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Developing tools to assess agri-food systems responses to food sovereignty policies: A conceptual and methodological approach through integration of SES and vulnerability frameworks

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Abstract[1]

Agri-food systems assessments can be performed following different framings, e.g., *official* and *alternative* frames of research, each of them linked to different policy options. For instance, policies for *food security* are specially linked to *official frames*, while *food sovereignty* requires of *alternative frames*. Within an alternative frame agri-food systems, commonly defined as a set of activities ranging from production through to consumption, can be conceptualized as integration and processes of interaction between humans and the agro-environment, i.e. complex social-ecological systems (hereafter SES). Conceptualizing agri-food systems as SES and assessing their future vulnerability to global change and responses to food policies requires of new integrated frameworks. Here we propose to integrate the general conceptual and methodological SES framework proposed by Ostrom (2007; last revision in 2013) with the framework of vulnerability. Conceptually, the SES framework provides a common language and a logical linguistic structure for classifying those factors deemed to be important influences on the SES behaviour. The vulnerability framework takes into account context-specific characteristics of sensitivity and capacity to adapt (at individual and collective level) generated and influenced by multiple factors and process, including the perception of actors about vulnerability for whom, at which scale and to what. Methodologically, the SES framework allows us identifying the boundary and components of SES, moving across spatial scales and institutional levels. The framework analyzes how interactions may produce certain outcomes, such as impacts on food production and self-sufficiency, affected by internal feedbacks and external forces. The integration between the system-oriented and the actor-oriented frameworks allows us analyzing the relationships between vulnerability, resilience and adaptive capacity as properties of the agri-food system, moving beyond the food security official focus. The establishment of this link is important in the research of sustainable agri-food systems to socio-economic, political and environmental changes.

Introduction

In agriculture and food policies many complex goals exist, being one of them to achieve food for all. In this context, food should be conceived as a human right (UN, 1948, 1966; De Schutter, 2013), with both material and symbolic power, given it embodies complex links between nature, human survival, health, culture and livelihood (McMichael, 2000). To understand these interrelationships is necessary to rethink the way agri-food systems' are studied and managed (Rivera-Ferre, 2012; Rivera-Ferre *et al.*, 2013). Rivera-Ferre (2012) suggests that agri-food system studies are mainly determined by both the role of agriculture in society and the role of science in society under the current concept of development, resulting in two different research framings: *alternative* and *official* (table 1). The *official frame* tends to analyze agri-food systems mainly from natural sciences, separating the social

[1] Note: Work in progress specially written for the food sovereignty conference – comments welcomed.

and ecological components to study the system, and focusing in developing blueprint approaches to predict changes and design market-centered policies (Rivera-Ferre, 2012). These policies are grounded within the neoclassical economic paradigm, which emphasizes that the 'invisible hand' of the marketplace will encourage or discourage various adjustments of agri-food systems (Chen & Kates, 1994: 4). The problems are viewed as 'market failures', which can be overcame with simple and technocratic solutions (Chen & Kates, 1994; Rivera-Ferre, 2012). The neoliberal paradigm in agri-food systems, institutionalized by the World Trade Organization (WTO), has involved huge subsidies to Northern agribusiness jointly with lowering trade barriers, allowing the artificial cheapening of agro-exports via a below-production-cost which in turn has undercut small-farming cultures, both from Northern farmers and Southern peasants, and their forms of eco-system management (McMichael, 2005; quoted in McMichael, 2011: 805).

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 simplifica-tion processes
	Interdisciplinarity/ Transdisciplinarity	High	Null or very little. Fragmenta-tion 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	Non-replicable

	technologies	technologies
Vision of science	Complex vision of science Constructionist approach	Instrumental vision of science Positivist approach
Policy responses	Address power structures, alternative development path-ways, integrated response	Economic growth, sectorial responses

Source: Rivera-Ferre (2012).

The *alternative frame* of research tends to combine natural, social and political sciences to study agri-food system as a complex socio-ecological system (SES), analyzing diverse strategies according the social, cultural and environmental context for supporting the design of people-centered polices linked to alternative development pathways based on human rights perspective (Rivera-Ferre, 2012). The objective is mainly to assess scenarios, where local areas explore proactive adaptive management (MA, 2005: 14-15). The human rights perspective, 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, Vía Campesina), advocates by healthy and culturally adequate food. It is based on participation and enhances access rights, equity and social responsibility (De Schutter, 2013).

Given the failure of most food policies to tackle the problem of hunger and rural poverty, new agri-food management should consider exploring new policy options that go beyond those focusing only on food security[2] (Maxwell & Slater, 2003). In the last decades an alternative policy goal of food sovereignty, a term coined by the international farming and peasant movement *Vía Campesina* in 1996, has been taking emphasis in the academic milieu and policy discourse (Martinez-Alier *et al.*, 2011; Aistara, 2013). This approach includes different claims related to institutions, governance, and agricultural systems (*Vía Campesina*, 2009) which go beyond the technical focus of the food security approach. Consequently, agri-food studies should adapt to these new policies (Rivera-Ferre, 2012) and conceptualize agri-food systems as complex socio-ecological systems (hereafter SES) (Ericksen, 2008b; Rivera-Ferre *et al.*, 2013); paying special attention to their institutional, socio-economic, and agro-ecological dimensions (Fraser, 2007, 2011), as suggested by alternative research frames (Table 1). Agri-food studies, specifically those aiming to assess agri-food systems under polices of food sovereignty, have centered their research mainly in the development of food sovereignty indicators (Entrepueblos & IEEEP, 2010; Rivera-Ferre &

[2] Food security is defined as "a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2001).

Ortega-Cerdà, 2010; Badal *et al.*, 2011). However, indicators are not enough when analyzing agri-food systems as complex SES. They are not able, for instance, to study the system interactions and how they affect specific outcomes, namely those leading to food sovereignty.

Agri-food systems, defined as a set of activities ranging from production through to consumption, respond in different manner to environmental, socio-economic and policy changes (Ingram & Brklacich, 2002; Ericksen 2008b; Ingram, 2009). As these changes can lead to system's modifications, desirable or not (Ingram, 2009) there is growing concern regarding future global environmental change and their potential implications for agri-food systems at various spatial scales (Ericksen *et al.*, 2009; Ingram *et al.*, 2010; Vermeule *et al.*, 2010; Ziervogel & Ericksen, 2010; Vermeule *et al.*, 2012; FAO, 2013). Within a context of global environmental change, addressing the analysis of institutions[3] in the assessment of responses of agri-food systems to changes, as well as their vulnerability to long-lasting change and crisis, can lead to develop context-specific policy processes to respond and /or adapt to change (Ostrom, 2001). Therefore, policy and institutional interventions are key issues to enable adaptation to global environmental change in agri-food systems (Ziervogel & Ericksen, 2010). Institutions play, thus, a key role in designing food sovereignty policy goals.

Vulnerability of local systems to global environmental change strictly links to social and institutional sensitivity and adaptive capacity (Agrawal, 2008; Agrawal & Perrin, 2008). However, the assessment of agri-food systems vulnerability to global environmental change has given little attention, up to date, to social and institutional factors. In fact, vulnerability studies applied to agri-food systems have been more focused on the nexus between agriculture (food production) and climate variations (e.g., UNDP, 2007; IPCC, 2007; FAO, 2008; World Bank, 2010; Ericksen *et al.,* 2011*;* Smith & Gregory, 2012; Yu *et al.*, 2012), even when they include societal factors, such as food consumption (e.g., INRA/CIRAD, 2009), poverty (e.g., Hertel & Rosch, 2010), economic implications of adaptation (e.g., Nelson *et al.*, 2009; Nelson *et al.*, 2010), and policy (e.g., Appendini & Liverman, 1994; Downing & Parry, 1994; Rosenberg & Scott, 1994; FAO, 2007). Although recent researches start up providing assessments across the whole food system (e.g., ESF/COST, 2009) taking into account both social and environmental change (see framework proposed by Ericksen 2008b), these approaches tend to analyze agri-food systems from an official, more technical and food security oriented, perspective.

The article proposes to draw an integrated framework for assessing the response of agri-food systems to socio-economic, political and environmental changes, focusing in how agri-food system outcomes, e.g., those contributing to food sovereignty, are differently affected

[3] Institutions, in this case, are defined as "human-constructed constraints or opportunities within which individual choices take place and which shape the consequences of their choices" (McGinnis, 2011: 170).

by different food policy scenarios. To do this, we link conceptual and theoretical reflections from institutional economy, and specifically Ostrom's approach to study SES and vulnerability studies applied to agri-food system as a unit of analysis. This framework may contribute to highlight underlying components of vulnerability of local agri-food systems to socio-economic, political and environmental changes. The paper also contributes to the understanding of the role of social and institutional adjustments and adaptation to these changes.

The paper is organized as follow: in the second section, we present food sovereignty as an alternative policy goal for the management of agri-food systems. We show the potential of SESs approach to conceptualize agri-food systems as complex systems. We emphasize the need of applying a new integrated research framework for the assessment of alternative policy goals. We, then, present the SES framework proposed by Ostrom (2007) as useful methodological tool for analyzing agri-food systems (section third). In the fourth section, we show a brief historical review of vulnerability interpretations and the importance of considering vulnerability as characteristic generated by exposure, sensitivity and adaptive capacity and influenced by multiple factors, processes and perceptions. The last section describes in detail the proposed integrated framework, which attempts to integrate the agri-food system as complex SES within the vulnerability framework of assessment, having as example food sovereignty as core policy goal. We, finally, show some remarks for future applications of the integrated framework to an empirical research case.

Food sovereignty: an alternative policy goal

Food sovereignty is a controversial policy proposal that encompasses both a social countermovement and a policy discourse that explicitly challenge the current food regime (McMichael, 2013). Food sovereignty is fairly a new alternative policy goal, first brought to international attention at the World Food Summit organized by Food and Agricultural Organization (FAO) in 1996, championed by the farming and peasant movement Via Campesina[4] and opposite to the neoliberal view of agri-food systems (Borras, 2004; Desmarais, 2008; Pimbert, 2009; Desmarais & Nicholson, 2013). Food sovereignty questioned the potential impacts and risks of agriculture industrialization and globalization on social, ecological and economic contexts (Altieri, 2009; McMichael, 2011, 2013), e.g., their impacts on farmers across the world or their contributions to climate change. These societal and environmental concerns have also been taking emphasis within the academia which has resulted in a dialectic and dynamic relationship between science and activism (Martinez-Alier *et al.*, 2011). Food sovereignty is defined as the right of peoples and nations

[4] "La Vía Campesina is an international movement embracing organizations of peasants, small and medium-scale farmers, rural women, farm workers and indigenous agrarian communities in Asia, the Americas, Europe and Africa. It provides opportunities for peasants to articulate a coherent set of demands in the international arena" (Desmarais, 2008: 138).

to *"healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems"* (Vía Campesina, 2009: 147). But since food sovereignty encompasses complex objectives and claims from the academia it is also conceived as a contested concept. Some scholars interpret the concept as a feasible alternative (van der Ploeg, 2013), while others are skeptical when they address the concretization of its objectives (Bernstein, 2013). In this line authors point that although food sovereignty is an invitation to address important social relations such as class and power, it needs to consider them as prerequisites to achieve its objectives (Patel, 2009). Hence, addressing food sovereignty represents an important theoretical and practical challenge within the social science research (van der Ploeg, 2013).

This paper uses the food sovereignty discourse given by La Via Campesina (2009) to develop an integrated framework of food policy analysis. Stemming from that definition some priority areas emerge (IPC, no date) which can be analyzed through the so-called pillars of food sovereignty: right to food, access to productive resources, production models based on agro-ecological approaches and peasant agriculture, trade and local markets, and agrarian policies (Ortega-Cerdà & Rivera-Ferre, 2010). As food sovereignty encompasses claims related to institutions, governance, and agricultural systems that operate at different scales, food sovereignty could play as a mean to achieve sustainability, social justice and resiliency[5] within social and ecological components of the agri-food system. But to analyze this alternative policy and societal goal is necessary to create new frames of agri-food research that consider both the socio-ecological contexts of agri-food systems and the social function of agriculture to fulfill the human right to food, as required by alternative frames of research.

Previous research aiming to evaluate food sovereignty polices have been based in the development of indicators for different spatial levels, e.g., regional and international levels (Entrepueblos & IEEEP, 2010; Rivera-Ferre & Ortega-Cerdà, 2010; Badal *et al.*, 2011). But indicators are not enough to analyze the cross-scale interactions within and between the components of agri-food systems under the political and societal goals of food sovereignty. Food sovereignty encompasses issues of different nature e.g.: the seed diversity within agro-ecological dimension; the importance of resources generated from agro-ecosystems within socio-economic dimension, as well as, the traditional/ indigenous knowledge of actors to perform agri-food activities; and, the questioning of power structures within institutional dimension of the agri-food systems. Assessments based on complex system thinking, as SES approach, allow analyzing these cross-scale interactions and how they are affected by external socio-economic, political and environmental drivers such as changes in policies relating to agri-food systems.

[5] As sustainability (capacity to continue a desired condition or process, social or ecological) and resiliency (ability of a system to adjust its configuration and function under disturbance) can conflict (Allen *et al.*, 2003: 26) the societal goal of agri-food system should encompass these two aims.

Conceptualization of Socio-Ecological Systems (SESs) and vulnerability approaches to analyze agri-food system under alternative frames of research

SES conceptualization is derived from complex system thinking (Constanza *et al.*, 1993; Kauffman, 1993; Holling, 1994; Ison *et al.*, 1997; Berkes and Folke, 1998). "*Complex systems are characterized by strong (usually non-linear) interactions between the parts, complex feedback loops that make it difficult to distinguish cause from effect, and significant time and space lags, discontinuities, thresholds, and limits*" (Constanza *et al.*, 1993: 545). In complex systems the surprises emerge from coupling of human time and spatial scales with smaller and larger ones in nature (Holling, 1994: 599). The complex system thinking is the basis of sustainability science (Berkes *et al.*, 2003: 2); which uses as analytical unit the SES (Gallopín *et al.*, 2001; Kates *et al.*, 2001). Ostrom defines SES as:

> [a complex system] *composed of multiple subsystems and internal variables within these subsystems at multiple levels* (…) [where these subsystems] *are relatively separable but interact to produce outcomes at the SES level, which in turn feed back to affect these subsystems and their components, as well other larger or smaller SESs* (Ostrom, 2009: 419).

SES conceptualization allows the study of complex, multivariable, nonlinear, cross-scale in time and space, self-organizing and changing systems to enable diagnosis of the problems and potentialities of any complex adaptive SESs (Holling *et al.*, 1998; Berkes *et al.*, 2003; Ostrom *et al.*, 2007; Ostrom, 2007; Ostrom, 2009; Ostrom & Cox, 2010; Cox, 2011). According to Becker (2012) the concept of SES has proven itself the strongest and most convincing candidate in the contest for a boundary object relevant both to sustainability science and to the study of the manifold of interdependencies among natural and social processes along different temporal and spatial scales.

Since all humanly used resources, as those used to perform agri-food activities, are embedded in complex SESs (Ostrom, 2009); both agricultural and food systems are complex SESs. According to Ericksen (2008a: 234-235) the food system includes: (a) The interactions between and within biogeophysical and human environments, which determine the food activities. (b) The activities themselves, i.e., the production, process and package, distribution and retail, and consumption (see Table 4). (c) The outcomes of these activities, which can contribute to food security, environmental and social welfare, or in our case to food sovereignty. (d) And other determinants or drivers of these outcomes; stemming in part from the interactions, rather than food system activities directly. Agricultural and food systems show complex interactions associated with evolving environmental, agricultural, socio-economic and institutional systems that are heterogeneous in space and time, multidimensional in nature and with high variability, uncertainty and potential surprises (Chen & Kates, 1994; Downing & Parry; 1994; Ericksen, 2008a, 2008b; Liverman & Kapadia,

2010; Rivera-Ferre *et al.*, 2013). These dynamic interactions are vulnerable to short-term shocks (e.g., pricing) and long-term stresses (e.g., climate change) (Ericksen, 2008b; Thompson & Scoones, 2009). Hence agri-food systems may or may not result in a desirable outcome for the target unit of analysis; the drivers can "disrupt" or "distort" the food system so that it does not deliver the desired outcome (Ericksen, 2008a; Ingram, 2009).

To assess any alternative policy and societal goal, such as food sovereignty, it is necessary to use frameworks that do not only conceptualize agri-food systems as complex SESs but also that take into account the perceptions and claims of actors. One way to perform this type of assessments is through the integration between system-oriented approaches, such as SES framework, and actor-oriented approaches, such as vulnerability frameworks. Vulnerability analysis looks at the processes of negotiation, decision making, and action of actors; and, SES analysis complements this approach by examining the implications of these processes on the rest of the SES (Nelson *et al.*, 2007) i.e., on agri-food systems. In this line, we propose an integrated conceptual and methodological framework based on the linkages of SES (Ostrom 2007; reviewed in 2013) and contextual and perceptive vulnerability frameworks (proposed by Adger, 2006 and operationalized by Fraser 2007, 2011) to assess the responses of agri-food systems to socio-economic, political and environmental changes to move beyond the food security official focus. Particularly we are interested in determining how the system respond to policies centered on food sovereignty.

Socio-Ecological Systems (SESs) methodological framework

The Nobel Prize winning economist Elionor Ostrom in "A Diagnostic Approach for Going beyond Panaceas" (2007) proposes a nested, multitier framework to analyze any SES across the spatial and temporal dimensions (first version in 2007; revised in Ostrom, 2009; McGinnis, 2010; McGinnis & Ostrom, 2012; McGinnis, 2013). Ostrom (2007) bridges biophysical and social science research to establish a common conceptual language and a logical linguistic structure for classifying those factors deemed to be important influences on the types of SESs of most interest to researchers in the context of sustainability study of complex SESs (McGinnis & Ostrom, 2012).

> [SES framework examines] *the nested attributes of a resource system and the resource units generated by that system that jointly affect the incentives of users within a set of rules crafted by local, distal, or nested governance systems to affect interactions and outcomes over time* (Ostrom, 2007: 15181).

This framework shows SES as complex system partially decomposable in subsystems, i.e., as an ontological or nested-tiers framework (Ostrom, 2012: 115) where the broad first variables can be discomposed in second-tier variables, also called explanatory factors, and these likewise can be discomposed in more detailed variables, also called empirical

indicators (McGinnis & Ostrom, 2012). The key is assessing which variables at multiple tiers across the biophysical and social domains affect human behavior and social–ecological outcomes over time (multi-tiered diagnostic approach).

The SES framework, see figure 1, shows eight broad core variables or first-tier core components (S, RS, RSU, GS, A, I, O and ECO) that enables to organize the analysis of any SES. These core variables can be unpacked and further unpacked into multiple conceptual tiers depending on the specific empirical or policy question under investigation. Thus, the SES framework allows moving between scales and levels to help explaining the differences in outcomes within a SES (Ostrom, 2007, 2009, 2012; McGinnis & Ostrom, 2012). Here scales are used to refer to dimensions, e.g., spatial, temporal, institutional, etc; and, levels are used to refer to specific positions on any given scale, e.g., within the institutional scale there are mainly three levels: operational rules, collective-choice rules and constitutional rules (Cash *et al.*, 2006; Ostrom, 2007; Brondizio *et al*, 2009). Table 2 presents examples of second-tier variables under first-tier core components in a framework for analyzing SES (Ostrom, 2009; McGinnis 2013).

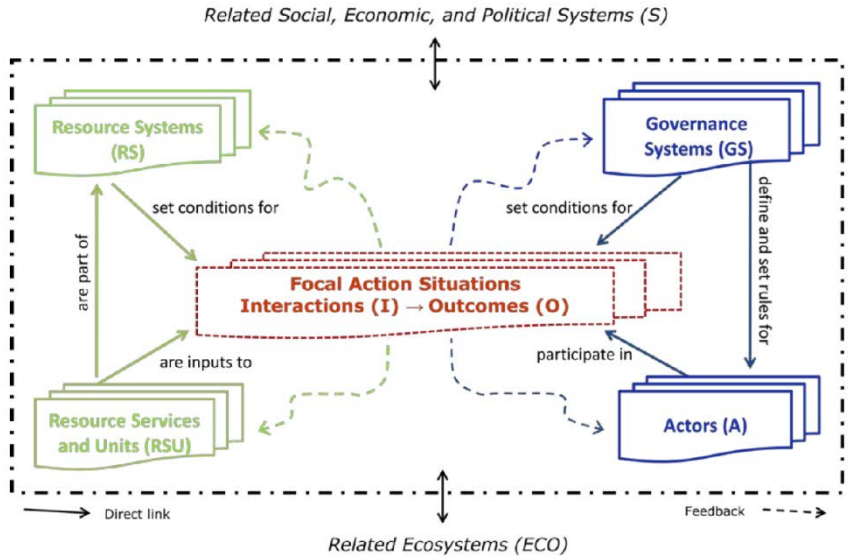


Figure 1. The core components in a framework for analyzing social-ecological systems
Source: McGinnis (2013: 36)

In figure 1, the broad variables Resource System (RS); Resource Services and Units (RSU); Governance System (GS); Actors (A); and Focal Action Situation: Interactions (I) and Outcomes (O); are represented by rectangular boxes, the arrows show the relation between them, the dashed arrows show the feedbacks between them, the dotted-and-dashed box encompass these elements to show the focal SES as a whole. This focal system is embedded in Social, Economic and Political Settings (S) and Related Ecosystems (ECO), both of which could be larger or smaller than the focal system. S and ECO variables are represented outside from focal box. These are the exogenous forces, also called drivers that influence the SES and vice versa. These influences are shown by the bidirectional arrows (Ostrom, 2007, 2009, 2012; McGinnis, 2013). The dynamic nature of the presentation of the SES

framework is shown through the feedback presented in the figure (McGinnis, 2013). McGinnis & Ostrom (2012) mention that although each subsystem (i.e., RS, RSU, A and GS) is itself dynamic, the most dynamic processes in the SES framework occur in the focal action situations. They stress that dynamic representation has a key repercussion for addressing the individual and collective learning within the SES through the analyses of the focal action situation "*where human activities directly impact natural processes, and vice versa*" (McGinnis & Ostrom, 2012: 18). The learning occurs within and across focal action situations on multiples scales of time through a complex process of adaptation to new circumstances also referred as learning loops (Pahl-Wostl, 2009). In this paper the SES framework allows us to evaluate how different strategies relating to agri-food systems can result in different patterns of interactions and outcomes (focal action situation) when an agri-food system is analyzed under a given development pathway or political context, in our case, food sovereignty policies.

Table 2. Second-tier variables under first-tier core components (S, RS, RU, GS, A, I, O and ECO) in a framework for analyzing social-ecological systems

Social, Economic, and Political Settings (S)	
S1-Economic development. S2-Demographic trends. S3-Political stability. S4-Government resource policies. S5-Market incentives. S6-Media organization.	
Resource Systems(RS)	**Governance Systems (GS)**
RS1-Sector (e.g., water, forests, pasture, fish)	GS1-Government organizations
RS2-Clarity of system boundaries	GS2-Nongovernment organizations
RS3-Size of resource system*	GS3-Network structure
RS4-Human-constructed facilities	GS4-Property-rights systems
RS5-Productivity of system*	GS5-Operational rules
RS6-Equilibrium properties	GS6-Collective-choice rules*
RS7-Predictability of system dynamics*	GS7-Constitutional rules
RS8-Storage characteristics	GS8-Monitoring and sanctioning rules
RS9-Location	
Resource Services and Units (RSU)	**Actors (A)**
RU1-Resource unit mobility*	A1-Number of actors*
RU2-Growth or replacement rate	A2-Socioeconomic attributes of actors
RU3-Interaction among resource units	A3-History of use
RU4-Economic value	A4-Location
RU5-Number of units	A5-Leadership/entrepreneurship*
RU6-Distinctive markings	A6-Norms (trust-reciprocity)/social capital*
RU7-Spatial and temporal distribution	A7-Knowledge of SES/mental models*
	A8-Importance of resource

	(dependence)*
	A9-Technology used
Focal Action Situations: Interactions (I) →Outcomes (O)	
I1-Harvesting levels	O1-Social performance measures (e.g., efficiency, equity, accountability, sustainability)
I2-Information sharing	
I3-Deliberation processes	
I4-Conflicts	O2-Ecological performance measures (e.g., overharvested, resilience, biodiversity, sustainability)
I5-Investment activities	
I6-Lobbying activities	
I7-Self-organizing activities	O3-Externalities to other SESs
I8-Networking activities	
I9-Monitoring activities	
Related Ecosystems (ECO)	
ECO1-Climate patterns. ECO2-Pollution patterns. ECO3-Flows into and out of focal SES	

**Subset of variables found to be associated with self-organization (Ostrom, 2009: 421).*
Source: adapted from McGinnis (2013: 35)

The SES framework should help us to identify parts of a SES which are potentially vulnerable to internal and external disturbances and to identify design principles for institutions leading to robust SES (Anderies *et al.* 2004). In sum, SES framework has been used by environmental scientists for years, but only recently definition of SES as epistemic objects has been proposed (Becker, 2012) and this can help to introduce modifications in the framework to address social-related concerns. Analysis of SES by social scientists have shown that some limitations exist in the analysis of social dynamics, and thus in the use of SES framework to analyze agri-food systems: (i) SES framework has mainly been used to address management of natural resources in which society is embedded and where ecological principles are used to analyze social dynamics, problematically assuming that social and ecological dynamics are essentially similar; (ii) as currently conceptualized, SES framework does not allow introducing normative questions, such as "resilience of what and for whom?", leaving behind the role of power, culture or worldviews that affect social-ecological systems and determine different configuration of SES. Changes to SES have been proposed to meet social theory. Cote and Nightingale (2012) argue that normative factors, including power relations and cultural values, are integral to social change and to the institutional dynamics that mediate human-environment interactions. They suggest that power operates in and through SES in ways that link together the social and conceptual as well as empirical levels. To address some of these gaps in the SES framework we propose to combine it with the vulnerability framework.

Vulnerability conceptual and methodological framework

System vulnerability has been conceptualized in different manners for its analysis (see e.g., Bohle *et al.* 1994; Burton *et al.*, 2002; O'Brien *et al.*, 2004; Adger, 2006; O'Brien *et al.*, 2007). Our approach is based on the interpretations given by O'Brien *et al.* (2004, 2007). They distinguish between *outcome* or *"end-point" vulnerability* and *contextual* or *"start-point"* vulnerability.

The first interpretation i.e., outcome vulnerability, focuses on vulnerability as a result of global change impacts (O'Brien *et al.*, 2004, 2007). According to Burton *et al.* (2002) vulnerability studies under this interpretation are included in the "first generation" of adaptation research or "impacts/mitigation" research. This kind of studies are based on future climate studies (climate scenarios) without considering the current state of the systems that will be impacted, i.e., the socio-economic changes and policy context of adaptation have less attention than climate change (Burton *et al.*, 2002). Official assessments from Intergovernmental Panel on Climate Change (IPPCC) were mainly inspired by this approach (Burton *et al.*, 2002).

The second interpretation, i.e., contextual vulnerability, views vulnerability as a general characteristic generated by multiple factors and processes (O'Brien *et al.*, 2004). It focuses on the institutional, biophysical, socio-economic and technological conditions that affect the extent of exposure of the system to climate changes, alongside other types of changes (e.g., political and institutional changes), and the ways in which the system exposed can respond in both the short and long-term (O'Brien *et al.*, 2007). Contextual vulnerability draws attention to the factors that make some people or groups disproportionately vulnerable to hazards, shocks and stressors (O'Brien *et al.*, 2007). In this sense, scholars (see e.g., Bohle *et al.* 1994; Adger, 1999; Kelly and Adger, 2000; Kasperson *et al.*, 2005) point out that not only underlying factors, such as political and socio-economic processes and structures, but also values and world views make some people and places more vulnerable to extreme events than others. In fact, they can affect the thresholds and perceptions of vulnerability (i.e. sensitivity to exposure and potential avenues of action) among individuals and groups, even when they confront seemingly identical risks. The perceptions and the social and cultural evaluation of stresses influence on both the recognition of stresses and the decisions of coping, adaptation, and adjustment (Kasperson *et al.*, 2005). This constructivist perspective of vulnerability is defined from an actor oriented approach (McLaughlin & Dietz, 2008). Recent studies suggest that also political discourses affect the perception of risks and can influence in their biophysical and social production (Rebotier, 2012). The contextual and perceptive interpretation of vulnerability is consistent with what Burton *et al.* (2002) denominate "second generation" of adaptation research or "vulnerability/adaptation" research.

Applying the contextual vulnerability concept to the agri-food context, some preliminary studies suggest that patterns of access to resources, strength of social networks, ability to mobilize labor, and other socioeconomic and institutional characteristics determine different levels of food insecurity among groups or regions (Downing, 1993). Moreover, agricultural policies can have differential impacts on different groups (Appendini & Liverman; 1994). Recent empirical research has focused on individual and collective sensitivity and capacity to respond and adapt when exposed to change (Fraser, 2007); and, in the role of local institutions in promoting effective adaptation and enhancing adaptive capacity of vulnerable rural populations (Agrawal, 2008). Given that different policy responses could differently affect the complex nature of agri-food systems, we propose to use the contextual approach for the assessment of vulnerability to those responses. Within this corpus of researches, Adger (2006) provide a vulnerability conceptualization which merges two research traditions in order to propose a way to operationalize the contextual interpretation of vulnerability: i) the analysis of vulnerability as lack of entitlements (see e.g., Sen, 1980) and ii) the analysis of vulnerability as sensitivity to natural hazards (see e.g., Blaikie *et al.*, 1994). Entitlements-based explanations of vulnerability are mainly focused on the social realm of institutions, well-being and on class, social status and gender as important variables (Adger, 2006). Vulnerability research on natural hazards provides an integral knowledge of environmental risks and human susceptibility and capacity of response, drawn on geographical and psychological perspectives in addition to social parameters of risk (Adger, 2006). Thus, Adger (2006) integrates the entitlement approach that tends to focus at an individual level with the natural hazards approach that tends to focus at a system level and conceptualizes vulnerability as a characteristic of a system and as a function of exposure, sensitivity and adaptive capacity in a specific time and spatial context, where:

> *Exposure is the nature and degree to which a system experiences environmental or socio-political stress. The characteristics of these stresses include their magnitude, frequency, duration and areal extent of the hazard (Burton et al., 1993). Sensitivity is the degree to which a system is modified or affected by perturbations*. [And] *Adaptive capacity is the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope* (Adger, 2006: 270).

However, as suggested by Gallopín (2006) we consider exposure as a relational property, which implies that vulnerability becomes a property of the system expressed/revealed when the system is exposed to perturbation or stress. It depends to some extent on the history of disturbances to which the system was exposed in the past (system's history). This consideration is important for the assessment of agri-food systems vulnerability because decision-making process in these systems, e.g., regarding to land management, is socially constructed, environmentally influenced and historically contingent (Chiotti & Johnston,

1995). The linkages between vulnerability, adaptive capacity and resilience as features both of actors and of SES have been emphasized by several authors (e.g., Adger, 2000; Adger, 2003; Turner *et al.*, 2003; Kasperson *et al.*, 2005; Gallopín, 2006; Janssen & Ostrom, 2006; Smit & Wandel, 2006; Young *et al.*, 2006; Nelson *et al.*, 2007; Miller *et al.*, 2010). In this context, Adger (2000: 347) defines social resilience as "*the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change*".

Therefore, resilience[6] in both the social and ecological components of a SES, is an important property to achieve social (e.g., development) and ecological (e.g., resource management) sustainability at different temporal and spatial scales (Adger, 2000). However, Adger (2000) notices that the concept of resilience cannot be transferred uncritically from the ecological sciences to social systems and not always resilience is considered the flip-side of vulnerability, because it is not clear whether the initial features of the system are always desirable (Gallopín 2006). There may be cases in which the resilience impedes a positive transformation to a less vulnerable state of the system; and, could be cases where vulnerability leads to a beneficial transformation such as the emergence of a given social group from a crisis[7] (Gallopín, 2006). This last aspect, applied to agri-food systems, can be illustrated citing at McMichael (2000). He mentions, in the 'Power of food', that the crisis of development has generated two basic responses:

> *(1) the attempt to redefine development as a global project, including harnessing biotechnology to resolve the food security question, and (2) a series of countermovements* [e.g., food sovereignty movement] *attempting to simultaneously reassert the value of local, organic foods, and challenge the attempt on the part of food corporations and national and global institutions to subject the food question to market solutions* (p. 21).

Thus, this new way of thinking can lead to explore new ways to manage agri-food systems that include alternative measures to increase agro-ecological resilience (e.g., linking the traditional/ indigenous knowledge with the new agro-ecological research) and individual and collective adaptive capacity (e.g., considering new/ alternative food policies) to confront some agri-food related crisis.

[6] Resilience according the Resilience Alliance (2002) has three defining characteristics: (i) the amount of change the system can undergo and still retain the same controls on function and structure, or still be in the same state within the same domain of attraction; (ii) the degree to which the system is capable of self-organization; (iii) the ability to build and increase the capacity for learning and adaptation (Berkes *et al.*, 2003: 13).

[7] Here Gallopín (2006) illustrates that vulnerability is not always a negative property. He mentions that is possible to speak of a positive vulnerability when it lead to beneficial transformations such as the emergence of a given social group from chronic poverty or the collapse of an oppressive regime (p. 295).

To operationalize the contextual vulnerability concept linked to adaptive capacity and resilience within agri-food systems, we use the framework proposed by Fraser (2007, 2011). His framework merges three approaches mainly derived from resilience theories, development theories and institutional economic theories. Resilience theories allow analyzing the vulnerability of agro-ecosystems, of which people depend for food, to environmental shocks. Development theories, such as entitlement theory (Sen, 1980) and sustainable livelihoods approach (Scoones, 1998), allow analyzing how households deploy "capital assets" to maintain livelihoods during shocks (Scoones 1998); e.g., to switch from rural activities, such as farming, to another sources of income to buy food. And the institutional economic theories (e.g., Ostrom, 1990) allow analyzing the capacity of institutions to provide help in the event of problems within the agri-food system (Fraser, 2007). Thus, the framework developed by Fraser (2007, 2011; figure 2), allows analyzing the agri-food system vulnerability through the study of three dimensions: (1) agro-ecosystem resilience that measures the extent to which the agro-ecosystem can tolerate climatic shocks and remain productive, (2) individual capacity that measures the socio-economic attributes of actors to adapt to changes (e.g., food shortages), and (3) institutional capacity that measures the extent to which the institutions respond and /or adapt to changes[8].

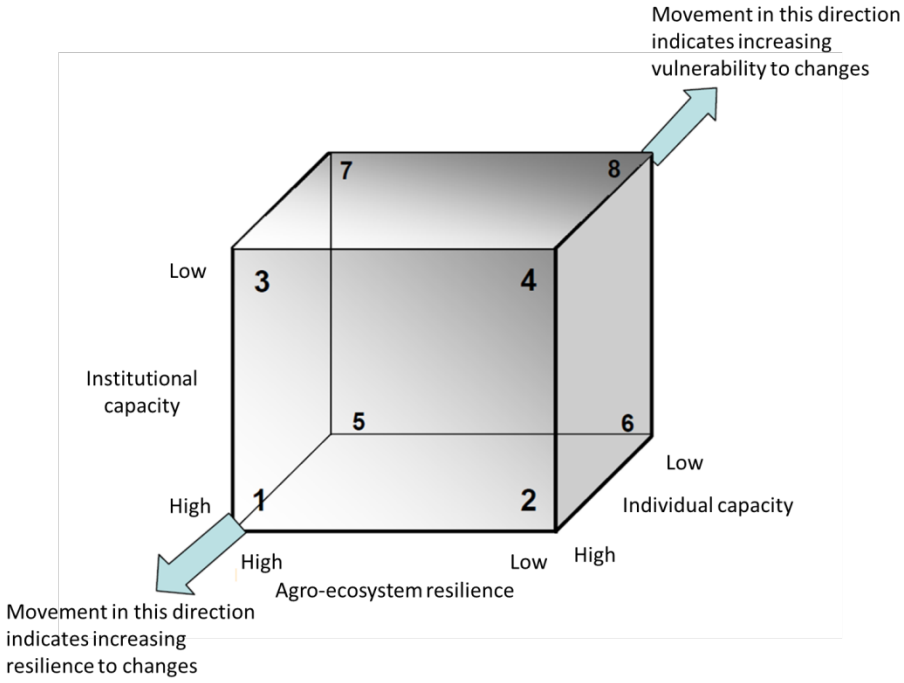


Figure 2. Vulnerability framework made up of three dimensions the literature suggests are important in assessing vulnerability of agri-food systems: (1) agro-ecosystem

[8] Within a SES the coping mechanisms (or capacity of response) are those that permit immediate or near-term adjustments to face perturbations; while, the adaptation emerges when these perturbations persist in the time, i.e., the adaptation involves a fundamental change and long term responses (Kasperson *et al.*, 2005: 146). As mention Gallopín (2006: 300-301) the adaptations would seem to be broader than the coping mechanisms, these may include modifying the sensitivity of the system to perturbations, increasing its resilience and reducing the exposure of the system to perturbations (Gallopín, 2006).

resilience, (2) individual capacity, and (3) institutional capacity. Movement over time towards the top, back, right-hand corner indicates increased vulnerability to changes. *Source: adapted by Fraser et al. (2011)*

This type of assessment allows us to take into account the context-specific conditions of a case study (O'Brien *et al.*, 2004, 2007), including the perception of actors about vulnerability: for whom, at which scale and to what (Kasperson *et al.*, 2005). Integrated assessment of vulnerability inspired by both the contextual and the perceptive fields of research is required to underpin more sustainable livelihood strategies[9] and more adaptive governance in SESs (Miller *et al.*, 2010), such as those advocated from food sovereignty to manage agri-food systems.

Proposal of an integrated conceptual and methodological framework: linking SES and vulnerability frameworks

As agri-food systems can be conceptualized as complex SESs we use the SES framework to operationalize their analysis. We recognize eight first-tier variables (RS, RSU, GS, A, I, O, S and ECO) within agri-food systems, see figure 3. Agro-ecosystem boundaries, RS, correspond to the sector in which agri-food activities are carried out. RS include both agro-ecosystem and human-constructed facilities such as irrigation systems, processing and packaging plants, storage facilities, transportation infrastructure (including road network). Agro-ecosystem resource units and services, RSU, are part of RS and constitutes the inputs to perform the agri-food activities; it includes e.g., cropping cycles, cropping varieties, animals, natural resources (e.g., water sources), services that people obtain from agro-ecosystems[10] (e.g., soil formation, photosynthesis, nutrient cycling), distinctive markings of farming (e.g., agro-ecological[11]), labeling systems for food and consumer products (e.g., organic food labels, eco-labels). Agri-food system governance, GS, is the set of conditions to perform the agri-food activities; it includes institutions, both formal and informal, of the agri-food sector (e.g., markets, subsidies) and their governance arrangements, i.e., the rules to agri-food system actors. Actors, A, constitute both individuals and collective organizations, including private, public and hybrid entities, that participate to perform the agri-food activities (e.g., cooperatives). RS, RSU, GS and A interact to achieve the agri-food system outcomes. The space wherein these processes are carried out is called focal action situation (red central

[9] According Chambers and Conway (1992) (quoted by Scoones, 1998:5) "a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living". And a livelihood is sustainable when "it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base".

[10] In general manner these services are those called ecosystem services; i.e.: provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling (MA, 2005).

[11] That means the application of ecological concepts and principles to the design and management of sustainable agricultural ecosystems (Altieri, 2009: 103).

box of figure 3; table 3). In any focal action situation the actors perform their agri-food activities using the agro-ecosystem and their resource units and services under a set of governance arrangements at different spatial and institutional scales which affect both how agri-food activities are carried out and which are the outcomes. The agri-food activities constitute the interactions between components, I, i.e., producing, processing, distributing, and consuming. The outcomes, O, are those that contributing to societal goals relating to agri-food systems. We have labeled the focal action situation as *societal goals relating to agri-food systems*. In our case it includes goals for food sovereignty, defined by the following dimensions: right to food, access to productive resources, production model, trade and local markets, and agrarian policies; and others social (e.g., sustainable livelihoods) and ecological (e.g., agro-ecosystem resilience) goals that can be prioritized by agri-food system actors (see table 4). Additionally, feedbacks emerge from the focal action situation (dashed arrows in Figure 3), which can influence changes in the components of the agri-food system (i.e., RS, RSU, GS and A). For example, industrial agriculture favors one type of actors (large farmers) and not others (small farmers).

As we previously mentioned, agri-food activities can deliver undesired outcomes because there are exogenous drivers that can distort the agri-food system (Ingram, 2009). Exogenous drivers i.e., socio-economic and political drivers, S, and environmental drivers, ECO, influence on the whole system. And likewise agri-food system can also influence these drivers (bidirectional arrows in Figure 3). For example, the common agricultural policy (S) favors one type of agricultural production model (industrial agriculture) which at the same time impact agro-ecosystems and their resources.

When an agri-food systems are exposed to drivers of change (i.e., S and ECO), they reorganize their components (i.e., subsystems RS, RSU, GS and A), depending on both their sensitivity to exposure and adaptive capacity to face the changes. Here the sensitivity constitutes the degree to which the agro-ecosystem and their resource units and services (RS and RSU) are modified by perturbations and changes; and, the degree to which the actors (A) are affected by these changes. And the adaptive capacity constitutes the ability of these components to respond (in the short term) to abrupt perturbations and adapt (in the long term) to long-lasting changes. This ability is generated when certain outcomes result from a particular set of interactions at one time (t) under certain contextual drivers and the subsystems themselves are reorganized to maintain and/or achieve the desired outcomes (e.g., food, livelihoods, income, employment) in the future (t+1). Since the different perceptions of actors influence on their aspirations, decisions and actions to face the changes (Kasperson *et al.*, 2005), it could result in different individual, collective and institutional capacities to respond and/or adapt to changes depending on the strategies used to increase the adaptive capacity within their agri-food systems. For example, during a short food shortage agri-food system actors can reorganize through self-organizing and networking activities, such as informal social arrangements for barter, to maintain their food

availability. For farmers who depend on subsistence agriculture, domestic consumption and food self-sufficiency are important goals so they may prioritize the maintenance of specific services provided by the agro-ecosystem e.g., through agro-ecological practices and suitable harvesting levels, rather than focusing on short-term gains. Similarly, agri-food system actors can reorganize to expand the range of strategies suitable to cope with climate variations through sharing information of farm practices and exchange of seed varieties that fit to specific environmental situations. Within the context of socio-economic and political changes, interactions as deliberation process can lead to increase the collective and institutional capacity to respond to governance arrangements generated at broader levels (e.g., national and international levels) that impact the agro-ecosystem boundaries from which the farmers obtain their food and livelihoods. Also, interactions as information sharing of consumers could result in consumer networks that promote alternative and/or new patterns of consumption. The outcomes of these interactions (i.e., O) contain indicators that show the degree of adaptive capacity within the agri-food system.

The sensitivity and adaptive capacity of the components of an agri-food system generated through their interactions and influenced by the perceptions of agri-food system actors may be analyzed in the three dimensions and levels, as proposed by Fraser (2007, 2011): the agro-ecological resilience (i.e., interactions within RS and between their components, RSU); the individual socio-economic capacity (i.e., interaction within A and with RS, RSU); and, the collective or institutional capacity (i.e., interactions within GS and with A, RS, RSU). Table 3 resumes how the eight first first-tier variables of the SES framework are related with the components of both vulnerability and resilience frameworks.

Table 3. Relation between first-tier variables of SES framework, components of vulnerability framework, and resilience within agri-food systems

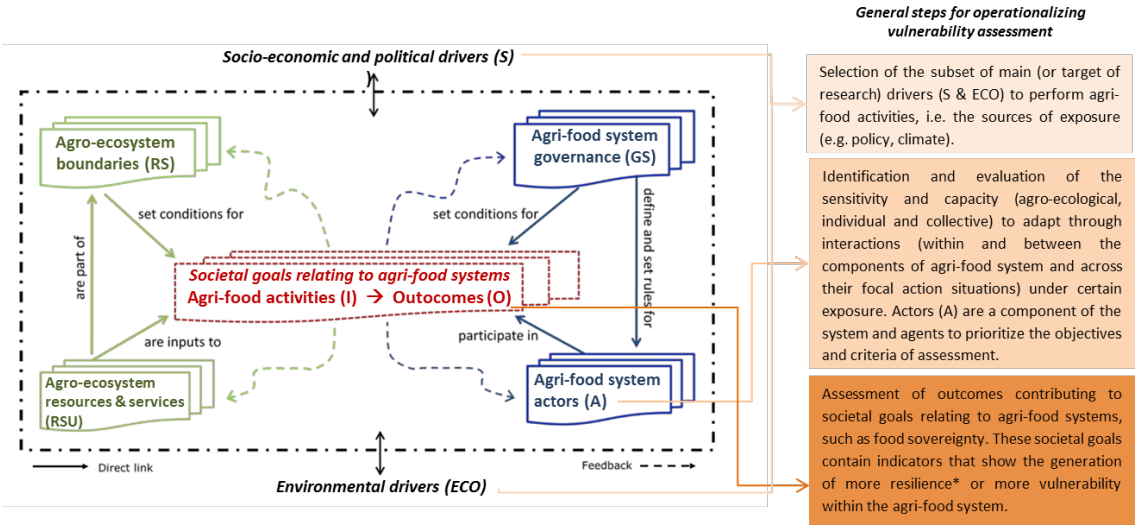
		First-tier variables			
	SES	S: socio-economic and political drivers ECO: environmental drivers	RS: agro-ecosystem boundaries RSU: agro-ecosystem resource units and services GS: agri-food system governance A: agri-food system actors	*Focal Action Situation* I: agri-food activities	O: contributing to food sovereignty and other societal goals
Framework		**Components**			
	Vulnerability	Exposure	Sensitivity	Adaptive capacity	Resilience* generation/vul

			nerability decreasing

S = Social, Economic and Political Settings, ECO = Related Ecosystems, RS = Resource System, RSU = Resource Services and Units, A = Actors, GS = Governance System, I = Interactions and O = Outcomes.

* Resilience is not a component of vulnerability. Only has been placed to indicate that it can be generated from adaptive capacity in the interaction phase of the system. Thus, vulnerability decrease can lead to generation of resilience in the outcomes component of the system.

In sum, the exploration of focal action situations, that is, the space where most of the interactions occur, enables analyzing how the drivers of change (i.e., those strategies intended to achieve specific societal goals, e.g., food sovereignty) affect the components of agri-food systems (in the present and in the future) and it determines if the induced changes lead over time to a less or more vulnerable system as perceived by actors. Figure 3 shows the integrated SES and vulnerability frameworks to analyze responses of agri-food systems to socio-economic, political and environmental changes. This figure includes the general steps for operationalizing vulnerability assessment in agri-food system research.



Note: S = Social, Economic and Political Settings, ECO = Related Ecosystems, RS = Resource System, RSU = Resource Services and Units, A = Actors, GS = Governance System, I = Interactions and O = Outcomes.

* Resilience is here considered as flipside of vulnerability (Fraser, 2007). It can be related to adaptive capacity in the interaction phase. Thus, vulnerability decreasing can lead to resilience increasing in outcomes phase of the system.

Figure 3. Integrated SES and vulnerability frameworks to analyze responses of agri-food systems to socio-economic, political and environmental changes (the SES graphic is adapted from McGinnis, 2013)

The second-tier variables (Ostrom 2009, see Table 2) under the eight first-tier variables described above (RS, RSU, GS, A, I, O, S and ECO) are those needed to perform the agri-food activities in order to obtain the desired outcomes prioritized by the actors of the agri-food system. Therefore, the second-tier variables need to be grounded under the local conditions of the target area/sector of research.

We propose to apply the proposed integrated framework to an empirical research in Andean Ecuadorian region to assess the future of local agri-food systems under two likely policy scenarios: (1) scenario based on food sovereignty policies arising from the Ecuadorian governmental agenda of Good Living or *Sumak Kawsay* (in the Quechua language); and, (2) scenario based on green economy policies linked to REDD+[12] readiness, such as the "Socio-Bosque" program in Ecuador (Hübenthal *et al.* 2010; Lawson *et al.*, 2010; de Koning *et al.*, 2011; MAE, 2011; MAE, 2012). The Andean Ecuadorian region has a great cultural and biological diversity (Myers *et al.*, 2000; IGM, 2010) which are affected by these two contradictory policy approaches as implemented by the national government, which makes it an interesting context for applying the proposed framework to analyze the different individual and collective/ institutional adaptive capacity to external drivers. This diversity can be expressed through the presence of diverse indigenous and non-indigenous groups that have different worldviews to manage the agro-ecosystems and their resources (e.g., agro-biodiversity) of which they depend to obtain both food and livelihoods. For the indigenous groups these worldviews are mainly based on the *Sumak Kawsay*[13] paradigm, which can also be linked to some premises of the food sovereignty proposal. However, policies based on the green economy perspective, focused mainly in forest conservation and climate mitigation through market initiatives, could affect some Andean zones. As indigenous and non-indigenous groups live in the Andean region, their actors could have different individual and collective interests which may or may not be consistent with the goals/policies established by the national government. Also their worldviews, interests and other perceptions could result in deploying different strategies for responding and/or adapt to changes. Thus, the actors could influence differentially the adaptive capacity generation process within the components of agri-food system. Some example on strategies to be implemented may be the management of agro-biodiversity to increase agro-ecosystem capacity to absorb change (i.e. resilience); the promotion of self-organizing activities (e.g., to produce, process, distribute and sell their products) to increase individual socio-economic ability; and, the deliberation process, networking and information sharing on food sovereignty to increase institutional capacity. Additionally, since the Andean region suffers

[12] Reducing Emissions from Deforestation and Forest Degradation. The 'plus' denotes the conservation of forests, enhancement of forest carbon stocks and sustainable management of forests (Sukhdev *et al.*, 2011). Within this category is included the carbon stock and sequestration potential of agroforestry systems (Thangata & Hildebrand, 2012).

[13] Sumak Kawsay or Good Living implies a new form of development in which people coexist in diversity and harmony with nature (Ecuadorian National Constitution, 2008).

from important agri-food related problems, such as chronic malnutrition in children (SENPLADES, 2013) it deserves a special attention to analyze the factors that can impact in the agri-food systems. Table 4 summarizes the agri-food activities, key agri-food system actors and possible outcomes contributing to food sovereignty, food security and other societal (social and environmental) goals for the specific case study proposed. Here the first-tier of our agri-food system conceptualized as SES will be: RS = Andean agro-ecosystem boundaries (including their human-constructed facilities); RSU = Andean agro-ecosystem resource units and services; GS = institutions (formal and informal) linked to agri-food sector and their rules; A = key actors defined in table 4; I = agri-food activities as shown in table 4; O = potential outcomes described in table 4; S = food sovereignty policy drivers (proposals formulated by the Plurinational and Intercultural Conference on Food Sovereignty, COPISA) and green economy policy drivers ("Socio-Bosque" program); and, ECO = climate change driver (assessed indirectly through actor perceptions).

Table 4. Agri-food activities, key actors and possible outcomes within agri-food systems for the specific case study proposed for the application of the integrated SES-vulnerability framework

Agri-food activities	Key actors	Potential Outcomes		
(i) Producing food: Linked to production of raw food materials (e.g., corn, beans, potatoes, vegetables, spices, fruits, medicinal plants, milk, eggs), including obtaining inputs (e.g., land, labor, plants, animals), harvesting and/or slaughtering.	Farmers, multiple suppliers of production inputs (including agricultural laborers and land owners), and organizations that establish and monitor the production model (e.g. participatory guarantee systems in Andean Ecuadorian region of Loja province).	Food sovereignty (alternative outcome)	▪ Right to food	Healthy, nutritious and culturally appropriate food
			▪ Access to productive resources[(b)]	Land Genetic (seeds and livestock breeds) Water Forest Credit, insurance and subsides Human-constructed facilities
(ii) Processing and packaging food: Linked to transformation of the raw food materials before they are carried for sale (directly to consumers or through retailers). Also called "add	Farmers that transform their raw products, middlemen[(a)], owners and managers of processing plants, regulatory bodies established to control quality and safety food.		▪ Production model[(b)]	Small-scale/peasant agriculture Agro-ecological and local models
			▪ Trade and local markets[(b)]	Local and regional markets Fair prices
			▪ Agrarian policies[(b)]	Agrarian reforms linked to food sovereignty proposal, such as: Use and access to lands; Access to credit, insurance and subsidies; Agro-

value" activities. Here are included craft processes (e.g., to obtain cheese, sweetmeats, tea).				biodiversity, seeds and agro-ecology; Communal property; Commercialization and agricultural supply; Consumption, nutrition and health food; Agribusiness and agricultural employment; Food safety [(c)]. Actions to favor participation of farmers in policy-making. Policies linked to gender equality.
(iii) Distributing and retailing food: Linked to the sale of products in fairs, local markets (e.g., municipal markets), and retailers .It also include the activities linked to the transportation of products from farms to markets.	Farmers that sell their products, informal networking organizations to distribute and sell, middlemen[(a)], governmental and municipal authorities (that regulate markets and prices), owners of small stores and supermarkets.	Food Security (official outcome)	▪ Food availability	Production Distribution Exchange
			▪ Food access	Affordability Allocation Preference
			▪ Food utilization	Nutritional value Social value Food safety
(iv) Consuming food: Linked to activities from deciding what to purchase, through to preparing, eating and digesting food, as well as the cultural factors related to the consumption of food	Consumers. Includes people that obtain food through food purchase, subsistence agriculture, and through other means such as informal social arrangements for barter and food aid	Other societal interests	▪ Social welfare	Rural development, livelihoods Equity, gender equality Income, employment Health Human, social and political capital (…)
			▪ Environmental welfare	Agro-ecosystem stocks, flows, biodiversity, resilience Ecosystem functions (Ecosystem Services)

(e.g., of local indigenous group).	(e.g., government programs).	Access to natural capital Landscape Animal welfare (…)

Notes: (a) Middlemen (actor who buys from producers and sells to retailers or consumers) can be replaced by the own food producers (e.g., farmers) and/or their organizations. (b) These outcomes can act as outcomes themselves or as a set of conditions to achieve food sovereignty within whole agri-food system. (c) These agrarian policies are part of the nine-supplementary laws that support the Law of Food Sovereignty (LORSA). They constitute law proposals formulated by the Plurinational and Intercultural Conference on Food Sovereignty (COPISA).

Source: elaborated from Windfuhr & Jonsén (2005), Ericksen (2008a), Entrepueblos & IEEEP (2010), Ortega-Cerdà & Rivera-Ferre (2010), COPISA (2013)

Final remarks

The integrated framework proposed allows the conceptualization and visualization of agri-food systems as SES, as required by alternative research framings. It enables analyzing the diversity of complex interactions between and within the social (i.e., GS and A) and agro-ecological (i.e., RS and RSU) components of an agri-food systems which lead to agri-food activities (i.e., the production, process and package, distribution and retail, and consumption) and the outcomes derived from these activities (e.g., contributing to food sovereignty).

Commonly, agri-food studies tend to give little attention to socio-economic and political factors such as the role of institutions to mediate the adaptation (or exacerbate the problems) to global environmental change. In accordance with other authors (Ostrom, 1990; Fraser, 2007; Agrawal, 2008; Brondizio *et al.*, 2009) we state that individual and collective/ institutional capacity play an important role within the context of agri-food system adaptation to socio-economic, political and environmental changes. The integrated framework allows visualizing the process of adaptive capacity generation from the interactions between and within the social and agro-ecological components of agri-food systems (e.g., generated in different spatial, institutional and time scales). During this process the actors can deploy a variety of strategies to increase the agro-ecological, individual, collective and institutional capacity to respond and/or adapt to changes for maintaining (or achieve) their desired outcomes (e.g., access to land, maintaining their livelihoods) of agri-food system.

A step further, as pointed out by Nelson *et al.* (2007) and Miller *et al.* (2010), linkages between vulnerability, adaptive capacity and resilience of SES allow the integration of the actor-oriented research (from vulnerability community) with the system-oriented research (from resilience community). Particularly, this integration makes possible the incorporation of the perceptions of agri-food system actors. This aspect is very relevant in agri-food research given that different social groups with divergent interests can be found within a given area/sector of research. Incorporating the perceptions of actors in the analysis allows addressing the processes of negotiation, decision making, and action based on the societal goals most relevant and prioritized by those actors. Thus, the integrated framework is particularly useful when evaluating policy and societal goals relating to agri-food systems that encompass not only the agro-ecological factors but also socio-economic and political factors linked to the aspirations and claims of the actors. At the same time, it allows examining the implications of these processes on the rest of the agri-food system components, for instance in the reorganization of the system during adaptive capacity processes.

Moreover, the framework proposed gives the same level of attention to multidimensional factors which involve processes that occur at different scales and levels. Specific emergent properties of the agri-food systems may be understood as well as potential surprises that can be potentially affected by change. Hence, it enables analyzing how multiple drivers generated at broader scales affect the cross-scale and cross-level interactions within the agri-food system, the changes over time in its configuration and its adaptive capacity, thereby increasing or decreasing its vulnerability over time. In sum, in the context of adaptation and global environmental change research, the framework is particularly useful to design likely future policy scenarios, since it enables the analysis of responses of agri-food systems to policy changes at different spatial and temporal scales.

Table 5 shows an overview of conceptual similarities and complementarities between SES and vulnerability frameworks and their implications for analyzing responses of agri-food systems to socio-economic, political and environmental changes.

Table 5. Conceptual similarities and complementarities between the SES framework and vulnerability framework and implications for analyzing responses of agri-food systems to changes

SES framework	Vulnerability framework	Implications for analyzing responses of agri-food systems to changes
System-oriented approach	Actor-oriented approach	Analysis of the relationships between vulnerability, adaptive capacity and resilience as properties of each component of agri-food system. Inclusion within the analysis of perceptions of actors of the target sector/ area of research. Analysis of policy and societal goals relating to agri-food systems linked to aspirations and claims of the actors (e.g., those linked to food sovereignty).
Descriptive analysis of components and configuration of a complex system.	Assessment of vulnerability (or resilience) from each dimensions of a system to change	Analysis of changes in the system configuration when different strategies are used to reduce the vulnerability (i.e., promote the adaptive capacity

(Descriptive approach)	under different policy scenarios. (Normative approach)	generation) of agri-food systems. Analysis of changes in the system configuration when different drivers impact agri-food systems.
Analysis of social and agro-ecological components of a complex system, including drivers of change	Analysis of agro-ecological, individual and institutional capacity dimensions	Analysis of context-specific agro-ecological, socio-economic and institutional components of the target area/sector of research within the boundaries of an agri-food system, taking into account the socio-economic, political and environmental drivers of change which could affect their adaptive capacity.
Movement across spatial, institutional and temporal scales	Assessment across temporal scales	Analysis of cross-scales interactions to achieve adaptive capacity generation under drivers that operate at different scales (e.g., policies and climate) over time. Movement from household level to broader levels to analyze the role of governance arrangements across scales (e.g., policies generated at national and international levels).

Conclusions

Given the failure of official framings of food research and associated policies to address the problem of hunger and vulnerability of agri-food systems to global change, policy-making in the agri-food sector should consider the implementation of new and alternative policy options that go beyond those focusing only on food security. Food sovereignty, an alternative policy and societal goal originated in peasant and activist circles, has been taking emphasis in the academic and policy discourse. This approach includes different claims related to institutions, governance, and agricultural systems, always considering that agri-food systems show complex interactions between and within their social and agro-ecological components and thus, moving beyond the food security technical goals.

Following this approach, policies that acknowledge the complexity of agri-food systems are implicitly conceptualizing agri-food systems as SES, and thus, they require of appropriate approaches to analyze and evaluate responses to socio-economic, political and environmental changes. In this paper, to address this major challenge, we draw an integrated framework based on the link between a system-oriented framework, the SES framework, with an actor-oriented framework, the contextual and perceptive vulnerability framework. This integrated framework enables the analysis of cross-scale interactions of agri-food systems conceptualized as SES; the analysis of multiple societal goals prioritized by the actors in a given context; the exploration of the multiple perceptions of vulnerability and assessment of multidimensional underlying factors which influence sensitivity and capacity to respond of the agri-food system to changes, i.e. the system response, when different drivers impact the agri-food system. Overall, we argue that the framework proposed is particularly useful to help understanding changes in the configuration of the agri-food system under different policy scenarios and particularly to design food sovereignty policies.

However, the framework in its current form still has some important gaps which need to be addressed in the analysis of agri-food systems, such as the power of specific actors and institutions in the system and how they can determine the system configuration.

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References

Adger, W.N., 1999. Social vulnerability to climate change and extremes in coastal Vietnam. World Development 27, 249–269.

Adger, W.N., 2000. Social and ecological resilience: are they related? Progress in Human Geography 24, 347–364.

Adger, W.N., 2003. Social Capital, Collective Action, and Adaptation to Climate Change. Economic Geography 79, 387–404.

Adger, W.N., 2006. Vulnerability. Global Environmental Change 16, 268–281.

Agrawal, A., 2008. The role of local institutions in adaptation to climate change.

Agrawal, A., Perrin, N., 2008. Climate adaptation, local institutions and rural livelihoods. International Forestry Resources and Institutions Program (IFRI) Working Paper # W08I-6, University of Michigan.

Aistara, G., 2012. Food sovereignty: reconnecting food, nature, and community. The Journal of Peasant Studies 40, 314–318.

Altieri, M.A., 2009. Agroecology, small farms, and food sovereignty. Monthly Review 61, 102–113.

Anderies, J.M., Janssen, M.A., Ostrom, E., 2004. A Framework to Analyze the Robustness of Social-ecological Systems from an Institutional Perspective. Ecology and Society 9(1):18.

Appendini, K., Liverman, D., 1994. Agricultural policy, climate change and food security in Mexico. Food Policy 19, 149–164.

Badal, M., Binimelis, R., Gamboa, G., Heras, M., Tendero, G., 2011. Arran de terra. Indicadors participatius de Sobirania Alimentària a Catalunya. Associació Entrepobles, Institut d'Economia Ecològica i Ecologia Política, Catalunya.

Becker, E., 2012. Social-ecological systems as epistemic objects. Human-Nature Interactions in the Anthropocene: Potentials of Social-Ecological Systems Analysis. London: Routledge 37–59.

Berkes, F., Colding, J., Folke, C., 2003. Introduction, in: Berkes, F, Colding, J, Folke, C (Eds.), Navigating Social-ecological Systems: Building Resilience for Complexity and Change. Cambridge University Press, pp. 1–30.

Berkes, F., Folke, C., 1998. Linking social and ecological systems for resilience and sustainability, in: Berkes, F, Folke, C (Eds.), Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience. Cambridge University Press, pp. 1–25.

Bernstein, H., 2013. Food Sovereignty: A skeptical view. Presented at the Food Sovereignty: A Critical Dialogue International Conference, Yale University.

Blaikie, P., Cannon, T., Davis, I., Wisner, B., 1994. At risk: Natural Hazards, People's Vulnerability and Disasters. Routledge, London.

Bohle, H.G., Downing, T.E., Watts, M.J., 1994. Climate change and social vulnerability: toward a sociology and geography of food insecurity. Global Environmental Change 4, 37–48.

Borras, S., 2004. La Vía Campesina: An Evolving Transnational Social Movement. TNI Briefing Series No. 2004/6.

Brondizio, E.S., Ostrom, E., Young, O.R., 2009. Connectivity and the Governance of Multilevel Social-Ecological Systems: The Role of Social Capital. Annual Review of Environment and Resources 34, 253–278.

Burton, I., Huq, S., Lim, B., Pilifosova, O., Schipper, E.L., 2002. From impacts assessment to adaptation priorities: the shaping of adaptation policy. Climate policy 2, 145–159.

Burton, I., Kates, R.W., White, G.F., 1993. The environment as hazard. Guilford Press, New York.

Cash, D.W., Adger, W.N., Berkes, F., Garden, P., Lebel, L., Olsson, P., Pritchard, L., Young, O., 2006. Scale and cross-scale dynamics: governance and information in a multilevel world. Ecology and Society 11, 8.

Chambers, C., Conway, G.R., 1998. Sustainable Rural Livelihoods: Practical Concepts for the 21st Century, in: IDS Working Paper 296.

Chen, R.S., Kates, R.W., 1994. Climate change and world food security: Editorial. Global Environmental Change 4, 3–6.

Chiotti, Q.P., Johnston, T., 1995. Extending the boundaries of climate change research: a discussion on agriculture. Journal of Rural Studies 11, 335–350.

Conferencia Plurinacional e Intercultural de Soberanía Alimentaria [WWW Document], n.d. URL http://www.soberaniaalimentaria.gob.ec/?cat=7 (accessed 9.5.13).

Constitución de la República del Ecuador, 2008.

Costanza, R., Wainger, L., Folke, C., Mäler, K.-G., 1993. Modeling complex ecological economic systems. BioScience 43, 545–555.

Cote, M., Nightingale, A.J., 2012. Resilience thinking meets social theory Situating social change in socio-ecological systems (SES) research. Progress in Human Geography 36, 475–489.

Cox, M., 2011. Advancing the diagnostic analysis of environmental problems. International Journal of the Commons 5, 346–363.

De Koning, F., Aguiñaga, M., Bravo, M., Chiu, M., Lascano, M., Lozada, T., Suarez, L., 2011. Bridging the gap between forest conservation and poverty alleviation: the Ecuadorian Socio Bosque program. Environmental Science & Policy 14, 531–542.

De Schutter, O., n.d. United Nations Special Rapporteur on the Right to Food [WWW Document]. URL http://www.srfood.org/en (accessed 8.7.13).

Desmarais, A., Nicholson, P., 2013. La Via Campesina: An Historical and Political Analysis, in: La Via Campesina's Open Book: Celebrating 20 Years of Struggle and Hope. La Vía Campesina.

Desmarais, A.A., 2008. The power of peasants: Reflections on the meanings of La Vía Campesina. Journal of Rural Studies 24, 138–149.

Downing, T.E., 1993. The effects of climate change on agriculture and food security. Renewable Energy 3, 491–497.

Downing, T.E., Parry, M.L., 1994. Introduction: Climate change and world food security. Food Policy 19, 99–104.

Ecosystems Panel, 2000. Global change ecosystems research. National Academy Press, Washington, D.C.

Entrepueblos, IEEEP (Instituto de Economía Ecológica y Ecología Política), 2010. Indicadores participativos de Soberanía Alimentaria en Catalunya.

Ericksen, P., Thornton, P., Notenbaert, A., Cramer, L., Jones, P., Herrero, M., 2011. Mapping hotspots of climate change and food insecurity in the global tropics (CCAFS Report No. 5). Copenhagen, Denmark.

Ericksen, P.J., 2008a. Conceptualizing food systems for global environmental change research. Global Environmental Change 18, 234–245.

Ericksen, P.J., 2008b. What is the vulnerability of a food system to global environmental change. Ecology and Society 13, 14.

Ericksen, P.J., Ingram, J.S., Liverman, D.M., 2009. Food security and global environmental change: emerging challenges. Environmental Science & Policy 12, 373–377.

ESF/COST, 2009. Forward Look on European Food Systems in a Changing World.

Food and Agriculture Organization of the United Nations, 20021. The State of Food Insecurity in the World 2001. Rome.

Food and Agriculture Organization of the United Nations, 2007. The state of food and agriculture 2007 (SOFA): Paying farmers for environmental service. Rome.

Food and Agriculture Organization of the United Nations, 2008. Climate change and food security: a framework document. Rome.

Food and Agriculture Organization of the United Nations, 2012. The state of food insecurity in the world: economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome.

Food and Agriculture Organization of the United Nations, 2013. The state of food and agriculture 2013: food systems for better nutrition. Rome.

Fraser, E.D.G., 2007. Travelling in antique lands: using past famines to develop an adaptability/resilience framework to identify food systems vulnerable to climate change. Climatic Change 83, 495–514.

Fraser, E.D.G., Dougill, A.J., Hubacek, K., Quinn, C.H., Sendzimir, J., Termansen, M., 2011. Assessing Vulnerability to Climate Change in Dryland Livelihood Systems: Conceptual Challenges and Interdisciplinary Solutions. Ecology and Society 16.

Gallopín, G.C., 2006. Linkages between vulnerability, resilience, and adaptive capacity. Global Environmental Change 16, 293–303.

Gallopín, G.C., Funtowicz, S., O'Connor, M., Ravetz, J., 2001. Science for the Twenty-First Century: From Social Contract to the Scientific Core. International Social Science Journal 53, 219–229.

Hertel, T.W., Rosch, S.D., 2010. Climate Change, Agriculture, and Poverty. Applied Economic Perspectives and Policy 32, 355–385.

Hildyard, N., 1993. Foxes in charge of chickens, in: Sachs, W. (Ed.), Global Ecology: A New Arena of Political Conflict. Zed Books.

Holling, C.S., 1994. Simplifying the complex: The paradigms of ecological function and structure. Futures 26, 598–609.

Holling, C.S., Berkes, F., Folke, C., 1998. Science, sustainability and resource management, in: Berkes, F., Folke, C. (Eds.), Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience. Cambridge University Press, pp. 342–362.

Holling, C.S., Schindler, D.W., Walker, B.W., Roughgarden, J., 1995. Biodiversity in the functioning of ecosystems: an ecological synthesis, in: Perrings, C., Maler, K.G., Folke, C., Holling, C.S., Jansson, B.O. (Eds.), Biodiversity Loss: Economic and Ecological Issues. Cambridge University Press, pp. 44–83.

Hübenthal, A., Starnfeld, F., Carrión, D., 2010. The Forests Dialogue. Field Dialogue on REDD Readiness in Ecuador.

IGM (Instituto Geográfico Militar). Atlas del Ecuador 2010. (2010). Imprenta del Instituto Geográfico Militar. Quito, Ecuador.

Ingram, J., 2009. Food system concepts, Chapter 2, in: ESF/COST Forward Look on European Food Systems in a Changing World. pp. 234–245.

Ingram, J., Brklacich, M., 2002. Global Environmental Change and Food Systems – GECAFS: A New Interdisciplinary Research Project. die Erde 113, 427–435.

Ingram, J.S.I., Ericksen, P., Liverman, D.M., 2010. Food Security and Global Environmental Change. Earthscan.

INRA/CIRAD, 2009. Agrimonde: Scenarios and Challenges for Feeding the World in 2050. Summary report. Institut National de la Recherche Agronomique (INRA) and Centre de coopération internationale en recherche agronomique pour le développement (CIRAD). Paris, France.

IPC (International Planning Committee for Food Sovereignty), n.d. Highlights: Food Sovereignty [WWW Document]. URL http://www.foodsovereignty.org/FOOTER/Highlights.aspx (accessed 8.14.13).

IPCC, 2007. Fourth Assessment Report: Climate Change 2007 (AR4). Intergovernmental Panel on Climate Change, Cambridge, United Kingdom and New York, NY, USA, Cambridge University Press.

Ison, R.L., Maiteny, P.T., Carr, S., 1997. Systems methodologies for sustainable natural resources research and development. Agricultural Systems 55, 257–272.

Janssen, M.A., Ostrom, E., 2006. Resilience, vulnerability, and adaptation: A cross-cutting theme of the International Human Dimensions Programme on Global Environmental Change. Global Environmental Change 16, 237–239.

Kasperson, R.E., Dow, K., Archer, E.R., Caceres, D., Downing, T., Elmqvist, T., Eriksen, S., Folke, C., Han, G., Iyengar, K., Vogel, C., Wilson, K., Ziervogel, G., 2005. Vulnerable Peoples and Places, in: Hassan, R., Scholes, R., Ash, N. (Eds.), Ecosystems and Human Well-Being: Current State and Trends: Island Press, Washington DC, USA, pp. 143–164.

Kates, R., Clark, W., Corell, R., et al, 2001. Sustainability science. Science 292, 641–642.

Kauffman, S.A., 1993. The Origins of Order: Self-organization and Selection in Evolution. Oxford University Press.

Kelly, P.M., Adger, W.N., 2000. Theory and practice in assessing vulnerability to climate change and Facilitating adaptation. Climatic change 47, 325–352.

La Via Campesina : International Peasant Movement [WWW Document], n.d. URL http://www.viacampesina.org/en/ (accessed 8.13.13).

Lawson, S., Maginnis, S., Suarez, L., 2010. Proceso de preparación para REDD-plus en Ecuador: desafíos desde una visión de múltiples actores: resumen de los co-presidentes de TFD acerca de un diálogo internacional sobre la preparación para REDD-plus.

Liverman, D., Kapadia, K., 2010. Food Systems and the Global Environment: An Overview, in: Ingram, J.S.I., Ericksen, P., Liverman, D.M. (Eds.), Food Security and Global Environmental Change. Earthscan, London; Washington, DC, pp. 3–24.

MA (Millennium Ecosystem Assessment), V.C., 2005. Ecosystems and human well-being: general synthesis : a report of the Millennium Ecosystem Assessment. Island Press, Washington, DC.

MAE (Ministerio de Ambiente), 2011. REDD+ en Ecuador. Una Oportunidad para Mitigar el Cambio Climático y Contribuir a la Gestión Sostenible de los Bosques. Quito, Ecuador.

MAE (Ministerio de Ambiente), 2012. La preparación para REDD+ en Ecuador. Quito, Ecuador.

Martinez-Alier, J., Healy, H., Temper, L., Walter, M., Rodriguez-Labajos, B., Gerber, J.-F., Conde, M., 2011. Between science and activism: learning and teaching ecological economics with environmental justice organisations. Local Environment 16, 17–36.

Maxwell, S., Slater, R., 2003. Food policy old and new. Development policy review 21, 531–553.

McGinnis, M.D., 2010. Building a Program for Institutional Analysis of Social-Ecological Systems: A Review of Revisions to the SES Framework.

McGinnis, M.D., 2011. An introduction to IAD and the language of the Ostrom workshop: A simple guide to a complex framework. Policy Studies Journal 39, 169–183.

McGinnis, M.D., 2013. Updated Guide to IAD and the Language of the Ostrom Workshop: A Simplified Overview of a Complex Framework for the Analysis of Institutions and their Development.

McGinnis, M.D., Ostrom, E., 2012. SES Framework: Initial Changes and Continuing Challenges, in: Bloomington, IN: Workshop in Political Theory and Policy Analysis, Department of Political Science, and Schoolof Public and Environmental Affairs, Indiana University.

McLaughlin, P., Dietz, T., 2008. Structure, agency and environment: Toward an integrated perspective on vulnerability. Global Environmental Change 18, 99–111.

McMichael, P., 2000. The power of food. Agriculture and human values 17, 21–33.

McMichael, P., 2005. Global development and the corporate food regime, in: Buttel, F.H., McMichael, P. (Eds.), New Directions in the Sociology of Global Development. Elsevier JAI, Amsterdam ; London.

McMichael, P., 2011. Food system sustainability: Questions of environmental governance in the new world (dis)order. Global Environmental Change 21, 804–812.

McMichael, P., 2013. Historicizing Food Sovereignty: a Food Regime Perspective. Presented at the Food Sovereignty: A Critical Dialogue International Conference, Yale University.

Miller, F., Osbahr, H., Boyd, E., Thomalla, F., Bharwani, S., Ziervogel, G., Walker, B., Birkmann, J., van der Leeuw, S., Rockström, J., 2010. Resilience and vulnerability: complementary or conflicting concepts. Ecology and Society 15, 11.

Myers, N., Mittermeier, R., Mittermeier, C., da Fonseca, G. & Kent, J., 2000. "Biodiversity hotspots for conservation priorities". Nature Journal 403: 853–858.

Nelson, D.R., Adger, W.N., Brown, K., 2007. Adaptation to Environmental Change: Contributions of a Resilience Framework. Annual Review of Environment and Resources 32, 395–419.

Nelson, G., Rosegrant, M., Koo, J., Robertson, R., Sulser, T., Zhu, T., Ringler, C., Msangi, S., Palazzo, A., Batka, M., Magalhaes, M., Valmonte-Santos, R., Ewing, M., Lee, D., 2009. Climate change: Impact on agriculture and costs of adaptation. Food Policy Report #19. International Food Policy Research Institute, Washington, DC.

Nelson, G., Rosegrant, M., Palazzo, A., Gray, I., Ingersoll, C., Robertson, R., Tokgoz, S., Zhu, T., Sulser, T., Ringler, C., Msangi, S., Liangzhi, Y., 2010. Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options. International Food Policy Research Institute, Washington DC, USA.

O'Brien, K., Eriksen, S., Nygaard, L.P., Schjolden, A., 2007. Why different interpretations of vulnerability matter in climate change discourses. Climate Policy 7, 73–88.

O'Brien, K.L., Eriksen, S., Schjolden, A., Nygaard, L., 2004. What's in a word? Conflicting interpretations of vulnerability in climate change research. CICERO Working Paper.

Ortega Cerdà, M., Rivera Ferré, M.G., 2010. Indicadores internacionales de Soberanía Alimentaria: Nuevas herramientas para una nueva agricultura. Revista Iberoamericana de Economía Ecológica (REVIBEC) 53–77.

Ostrom, E., 1990. Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.

Ostrom, E., 2001. Vulnerability and polycentric governance systems. IHDP Update 3, 1–4.

Ostrom, E., 2007. A diagnostic approach for going beyond panaceas. Proceedings of the National Academy of Sciences 104, 15181–15187.

Ostrom, E., 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. Science 325, 419–422.

Ostrom, E., 2012. Lecture I: Frameworks" and "Lecture II: Analyzing One-Hundred-Year-Old Irrigation Puzzles, in: Matheson, M. (Ed.), The Tanner Lectures on Human Values. University Of Utah Press, Salt Lake City, pp. 93–137.

Ostrom, E., Cox, M., 2010. Moving beyond panaceas: a multi-tiered diagnostic approach for social-ecological analysis. Environmental Conservation 37, 451–463.

Ostrom, E., Janssen, M., Anderies, J., 2007. Going beyond panaceas. Proceedings of the National Academy of Sciences 104, 15176–15178.

Pahl-Wostl, C., 2009. A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. Global Environmental Change 19, 354–365.

Patel, R., 2009. Food sovereignty. The Journal of Peasant Studies 36, 663–706.

Pimbert, M., 2009. Towards food sovereignty. International Institute for Environment and Development London, United Kingdom.

Rebotier, J., 2012. Vulnerability conditions and risk representations in Latin-America: Framing the territorializing urban risk. Global Environmental Change 22, 391–398.

Rivera-Ferre, M., 2012. Framing of Agri-food Research Affects the Analysis of Food Security: The Critical Role of the Social Sciences. International Journal of Sociology of Agriculture and Food 19, 162–175.

Rivera-Ferre, M., Ortega-Cerdà, M., Baumgärtner, J., 2013. Rethinking agri-food systems' assessment and management. Sustainability, 5 1-x(*in press*).

Rosenberg, N.J., Scott, M.J., 1994. Implications of policies to prevent climate change for future food security. Global Environmental Change 4, 49–62.

Scoones, I., 1998. Sustainable rural livelihoods : a framework for analysis, in: IDS Working Paper ; 72.

Sen, A., 1980. Famines. World Development 8, 613–621.

SENPLADES (Secretaría Nacional de Planificación y Desarrollo), 2013. Plan Nacional para el Buen Vivir 2013-2017: Todo el mundo mejor. Quito, Ecuador.

Smit, B., Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16, 282–292.

Smith, P., Gregory, P.J., 2012. Climate change and sustainable food production. Proceedings of the Nutrition Society 72, 21–28.

Sukhdev, P., Prabhu, R., Kumar, P., Bassi, A., Patwa-Shah, W., Enters, T., Labbate, G., Greenwalt, J., 2011. REDD+ and a Green Economy: Opportunities for a Mutually Supportive Relationship. UN-REDD Programme.

Thangata, P.H., Hildebrand, P.E., 2012. Carbon stock and sequestration potential of agroforestry systems in smallholder agroecosystems of sub-Saharan Africa: Mechanisms for "reducing emissions from deforestation and forest degradation" (REDD+). Agriculture, Ecosystems & Environment 158, 172–183.

Thompson, J., Scoones, I., 2009. Addressing the dynamics of agri-food systems: an emerging agenda for social science research. Environmental Science & Policy 12, 386–397.

Turner, B.L., Kasperson, R.E., Matson, P.A., McCarthy, J.J., Corell, R.W., Christensen, L., Eckley, N., Kasperson, J.X., Luers, A., Martello, M.L., 2003. A framework for vulnerability analysis in sustainability science. Proceedings of the national academy of sciences 100, 8074–8079.

United Nations Development Programme, 2007. Human development report 2007/2008: fighting climate change : human solidarity in a divided world. United Nations Development Programme ; Palgrave Macmillan, New York.

United Nations General Assembly, 1948. The Universal Declaration of Human Rights [WWW Document]. URL http://www.un.org/en/documents/udhr/ (accessed 8.7.13).

United Nations General Assembly, 1966. International Covenant on Economic, Social and Cultural Rights [WWW Document]. URL http://www.ohchr.org/EN/ProfessionalInterest/Pages/CESCR.aspx (accessed 8.7.13).

Van der Ploeg, J.D., 2013. Peasant-driven agricultural growth and food sovereignty. Presented at the Food Sovereignty: A Critical Dialogue International Conference, Yale University.

Vermeulen, S., Zougmoré, R., Wollenberg, E., Thornton, P., Nelson, G., Kristjanson, P., Kinyangi, J., Jarvis, A., Hansen, J., Challinor, A., Campbell, B., Aggarwal, P., 2012. Climate change, agriculture and food security: a global partnership to link research and action for low-income agricultural producers and consumers. Current Opinion in Environmental Sustainability 4, 128–133.

Vermeulen, S.J., Aggarwal, P.K., Ainslie, A., Angelone, C., Campbell, B.M., Challinor, A.J., Hansen, J., Ingram, J.S.I., Jarvis, A., Kristjanson, P., 2010. Agriculture, food security and climate change: Outlook for knowledge, tools and action.

Vía Campesina, 2009. La Vía Campesina Policy Documents: 5th Conference, Mozambique, 16th to 23rd October 2008. International Operational Secretariat of La Via Campesina.

Windfuhr, M., Jonsén, J., 2005. Food Sovereignty: towards democracy in localized food systems. ITDG Publishing, UK.

World Bank, 2010. World Development Report 2010: Development and Climate Change. World Bank, Washington, DC.

Young, O.R., Berkhout, F., Gallopin, G.C., Janssen, M.A., Ostrom, E., van der Leeuw, S., 2006. The globalization of socio-ecological systems: An agenda for scientific research. Global Environmental Change 16, 304–316.

Yu, Q., Wu, W., Yang, P., Li, Z., Xiong, W., Tang, H., 2012. Proposing an interdisciplinary and cross-scale framework for global change and food security researches. Agriculture, Ecosystems & Environment 156, 57–71.

Ziervogel, G., Ericksen, P.J., 2010. Adapting to climate change to sustain food security. Wiley Interdisciplinary Reviews: Climate Change 1, 525–540.

Food Sovereignty:
A Critical Dialogue

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FOOD SOVEREIGNTY: A CRITICAL DIALOGUE INTERNATIONAL CONFERENCE PAPER SERIES

A fundamentally contested concept, food sovereignty has — as a political project and campaign, an alternative, a social movement, and an analytical framework — barged into global agrarian discourse over the last two decades. Since then, it has inspired and mobilized diverse publics: workers, scholars and public intellectuals, farmers and peasant movements, NGOs and human rights activists in the North and global South. The term has become a challenging subject for social science research, and has been interpreted and reinterpreted in a variety of ways by various groups and individuals. Indeed, it is a concept that is broadly defined as the right of peoples to democratically control or determine the shape of their food system, and to produce sufficient and healthy food in culturally appropriate and ecologically sustainable ways in and near their territory. As such it spans issues such as food politics, agroecology, land reform, biofuels, genetically modified organisms (GMOs), urban gardening, the patenting of life forms, labor migration, the feeding of volatile cities, ecological sustainability, and subsistence rights.

Sponsored by the Program in Agrarian Studies at Yale University and the Journal of Peasant Studies, and co-organized by Food First, Initiatives in Critical Agrarian Studies (ICAS) and the International Institute of Social Studies (ISS) in The Hague, as well as the Amsterdam-based Transnational Institute (TNI), the conference "Food Sovereignty: A Critical Dialogue" will be held at Yale University on September 14–15, 2013. The event will bring together leading scholars and political activists who are advocates of and sympathetic to the idea of food sovereignty, as well as those who are skeptical to the concept of food sovereignty to foster a critical and productive dialogue on the issue. The purpose of the meeting is to examine what food sovereignty might mean, how it might be variously construed, and what policies (e.g. of land use, commodity policy, and food subsidies) it implies. Moreover, such a dialogue aims at exploring whether the subject of food sovereignty has an "intellectual future" in critical agrarian studies and, if so, on what terms.

ABOUT THE AUTHOR

Marta G. Rivera-Ferre is an associate professor at the University of Vic (Barcelona-Spain) and performs her research on food systems and sustainability from a wide scope, analysing interactions among different components of the systems. She has been interested in food sovereignty since 2006 and has centred the analysis of the proposal from a sociological perspective, including local research in Spain linked to the food sovereignty movement, and also from an international and institutional perspectives.