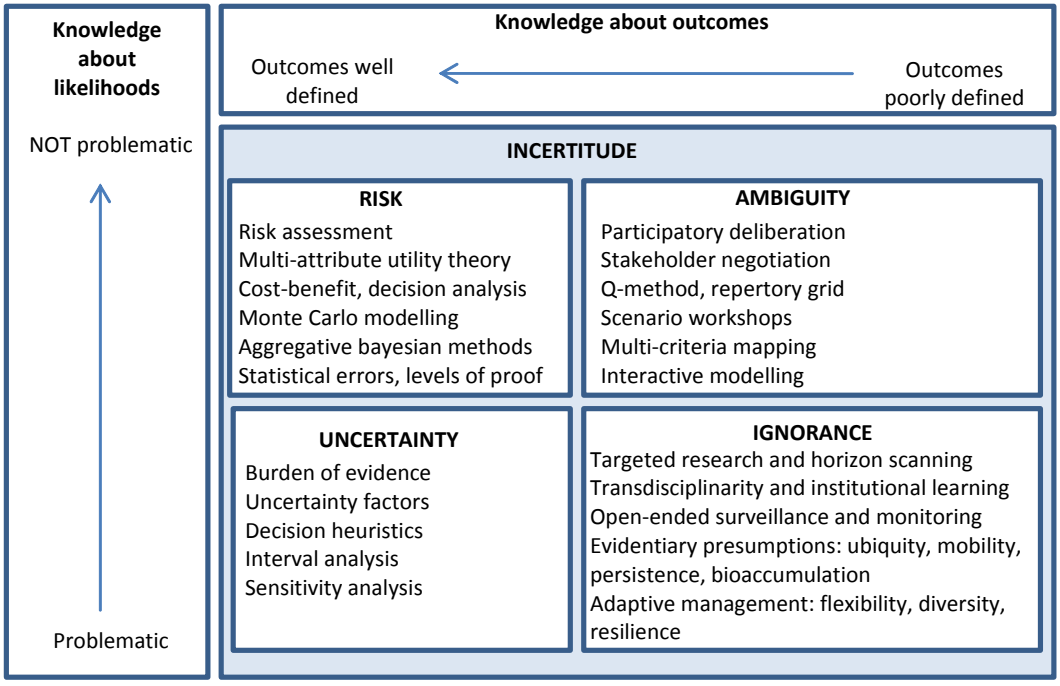
In order to clarify what we mean by incertitude we should first acknowledge the existence of different types of incertitude. The identification of the type faced in the agri-food system is highly relevant because it leads to different technical (Figure 1) and political approaches. There is not a single classification of the different types of incertitude and we follow the definitions proposed by Stirling (Stirling, 1999). In this context, systems are defined by two basic parameters: the knowledge of future events that might happen, referred to as outcomes, and the likelihood or probability associated with each of them. When there is a good knowledge of both parameters, we face a risk condition, and thus risk analysis techniques are appropriate tools. However, there are three other possible combinations of the outcomes and likelihood parameters where

our knowledge is not complete and we face incertitude: ambiguity, uncertainty and ignorance (Stirling, 2007; Stirling, 2008).

If we face a situation where it is possible to define a well set of outcomes as a consequence of our decisions, but it is acknowledged that there is no credible basis for the assignment of probability distributions we face *uncertainty*. If the situation faced is characterised by the poor definition of the outcomes of the technique or politics analysed we face *ambiguity* or *ignorance*. In the first case we can express in numerical terms the degree to which the different outcomes are actually manifested. In the *ignorance* state there exist neither grounds for assignment of probabilities, nor even a basis for the definition of a comprehensive set of outcomes. As Stirling (Stirling, 1999) establishes, the ignorance state emerges especially "*in complex and dynamic environments where agents may themselves influence (in indeterminate ways) supposedly exogenous "events" and where the identification of a particular course of action can exert a reflexive influence on the appraisal of alternatives"*. When we face this situation, the recognition of our limited scientific-expert-knowledge should be considered.

Overall, sources of incertitude in agriculture are diverse affecting both prices and productivity of the agricultural systems. Furthermore, different types of agriculture can have different sources of incertitude. Incertitude may also be linked to actors' behavior and can be intensified by dysfunction of institutions and policy, as well as by gaps of scientific knowledge.

Figure 1. Methodological response to different forms of incertitude (based on (Stirling, 1999; Stirling, 2007).



Modelers may acknowledge the existence of incertitude in agriculture that can affect policy decision-making and farmers' decisions (Just, 2001; Lagerkvist, 2005). Still, the

type of incertitude recognised is, in the best of the cases, uncertainty (Munier, 2009). Sensitivity analysis or interval analysis are presented as possible approaches to model uncertainty. However, agricultural incertitude may be better described if we recognized the ignorance condition. This recognition could facilitate the understanding of the importance of the element of "surprise", characteristic of ignorance. For instance, patterns of global food prices (e.g. the unexpected changes of agricultural international prices 2007-2008 and subsequent global food crisis) illustrate its importance.

3. MATERIAL AND METHODS

To understand the limits of the more usual approaches, we use the agricultural outlook as an illustrative showcase. Since 1995, the first quarter of every year, the Organisation for Economic Co-operation and Development (OECD) has been producing the Agricultural Outlook report. In the last four years it has been produced jointly by the OECD and the Food and Agriculture Organization (FAO) of the United Nations. From the beginning it has been considered a major reference for the most important international institutions dealing with international agricultural issues, as an information source used to develop agricultural international policies. Among its contents includes an assessment of agricultural markets covering cereals, oilseeds, sugar, meats, milk, dairy products, etc., and a set of projections for global markets, including a prediction of future world prices and production that "constitute a plausible medium-term future for the markets of key commodities" (OECD and FAO, 2008). From 1995 to 2003 (included) the Agricultural Outlook projections included a five years projection; since 2004 it has been expanded to a 10 years projection.

We have compared the Agricultural Outlook international prices and production predictions in the period 1999-2008, with the real market prices and production obtained from OECD.Stat agricultural data (OECD, 2009b). When real data have not been available in OECD.Stat, we have used the information obtained from Food Outlook publication (FAO, 2005)[1]. Latest available world real prices and production data where those for period 2007/08. Comparisons have included the following products: wheat, coarse grain, rice, oilseeds, oilseed mail and vegetable oil. We have used these products because they are the worldwide agricultural commodities more widely commercialised and with more influence in the international agricultural markets.

To avoid the inclusion of non-significant results, we have only considered temporal series with more than five data. This limited the analysis to projections up to five years ahead. For each product and each prediction we calculated the absolute value of the percentage difference between the prediction and the actual price and production for that year. Figures 2 and 4 represent these differences for 1-year to 5-years ahead predictions, respectively.

Furthermore, with the objective of establishing whether the prediction capacity of the models improved with the time, i.e., whether the agricultural outlook predictions of 2008 report were better than those of previous years for any product, we calculated the

[1] This has been the case of oil Argentinean trigo pan, F.o.b. Argentine ports in the period 1992-2002, and the US soyabeans, cif Rotterdam used for wheat and oilseeds projections in the Agriculture Outlook in the period 1995-1997, and the Argentine soybean meal pellets, 45/46% protein, ci.i.f. Rotterdam used in the oilseed meal projection in the Agriculture Outlook period 1996-1997.

correlation between the difference of prediction and reality for all the different agricultural outlooks (all predictions to 0 year for one specific product, all predictions to 1 year, all predictions to 2 years, etc.), i.e., if there exist a correlation between all predictions to 0 years within the different projections.

3. RESULTS AND DISCUSSION

Comparisons between projections and real data show that even if technical improvements in the models have been performed during the last decade, and historical expertise has been obtained, the final capacity to predict accurately has not significantly improved. Correlations between differences of predictions and reality for all reports showed that no clear temporal trends in terms of reliability of the predictions was observed for any product (in all of them non significant correlation was obtained). Thus, a temporal mean of the differences between projections and reality for each of the products can be calculated. Results can be observed in Figures 3 and 5.

The difference between international price predictions and reality continue to be around 17% for the ongoing campaign, and 28% for the five-year predictions (Figure 2). Since the margin of benefits for producers in the agricultural sector is less than the inaccuracy of the projection, we could assert that price projections have a limited application to develop policies that depend on the viability, or unavailability, of producers for international agricultural trade. Of course, the viability or unavailability of producers changes the agricultural production in a dramatic way. As a consequence, the use of these projections as possible scenarios may indeed be inappropriate to develop international policies. For production, differences vary between 3% and 7% (Fig.4). This result indicates that, indeed, weather is presently not the major source of uncertainty at a global scale.

The failure in the prediction of international agricultural prices is expected if the intrinsic incertitude of the present agri-food system. Until recently, dominant perspectives in conventional agricultural science and international agricultural policies have implicitly assumed a predictable, causal driven, and almost stable and indefinitely resilient agri-food system. Such deterministic, equilibrium-centred views, provide inadequate insight into the dynamic character of agri-food systems. This is particularly important in an era of global economic and environmental change, where factors such as the influence of financial system, energy prices, climate change, and uncertain political economic conditions affect more and more agriculture in general and agricultural economy in particular. In this sense, new socio-environmental research shows us that incertitude, complexity and diversity of agri-food systems should be recognised (Thompson and Scoones, 2009).

Figure 2. Differences between world prices projections of main agricultural commodities and reality.

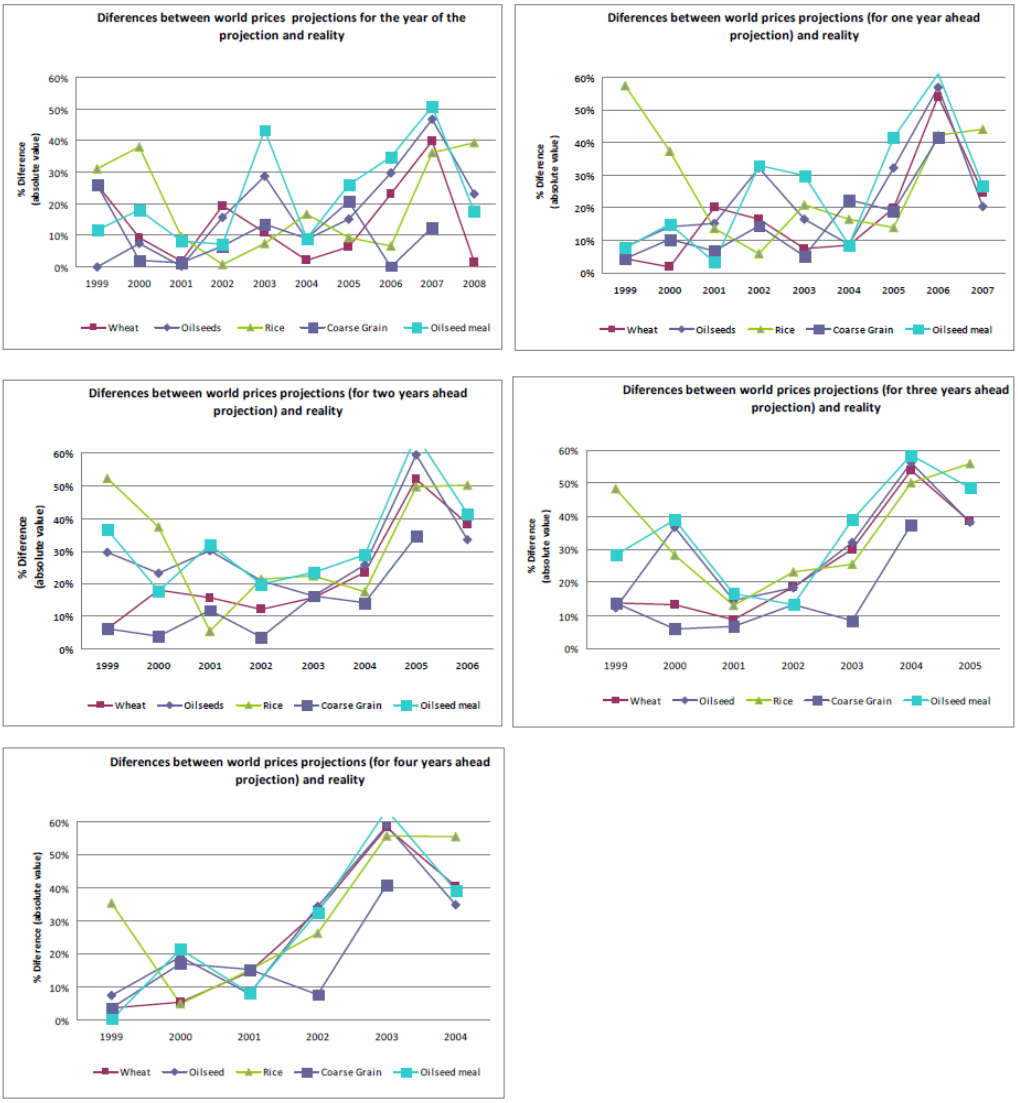


Figure 3. Media of differences between world price projections and reality for some agricultural commodities (Agricultural Outlook reports 1999-2008).

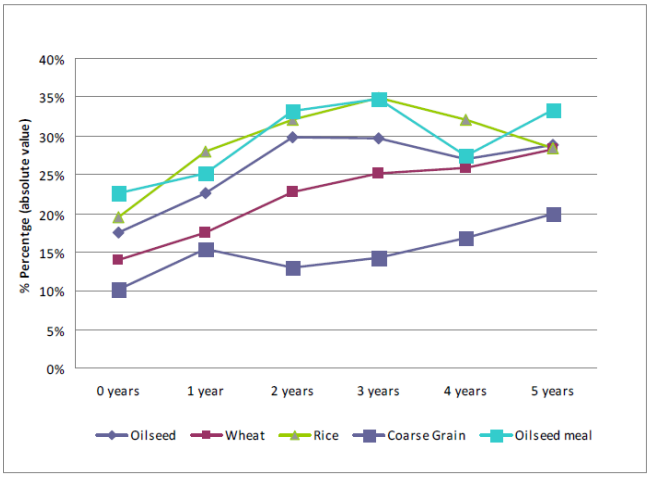


Figure 4. Differences between world production projections of main agricultural commodities and reality.

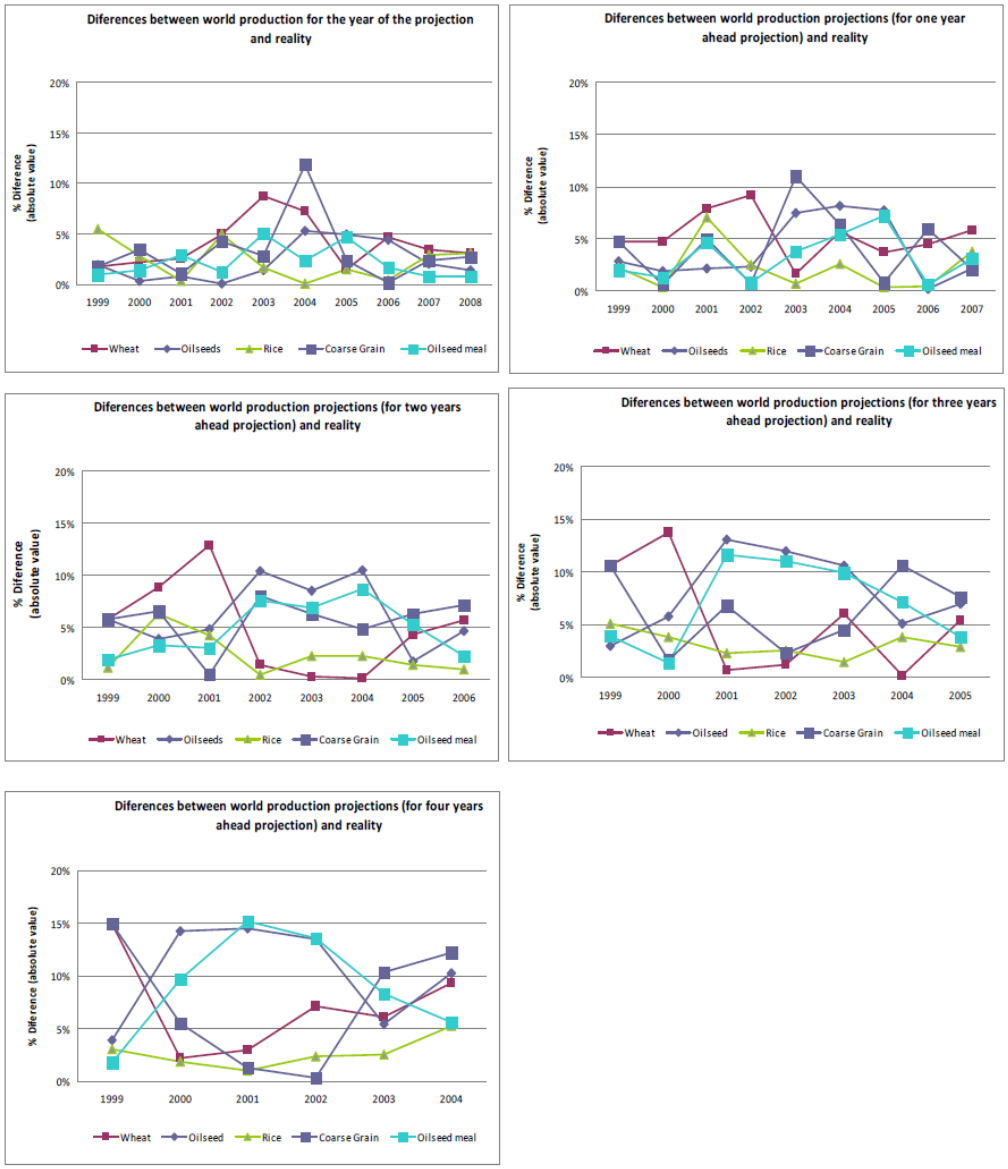
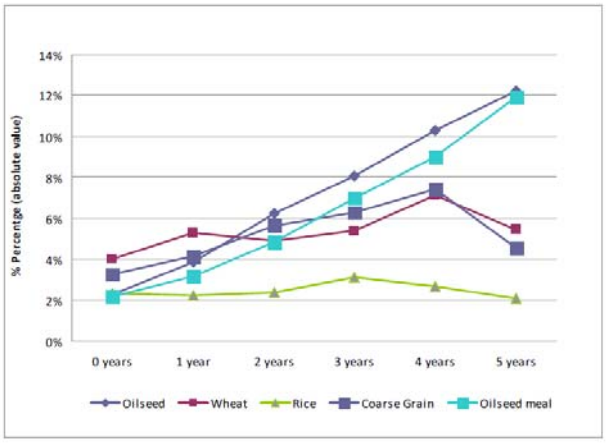


Figure 5. Media of differences between world production projections and reality for some agricultural commodities (Agricultural Outlook reports 1999-2008).



The OECD-FAO approach to forecast international agricultural commodity prices and production try to tackle incertitude using *uncertainty* and *risk* techniques. Currently, the projection is based in a model jointly developed by OECD and FAO Secretariats, based on the OECD's Aglink model and extended by FAO's Cosimo model. The model information is completed by an expert approach so a plausible scenario is produced, providing a tool for communicating uncertainty and complexity among diverse groups of experts and stakeholders. In the 2009 Agricultural Outlook, standard baseline projections were complemented with scenario and sensitivity analysis based on alternative GDP prospects and crude oil prices (OECD, 2009a), a probabilistic approach frequently used to manage uncertainty (Fig. 1). But a global probabilistic approach (risk assessment) is not possible in the agri-food system. This situation arises from many different sources including incomplete knowledge, contradictory information, conceptual imprecision, divergent frames of reference. Furthermore, many of the natural and social processes affecting food systems which are needed to develop the projection models are intrinsically complex or indeterminate. As a consequence, risk techniques can not be fully useful in the international agricultural price projections; i.e., we are not in a risk scenario.

Our analysis should be then in a better understanding if we are in an *uncertainty* or *ignorance* state. The *OECD-FAO Agricultural Outlook* may be useful if we face an uncertainty situation because it suggest us one "plausible scenario". This will not be the case if we faced an ignorance state, in which some new ideas should be introduced. Uncertainty and ignorance differ on the existing knowledge about outcomes (Fig. 1), in this case, outcomes of international agricultural policies. If outcomes for agricultural international policies are well defined, the *OECD-FAO Agricultural Outlook* projection may be the right tool, if not, other tools are required.

In fact, there is no consensus about what should these outcomes be and the expectations vary among different actors. For example, La Via Campesina states that an accepted outcome of the international agricultural policies should be achieving a culturally adequate food, as well as the right of peasants to participate in the political agricultural decision-making and the right to produce food (LaVíaCampesina, 1996). These outcomes are not part of expected outcomes from other international actors, including the UN-FAO, for whom international agricultural policies proposals should aim at contributing to the growth of the world economy, among other objectives (FAO, 2008). Similar analysis can be done for other major national actors as the European Union, United States, Brazil, etc. In some cases, even one actor can have different outcomes expectations in different contexts. Since outcomes are not common, there is no possibility of getting a "common projection" of the international agricultural policies results. If outcomes are poorly defined, and there is no clear basis for a probabilistic approach, as is the case of complex agri-food systems at the international level, then we should recognise that we are in an *ignorance* state.

3.1. The recognition of "ignorance"

The recognition of "ignorance" should not be considered as a "knowledge failure". Ignorance is founded just as rigorously in the theory of risk as it is the concept of "risk" itself (Stirling, 1999) and it does not avoid the establishment of policies. Rather, the adoption of ignorance could help introducing new principles. For example, precautionary principle is fundamental when ignorance states must be confronted.

Accepting the ignorance condition implies structural changes in the international agricultural policies arena aiming at decreasing incertitude. These include the formulation of policies supporting countries' and communities' ability to develop their own agricultural policies. In this case, voluntary and flexible policies would be perceived as better than closed and long-term unchangeable structures whose impacts are difficult to predict (Westhoff et al., 2004). Furthermore, local and regional production and consumption schemes may be prioritized over international long-chain relations in order to minimize the unexpected surprises.

Recognizing the fact that we face ignorance should also be accompanied by changes in the governance of the agri-food system. Ignorance requires democratizing the knowledge-base production and decision-making mechanisms (Craye and Funtowicz, 2009). The limits of the projection capabilities require that policies and knowledge-creation should move-on from an expert-driven approach to a more open perspective. Other actions would include the creation of structures where peasants' knowledge could support knowledge-making at an international scale. Recognition of this extended knowledge may support the promotion of traditional agricultural knowledge as part of international agricultural policies. Traditional knowledge has been suggested as better suited for coping with the uncertainty and unpredictability that are viewed as intrinsic characteristics of natural systems (Mazzocchi, 2006). Institutional diversity (Ostrom et al., 1999) can also be a useful tool under this circumstance.

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