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Framing of Agri-food Research Affects the Analysis of Food Security: The Critical Role of the Social Sciences

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Abstract. In our knowledge society, science plays a key role in policy-making through the production of assessments that provide evidence-based information to decision-makers. In that manner, science has also gained significant political power. This is an enormous responsibility for scientists but also constitutes a dangerous situation, since different social discourses lead to different analyses of a given problem, and to different solutions with very different impacts. Generally, this is the case of agri-food assessments, including food security, where impacts are huge given the present situation of nearly 1,000 million people suffering from hunger. In agri-food sciences framing of the research is mainly determined by two factors: the linkages between science and the concept of development, and the role given to agriculture in society. In general, it is easy to find two different opposite types of framing, with different objects of study, methods and characteristics. One type, which I refer to as official framing, tends to separate social and natural sciences, is more simplistic in analysing the causes of hunger, of food price crises or other important issues affecting food security. This type of scientific assessment usually regards solutions as more technical rather than social and/or political, and aims to find a panacea that can provide solutions to a given problem, in this case hunger. On the other side we have scientific evaluations, here alternative framing, which tend to be inter/trans-disciplinary, with a higher participation of social sciences. In this case, analyses tend to conceive agri-food system as complex systems, problems are normally more political than technical, and solutions tend to be diverse, contextual to each social, cultural and environmental context. In this sense, to encourage a change in agri-food assessments that recognizes the role of social sciences in addressing food security, critical social scientists can facilitate the introduction of frameworks developed by sustainability scientists into agri-food science, including the study of agri-food systems as socio-ecological complex systems.

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Introduction

Agricultural and food policies have strong implications for the achievement of sustainability. Food security, depletion of fresh-water reserves, land-grabbing, the use of unsustainable energy sources, habitat loss or global health, together with the important bearing that poverty has on these issues, are all related to agriculture (McIntyre et al., 2009). The increasing importance of global food markets, energy and water scarcity or climate change suggests that the current difficulties are likely to increase.

In the knowledge society, policy-makers use scientific, expert-based assessments to assist them in the decision-making process. As Weingart (1999) points out, the science–policy nexus is a dialectical process of the scientification of politics/policy and the politicization of science. This places science in a privileged position in the political arena for a wider discussion about the role of science in modern societies and science as a source of power (see Mulkay, 1979; Aronowitz 1988). For simplicity, we can divide the decision-making process in agriculture into three main elements embedded in three interacting tiers (Figure 1): 1. scientific assessments (scientists and knowledge); 2. management (policy-makers), including institutions/governance, social systems and legislation; and 3. agricultural practices (stakeholders), related to production (including technologies), distribution and markets. These elements are all interconnected: assessments generally evaluate, and are conditioned by, agricultural practices to provide information to the management, which in turn affects agricultural practices. Thus, through adequate assessments, science can (and must) play an important role in achieving sustainability (McIntyre et al., 2009), offering policy-makers and society the required information to develop focused policies. In this article, I centre my reflections on the assessment element of agri-food policy design.

Nowadays the remarkable gap between the objectives of sustainability (including food security for all) and current agri-food practices suggests that in order to achieve the objective of sustainability, agri-food assessments might need to introduce some changes, as it has been the case for other scientific disciplines in the past. In environmental sciences, for instance, over-exploitation of natural resources and the resulting increase in the number of social conflicts pointed to a wide gap between resource

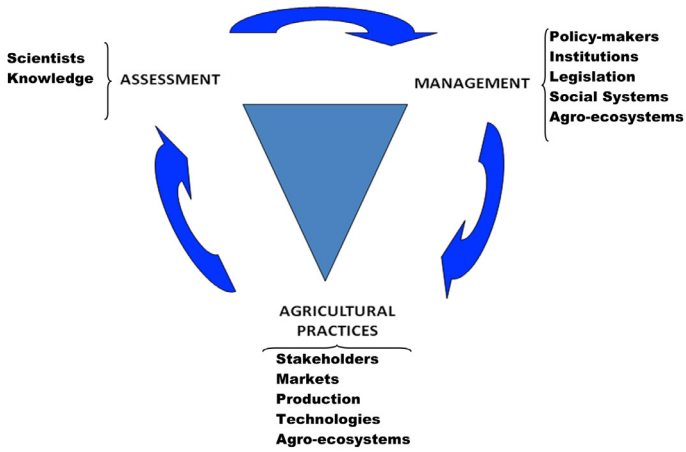

Figure 1. Relationships between assessment, management and agricultural practices.

management practices and the objectives of sustainability (Rammel et al., 2007). This prompted a fundamental paradigm shift (Kuhn, 1962) in environmental scientists who now recognize the intimate coupling between ecosystems and human well-being, evolving from the traditional view of people as external disrupters of ecosystems, to a focus on the dynamics of linked social (human)–ecological (environment) systems (SES). Social studies play a significant role in the assessment of environmental policies today. Such a paradigm change has so far not been adopted by agri-food related scientific disciplines and policy-making. Rather, dominant perspectives in agri-food sciences and international policy assume implicitly a predictable, causally driven agri-food system (Thompson and Scoones, 2009; Rivera-Ferre and Ortega-Cerdà, 2011). The emergence of sustainability science may favour this change.

Recent episodes of food crises have illustrated an important fact: the food system is not resilient but highly vulnerable. As a result, the number of under-nourished people after the sharp increase in food prices rose up to 1 billion in a short period of time. Following constructivist approaches, I will use the case of food security to illustrate how different social discourses result in different framings of agri-food research. Given the importance of food security worldwide, it is important to understand the existence of these framings, which result in different types of analysis that provide completely different solutions to the problem of hunger. Here, I will defend the need for a paradigm shift in agri-food sciences as an essential condition for achieving sustainability, emphasizing the role of critical social sciences in the process. In particular, I will use the example of food security to illustrate my arguments.

Framing Agri-food Research

As previously stated, assessment provides policy-makers with relevant information for the design of policies to secure a given objective – for instance, reducing hunger. However, knowledge creation, under a social constructivist perspective, is constructed in discourses that categorize the world and bring phenomena into view (Talja et al., 2005). Hence, assessments normally depend on researchers' world-views, values or paradigms which, in turn, affect the framing of their research (Kuhn, 1962) also in agricultural sciences (Woodhill and Röling, 1998; Fjelsted and Kristensen, 2002; Thompson and Scoones, 2009). At the same time, different framings result in different narratives. Framing is not used here as the social construction of a phenomenon by mass media or social movements or organizations, but as the mental models derived from a given discourse describing social-specific representations of information about reality, and frames contextualizing such mental models are embedded and give sense to it (Pahl-Wostl, 2007). Thus, framing of the problem is an essential step in the research process, and framing involves not just choices about which elements to highlight, but also subjective and value judgments (Beddoe et al., 2009; Leach et al., 2010). Given the important role of science during the policy-making process, framing does matter, since different policy responses may derive from it, as shown by O'Brien et al. (2007) in climate change research and Leach et al. (2010) in epidemics research. In the development of my argument, it is also important to understand the development of framings in sciences within the context offered by actor-network theory, which focuses on the processes through which technical entities transform into social constructs, and understand science as a process where pieces from the social, technical and textual come together and translate into a set of equally heterogeneous scientific constructs (Latour, 1987).

Thus, in agri-food systems different framings (and linked narratives) result in different assessments for a given problem with totally different approaches in addressing that problem, and different (if not opposing) results in the solutions proposed. To understand framing in food security research it is important to first understand how this process is affected by both the linkages between science and the concept of development, and the role given to agriculture in society.

The Role of Science in Society: Bio-capitalism and the Era of Development

Many development studies have analysed the birth of the concept of development and its implications in our society. This concept, which is widely accepted to be introduced in the public sphere with Truman's inaugural speech as President of the United States in 1949 (Escobar, 1994), had enormous implications for the role given to agriculture and agricultural sciences as a necessary tool to promote development in non-developed countries and societies. In a simple analysis of Truman's discourse, the number of times he used the words 'knowledge', 'science', 'techniques' and 'technology' are a good indicator of the importance that, given its potential capacity for unlimited growth, he gave to these 'tools' as elements that could promote the idea of development that he was launching to the world. Not by chance, even today the word science is always accompanied by the word technology (S&T), and research by the word development (R&D).

> 'More than half the people of the world are living in conditions approaching misery. Their food is inadequate. They are victims of disease. Their economic life is primitive and stagnant… For the first time in history, humanity possesses the *knowledge* and the skill to relieve the suffering of these people. The United States is pre-eminent among nations in the development of *industrial and scientific techniques*. The material resources which we can afford to use for the assistance of other peoples are limited. But our imponderable *resources in technical knowledge* are constantly growing and are inexhaustible. I believe that we should make available to peace-loving peoples the benefits of our store of *technical knowledge* in order to help them realize their aspirations for a better life… Greater production is the key to prosperity and peace. And *the key to greater production is a wider and more vigorous application of modern scientific and technical knowledge*' (Harry S. Truman, 20 January 1949, <http://www.bartleby.com/124/pres53.html>, para. 45ff.; emphasis added).

This new role given to agricultural sciences emphasized the importance of modern technology and knowledge as crucial elements to reduce hunger and poverty through greater production, favouring the instrumental function of science and the privatization of knowledge – that is, knowledge as one more productive force of capitalism. In that manner, the promotion of scientific and technical knowledge as tools to favour development worldwide can be framed within the process of accumulation founded on the exploitation of knowledge (but not only) known as bio-capitalism (Morini and Fumagalli, 2010). This is accompanied by the so-called privatization of bios, which in agriculture can be exemplified with the privatization of seeds (or more exactly, its material representation of life as information) (Rajan, 2003). The green revolution was one of the results, presented as a technological package that could provide the solution to hunger worldwide, i.e. the panacea that would solve

the food insecurity problem (Mann, 1997). Today, the same narrative can be found in the Alliance for a Green Revolution in Africa (AGRA; <http://www.agra-alliance.org/>). What does this mean for agri-food sciences? How does this affect the framing of the research, i.e. the analysis of a given problem and the proposal of solutions?

Agriculture and Society: The Role of the Agri-food System

Framing in agri-food research is also determined by the role that society gives to agri-food systems. Despite a risk of oversimplification, we could say that at present there exist two radical and opposed narratives about the role of agriculture in society: one has essentially an economic focus, while the other has a human rights perspective. The first narrative, which I call 'economic narrative', suggests that the main role of agriculture is to contribute to development through economic growth, which subsequently leads to an increase of social welfare (including nutrition improvement), while negative ecological impacts associated with agriculture have to be minimized through the development of new technologies. Thus, this narrative is in line with bio-capitalism and promotes market-centred policies. It is mainly supported by major governments, the private sector (agribusiness, large farmers) and some multilateral institutions. For instance, the FAO states that international agricultural policies should aim at raising levels of nutrition, increasing agricultural productivity, improving the lives of rural people, and contributing to the growth of the world economy (FAO, 2008). The new green economy proposals for agri-food and food security policies would derive from this narrative. The second narrative, which can be called 'human rights narrative', is promoted by some parts of civil society and small peasants' organizations and other multilateral institutions (e.g. United Nations Special Rapporteur on the Right to Food). According to them, the main goal of agriculture is to provide a healthy and culturally adequate food, through a democratization of the food system, the recognition of the role of peasants' livelihoods in sustainability, recognition of other forms of knowledge and promotion of bottom-up approaches. It is based on participation and enhances access rights, equity and social responsibility (UN, 2010). In this narrative, only people-centered policies can overcome the problems derived from the food system. One of the current policy proposals following this narrative to address the problem of hunger and rural poverty is that of food sovereignty (Vía Campesina, 1996; UN, 2010).

Thus, framing will be influenced both by the role of agriculture in society and by the role of science in society derived from the linkages between science and the concept of development under bio-capitalism. For instance, Bernal (1990), through the analysis of irrigation schemes in Sudan, found that agricultural research and development went hand in hand, the formulation of research problems and strategies of data collection being political, shaped by interests of scheme owners and managers.

Thompson and Scoones (2009) suggested different types of narratives that could be found in agricultural sciences: production–innovation, growth, agro-ecological and participatory. In fact, these narratives can be allocated to two opposite framings and, in line with Leach et al (2010) for epidemics research, we can call them alternative and official. Each of them has different characteristics in the research process, e.g. in the disciplines used for the assessment, in the objects of study or the methodologies used. Table 1 shows the characteristics of a typical assessment in agri-food sciences, based on these two framings. Under the official framing (here we could include the production–innovation and the growth narratives suggested by

Table 1. Agri-food assessments characteristics under different research framings.

		Alternative	Official
Object of study	*Agricultural systems*	Peasant agriculture	Industrial agriculture
	Seeds/breeds/ cultures	Multiple species/varieties + polyculture	Few species/varieties + monoculture
	Distribution	Short food supply chains	Long distribution–processing–storage (exports)
Methodology and research process	*Agri-food systems*	Complex socio-ecological systems/holistic	Simple systems or simplification processes
	Interdisciplinarity/ Transdisciplinarity	High	Null or very little. Fragmentation social–natural sciences
	Major scientific disciplines	Social and political sciences	Natural sciences
	Economic Science	Political economy/ecological economy	Classical economy/bioeconomy
	Type of knowledge	Traditional/ indigenous + formal knowledge (*Diálogo de saberes*)	Formal knowledge
	Participation	High	Small, null participation
	Production and knowledge transfer	Co-production of knowledge (science with people)	Top-down transfer of knowledge
Results	*Solutions*	Diverse	Panaceas
	Technologies	Appropriate technologies	Non-replicable technologies
Vision of science		Complex vision of science Constructionist approach	Instrumental vision of science Positivist approach
Policy responses		Address power structures, alternative development pathways, integrated response	Economic growth, sectorial responses

Thompson and Scoones (2009), problems related to agriculture are very often more technical than political and often only one discipline is in charge of performing agri-food analyses (disciplinary myopia). Actors in these narratives defend positivist and reductionist approaches of modern science. The main object of study is industrial agriculture, and technology has a prominent role in achieving sustainability in the food system, usually developed from top-down approaches. In this framing, classical economy has a prominent role, policies are market centred, and inefficient farmers are prone to disappear unless they modernize and enter into regional or international markets. For the analysis, this framing aims at simplifying agri-food systems in order to find unique and ubiquitous solutions to solve problems (i.e. panaceas). Under the framing of the agro-ecological alternatives and the participatory narratives suggested by Thompson and Scoones (2009), problems related to agriculture have a strong social and political component. Science is understood as one more element in society to contribute to the construction of discourses of different societal groups. The object of study is peasant agriculture, it calls for the recognition of different types of knowledge, technologies are normally context specific and participation is an essential component of the narrative, and thus, of the research process. One basis of this framing is the recognition of the complexity of agri-food systems.

Applying the Principles of Different Assessment to the Analysis of Hunger and Rural Poverty

Assessments normally start with the analysis of the causes of a given problem, in this case hunger: Why does hunger exist in the world? What is the nature of the

problem? (Answer: production–access.) Once these causes have been detected, potential solutions are provided, i.e. which policies and tools are required in order to reduce the number of hungry people in the world? Since the food security issues are subjected to different stressors (enduring and persistent long-running shifts) and shocks (transient disruptions), other questions that would need to be answered would include: At which temporal and spatial scale do we want to act? Both the diagnosis of a problem and solutions derived are determined by the framing of the problem. Following the two framings previously stated, alternative and official, we can define the main characteristics of assessments of hunger (analysis of causes and potential solutions) as a result of framing (Table 2).

Official Framing: Causes of Hunger and Potential Solutions

Normally, mainstream and official framing would suggest that the problem of hunger is due to a lack of productivity, and thus a technical problem, which can be more or less exacerbated by political reasons, but the underlying causes are mostly technical: more food needs to be produced. Thus, this framing tends to consider only one of the components of the food security concept: availability. This type of analysis

Table 2. Some causes of and solutions to hunger by different framings of the research.

Alternative	Official
Causes	
Structural unbalances among countries	
Concentration of power in the hands of few, mostly transnational corporations	Lack of access to food
Lack of access and control of resources to produce food	No property in land
Over-dimensioned international market under free-trade premises favouring dumping	Agricultural products are not in the international market
Lack of public rural and agricultural policies	
Imposition of policies from outside, as a result of structural adjustment programmes or free-trade agreements	
External debt	
	There is not enough food
	Low agricultural productivity
Ecological exploitation	Ecological exploitation
Solutions	
Increase countries' decision capacity	Classical economy measures, e.g. deepening into the elimination of the existing barriers to international markets
Distribution of power among actors and countries	
Favour participation of society (peasants, citizens) in decision-making	
'Genuine' agrarian reforms, which include concepts such as territory, and integral rural policies	Land reforms based on the market
Context-specific solutions to be developed	
Appropriate technologies developed for local contexts.	Technologies to increase the production of food (e.g. GMOs) that respect the environment, in line with the green growth or bio-economy proposals
Recognition of the traditional and indigenous knowledge in a more integrated management of the resources	Increasing role of formal knowledge (bio-capitalism)

tends to separate the problem of hunger from other social and ecological problems. It is normally reductionist in focus, more based in natural sciences disciplines, with a nearly insignificant participation of social sciences. From a social sciences perspective, there is a predominant role of classical economics analysis and use of modelling. Hence, it is stated that some underlying reasons for food insecurity are normally linked to market failure, such as low agricultural productivity, no property of land, or the difficulty to introduce agricultural products in international markets. Exceptionally, it can be associated with ecological depletion (OECD, 2008, World Bank, 2008). Therefore, the solutions required are mostly technical (OECD, 1999), and global (panaceas), not context specific. Resulting from this analysis, this framing assumes that solutions to be developed must be based on new technologies that increase food production without depletion of the environment, market-based agrarian reform, or the reduction of barriers to international trade. One recent example of policy responses under this framing was the 2007–2008 food crisis. This framing resulted in the proposal of policies based on the formula of more production, more technology (to increase productivity), and more international trade. Some attempts have been made to integrate the food security issue with other global policies, such as climate change, which in turn accept the complex characteristics of the agri-food system (Godfray et al., 2010) and the food security issue. However, important components of alternative framing, such as participation, are not yet considered.

Alternative Framing: Causes of Hunger and Potential Solutions

Assessments based on alternative framings would suggest that the causes of hunger and rural poverty are more political than technical or nature dependent. The analysis would have a stronger component of social sciences and a smaller participation of natural sciences and they follow a right-to-food discourse (Table 2). In fact, they would assess that enough food is produced today to feed 12 billion people (Ziegler, 2008) and, thus, would frame the research not only in the availability component of food security. In general, they would assess that some structural reasons (stressors), such as lack of access and control of the productive resources (land, water, seeds), an oversized international market, differences in terms of power among countries, or lack of public policies directed to agriculture and rural areas (Vía Campesina, 1996; FOEI, 2008; UN, 2010) could be identified as causes of hunger. Temporary reasons (shock) would also exist, such as adverse climate conditions. This suggests that in the food security issue, ecological, social and economic vulnerability to all the potential sources of incertitude are present, including vulnerability linked to actions, actors and outcomes (Ericksen, 2008). This analysis results in policy responses suggesting that to tackle the issue of food security, diverse set of policies are needed to reinforce the capacity of countries to decide their own policies, distribute the power and enhance participation of society, and peasants in particular. In places where productivity is low, they would suggest reinforcement of peasant agriculture, local traditional knowledge and development of appropriate technologies. This requires a diversity of policies at different scales and admitting that no panaceas exist. Solutions proposed would be contextual to different places: some would favour development of appropriate technologies and valorization of local traditional knowledge, others would opt for development of integral rural development policies.

An obvious question to ask is whether these two framings could be integrated to facilitate the policy-making process in an issue as important as food security, but

this is a matter of future research. Probably the two framings will have important contributions to make to the food security problem in different contexts. Technical solutions are important, but unless political issues are considered, they will only result in partial success, if not more damage. Yet the official framing has two important constraints: first, it is locked into its own past success, thus constraining the future; and second, it considers the food security problem from only one of its components, availability (sufficient food for all people at all times).

What seems clear is that since food security is a condition for sustainability, it is urgent to introduce changes in agri-food assessments favouring the understanding and potential solutions to this problem, including an enhanced role of social sciences and a real integration of social and natural sciences. But, what can critical social scientists do to achieve this objective?

Conceptual Changes that Need to Be Introduced into Agri-food Assessments

Promotion of sustainability is an open evolutionary process of improving the management of social–ecological systems through, among other things, better understanding and knowledge (Rammel et al., 2007). This is applicable to agri-food systems and, more specifically, to the issue of food security. One major problem in the food security analysis is that social sciences play a minor, if any, role in the official framing, and alternative framings are in a minority within this topic in mainstream research. But food security is a social issue, as are most agri-food related problems, and unless this is recognized and put into practice in the research process, progress in this topic will be irrelevant. Thus, critical and devoted social scientists have to prompt a change in agri-food sciences that may be able to lead to a major paradigm shift. Some efforts have been developed in the past (Busch and Lacy, 1983; Busch, 1984). Also, Kloppenburg (1991) suggested a deconstruction of social and natural sciences to favour the research of an emergent alternative agriculture. Yet, 30 years later we are still dealing with the same discussion. However, today we are probably at a crucial historical moment to introduce some changes. Recent events (2007–2008 food crisis, increasing droughts in several countries, revolts in some Arab countries) together with the other global crises (environmental and financial) may suggest that we are in a process of transformation of our societies, and could open a 'window of opportunity' (Gelcich et al., 2010) to bring changes into the food system with an increasing role of the social sciences. The food crisis, which joined the environmental and economical crises, can be viewed as an opportunity to redesign the agri-food system. We are at a turning point, in a transition process that requires different research strategies. Furthermore, two realities are converging that can favour the consideration of alternative framings within agri-food research. One is the emergence of sustainability science and its research tools, which by definition analyses socio-ecological complex systems through the combined action of both social and natural sciences. The second is the existence of a global organized civil society that has put at the centre of the food security (and other agri-food related) debate the human-right narrative, and is demanding an alternative framing of research. This civil society is led by small farmers' organizations grouped in the so-called La Vía Campesina, claiming the central role of peasant agriculture and peasants to reduce world hunger.

What Could Social Sciences Do to Favour Other Framings in Agri-food Research?

Critical sociologists argue that we should embrace complex visions that assume uncertainties, contradictions, and emergent properties arising from the parts (or actors) involved in a system (Morin, 1992). In the agri-food sciences, it is evident that social scientists introduce these elements into their research process and we need to expand this thinking to natural scientists too. There have been past efforts in rural sociology to promote changes that could favour alternative framings of agri-food research. Currently, the most straight-forward way to favour this expansion is the inclusion of agri-food science into the theoretical framework provided by sustainability science, which includes the recognition of agri-food systems as complex socio-ecological systems (SES). This change can be understood as conservative, simple and not a relevant change, but in fact can promote a major paradigm shift in agri-food sciences to introduce new elements in the research process, calling for a greater role of the social sciences. For instance, one intrinsic characteristic of SES is the ignorance condition. Recognition of ignorance brings many conceptual changes, as described by Rivera-Ferre and Ortega-Cerdà (2011), including changes in the governance of agri-food systems or the democratization of knowledge-base production, all requiring of social analysis. It can also facilitate the theoretical framework under which researchers perform vulnerability assessments of agri-food systems, and thus their capacity to adapt to changes. For instance, Turner et al. (2003) suggest that development of vulnerability analysis draws on three major components: entitlement (e.g. legal and customary rights to exercise command over food and other necessities of life), coping through diversity (diversity as an strategy to reduce risks) and resilience (global systems are not resilient, their adaptive capacity to surprises is small, contrary to local systems). In agriculture this is translated into strategies linked traditionally to alternative framings, including: analysis of access to resources (land, water, seeds) vs. control of resources in the hands of few (concentration); analysis of biodiversity vs. monoculture or homogenization; analysis of local, context-specific farming (traditional peasant agriculture) vs. long-distance farming (industrial, export-oriented agriculture).

If the objective of critical social scientists is to favour the recognition of alternative framings and enhance a shift in mainstream research, then they need to work together with scientists from other disciplines who are also interested in alternative framing of research, but also with people outside science working under different narratives, such as the human-right narrative previously described. The ideal would be to work with real practical experiences and proposals. For instance, if food sovereignty seems a reasonable policy proposal, then the academy should put efforts in analysing the proposal both to produce improvements and to demonstrate its viability, or not. Other actions aiming at introducing changes in agri-food research to favour alternative framings could include the following.

- Social scientists must make claim for the non-instrumental function of science. If Constanza (2008) calls for a 'science of happiness', we can call for a 'science of "buen vivir"', which should include the capacity to think critically, generate analysis and transmit concepts.
- Social scientists can contribute to analysis dismantling the myths of industrial agri-food systems, probing its inconsistencies, or showing the social impacts of such system, using the scientific method just as the environmental scientists did with the impacts on the environment.

- Propose and analyse alternatives for and with the society, e.g. using post-normal science premises (Funtowicz and Ravetz, 1990).
- Change attitudes and paradigms to favour a transition towards new framings.
- Promote changes in scientific institutions, since current structures do not favour the elements required to perform alternative framings.

One Example: Science for Majorities or Science for Minorities?

Today nearly 1,000 million people suffer from hunger and 80% of them live from agriculture, fisheries, pastoralism and recollection activities in rural areas (Sanchez et al., 2005). For that reason, there is a general consensus that in order to reduce hunger and poverty more investments in agriculture and agricultural research and agricultural knowledge are needed (World Bank, 2008; McIntyre et al., 2009), but… for which type of agriculture? Here a consensus does not exist while it is an important policy-making decision, since the targeted population and actors differ depending on which type of agriculture is the subject of 'development' and the mechanisms adopted to promote it. Clearly, the role given to agriculture in society will affect this decision, as well as the role of science linked to the concept of development. That is, it is conditioned by the framing of the research. For that reason, after recognizing that in a knowledge society science is also a source of power, it is important that scientists consider which power science is providing and to whom, which type of science shall be studied and with which objectives. Of course this is a subject dealing directly with ethical issues far beyond the objectives of this article, but it is interesting to exemplify one type of analysis that social scientists could perform in favour of alternative framings, in this case by dismantling myths linked to industrial agriculture.

Several data provided by the ETC Group and other organizations can give us some clues about the type of research presently performed in the agri-food system. In terms of research and development (R&D) investments in food and agriculture, 96% of them occur in industrialized countries, of which 80% is dedicated to research into the processing and distribution of food, not production (ETC Group, 2009). In terms of agricultural production, there is a clear bias towards the support of industrial agriculture and biotechnology against local, traditional or organic agricultural production. For instance, it is estimated that the agriculture and food biotechnology sector in Spain receives 60 times more support from public R&D investment than research in organic agriculture (€54.3 million vs. €0.9 million in 2008, according to Amigos de la Tierra, 2010). In the USA, the difference is approximately 42 times more in support to biotechnology against organic agriculture in 2001 ($210 million vs. $5 million; Wynen and Vanzetti, 2002). In this country, of all existing experimental farms, only 0.1% of land is dedicated to organic agriculture research. Quite probably, these differences would be even higher if private R&D funds were considered.

However, when we relate the type of agriculture funded by R&D investments with the type of agriculture practised by most peasants in the world, the direction of the arrows is opposite (Figure 2). According to the ETC Group, peasants, who cultivate using the local, traditional, peasant type of farming, represent almost half of the world population and they cultivate more than 70% of world food (Figure 3). Furthermore, 85% of food produced worldwide is consumed in the same ecological region (ETC Group, 2009). Thus, it seems that nowadays food is made by peasants to

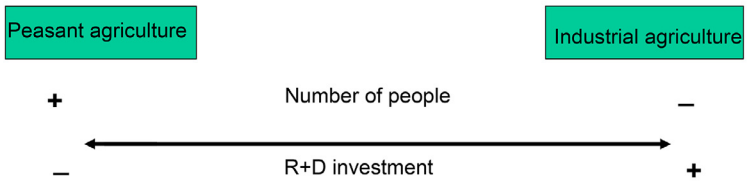

Figure 2. Funding of agricultural research by agricultural type and the number of people who practice it.

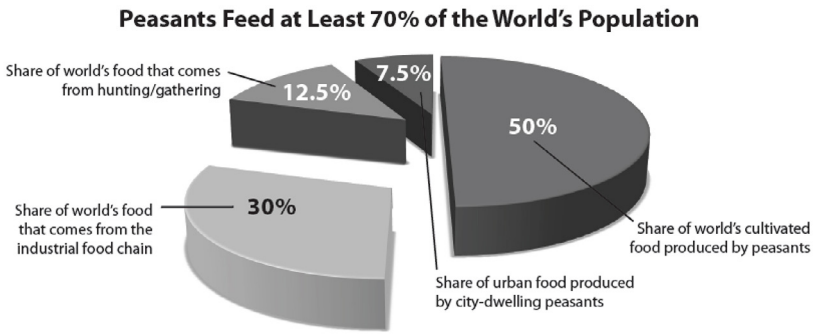

Figure 3. Share of world food by actors.
Source: ETC Group, 2009.

be eaten locally, but agricultural science is made for a type of farming that is not related to them. Thus, is our science a science for majorities or a science for minorities?

Conclusions

Framing of research, understood as the context in which mental models derived from a given discourse describing socially specific representations of information about reality are embedded and give sense to it, determine the assessment process of a given problem. In the case of agri-food research, and more specifically in the case of food security, framing is affected by both the role of agriculture in society and the role of science in society under the concept of development. As a result, two opposite framings may exist: alternative and official, with different research questions and approaches to address the problem of food security. Thus, analysis can be simplistic, when only one discipline or field of knowledge is used for the assessment, or it can be complex. The latter normally happens when inter- or trans-disciplinarity is at the basis of the assessment. As a result of these assessments, the solutions provided can be either simple, normally searching for a panacea to solve the problem of food security, or complex, enhancing the participation of actors and more adapted to the specific context in which the problem emerges and, thus, more diverse. To favour a paradigm shift in agri-food sciences that recognizes the role played by the social sciences in agri-food assessments for food security, social scientists can call for the recognition of agri-food systems as complex SES under the umbrella of sustainability sciences, and work together with those natural scientists willing to introduce

changes into their assessments. Important conceptual changes can be derived after recognition of agri-food systems as SES, with implications both at the scientific and al the policy levels.

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