



Social sustainability and resilience of the rural communities : the case of soy producers in Argentina and the expansion of the production from Latin America to Africa.

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TITOLO TESI

**SOCIAL SUSTAINABILITY AND RESILIENCE OF THE RURAL COMMUNITIES:
THE CASE OF SOY PRODUCERS IN ARGENTINA AND THE EXPANSION OF THE PRODUCTION FROM
LATIN AMERICA TO AFRICA**

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ABSTRACT

Soy is one of the most important and fast growing food commodities in the global market. Thanks to the introduction of GM soy varieties, Argentina has become the third producer in the world, what entailed significant impacts at environmental, social and economic level.

Objective of the study is to assess the social resilience of the rural communities cultivating soy in Argentina and to evaluate the current sustainability of the soy system.

At the same time, the analysis of the expansion of the soy production from Latin America to African countries represents an element of continuity in the evaluation of the phenomenon at global level.

The case study of the soy system in Argentina – strongly influenced by the introduction of GMOs and the consequent changes in land use, modernization and work organization – with its specific focus on rural communities, highlights how strongly social and ecological resilience are intertwined in the identification of mechanisms to guarantee social sustainability, which, in turn, is strictly interrelated with environmental and economic sustainability.

The agricultural sector showed a good capacity of adaptation and reorganization demonstrating being economically performing, but social and environmental costs were heavy, consisting in a deep disruption of the original rural communities structure and of the original natural ecosystem.

The soy system appears extremely rigid – because of the hyper specialization and the marked dependence on export – what makes it very vulnerable to changes in the international demand for soy.

The current system is strongly criticized by the civil society, blaming it to be the cause of environmental problems and of health risks.

To effectively contrast the negative consequences of the soy model, a significant role must be played by policy makers, who should define sustainability policies to enhance the resilience of the rural communities and to move towards more sustainable food production systems.

Keywords

Resilience, Rural Communities, Argentina, Soybean, Sustainability, Food Systems, Transition

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1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The present research finds its roots in the European project SALSA “Knowledge-based Sustainable vAlue-added food chains: innovative toolS for monitoring ethical, environmental and Socio-economical impActs and implementing Eu-Latin America shared strategies”¹, which aims at improving the environmental, economic and social sustainability and competitiveness for EU and Latin America stakeholders involved in the soybean and in the beef supply chains. The project addresses the major issue of reducing the environmental burden of two of the most significant food chains that are binding Latin America and EU and strongly influencing the eco-challenges and the social and economic development of small family farms and SMEs in Latin America.

The European project SALSA addresses the debate emerged with respect to the appropriate framework, tools and methods for evaluating food and feed sustainability along their supply chains.

Given the multiplicity of internal and external factors related to the agricultural production, it’s extremely significant to evaluate the rural communities capability to manage changes coming from external agents in order to identify sustainability oriented strategies and policies.

To assess the resilience of the rural communities producing soy in Argentina and to evaluate the sustainability of the current production system the Resilience Approach is applied.

Resilience thinking has emerged as one conceptual framework with which to understand change and the multiple, cross-scale interactions in social–ecological systems (Gunderson and Holling, 2002; Berkes et al., 2003). Although grounded in the ecological sciences (Holling 1973), resilience has increasingly been tested and applied by natural and social scientists to examine a range of ecological communities (Gunderson, 2003), linked social–ecological systems (Berkes and Folke, 1998; Berkes et al., 2003), and institutional and organizational arrangements (Anderies et al., 2006; Folke, 2006; Walker et al., 2006). Anderies et al. (2004) make the key point that resilience is a framework for systematically thinking through system dynamics (rather than a coherent body of theory) and that the concept helps in our understanding of complex systems behavior (Plummer and Armitage, 2007).

The concept of resilience is an increasingly relevant scientific approach to deal with the interconnected human and natural systems.

The Resilience approach can therefore be adopted in the evaluation of the rural communities’ social fabric capacity to manage changes coming from external agents, towards the objective of identifying effective social, environmental and economic sustainability strategies.

¹ "Knowledge-based Sustainable vAlue-added food chains: innovative toolS for monitoring ethical, environmental and Socio-economical impActs and implementing Eu-Latin America shared strategies" (SALSA, KBBE.2010.2.5-02), EU Seventh Framework Programme.

A literature survey was carried out on the Resilience approach definition and its application to the Social Assessment in rural areas (Severi, Rota, Zanasi, 2012). The analysis showed that the Resilience approach is dynamic and context-dependent and it enriches the Social Assessment by focusing on the specific capabilities of the communities in managing changes. The Resilience perspective embraces the dynamic character of communities and human-ecosystem interactions outlining multiple potential pathways. It provides a deeper understanding of how a community's positive response to change can be strengthened and supported.

Given the above-mentioned characteristics of the Resilience approach, a resilience assessment is identified as a suitable complement to improve the analysis of the Argentinian soy production system's sustainability.

1.2 THE ARGENTINIAN CONTEXT AND THE SOY AGRIBUSINESS SYSTEM

Agriculture represents an extremely relevant sector in the Argentinian economy, bringing about 4,06% of the Gross Value Added. The soybean cultivation in Argentina was originally introduced in the mid-sixties as an optional protein source for animal feed responding to the requests of the oilseeds development programme promoted by the national government.

To that experimental phase succeeded an expansion that brought the soybean representing the most significant production of the national agriculture, especially thanks to the technological revolution of the 90s characterized by no-till technique and GMO seeds. As a consequence, traditional crops were displaced, together with those producers who didn't adopt the new capital-intensive production techniques.

In such a context, new productive organizational schemes appeared and the soy production became more and more export-oriented².

The Asian countries – China and India – and the European Union lead the market demand for soy grains and oil, and for soy meal respectively.

Traditionally the European Union was the export destination for Argentinian soy meal: in 2008 it represented 58% of the total value, while in 2013 its relative position fell at 33%. Argentina has recently lost its competitive position in the European market due to the lack of protein quality in grains, generating a loss in the country's income.

Nevertheless, soybean is still one of the most important and profitable crops in Latin America and also one of the most controversial. It represents a significant share of the economy of many countries but it is also responsible for huge environmental impacts on valuable ecosystems such as the Amazonia, the Cerrado, the Chaco and the Pampas. Social impacts and public healthcare issues are also the focus of frequent criticism and activism among the civil society. The soybean expansion has also led to land distribution

² CESO, Centro de Estudios Económicos y Sociales Scalabrini Ortiz, *Costos y Rentabilidad del cultivo de soja en la Argentina*, Informe Económico Especial N. II, July 2013.

and tenure controversies and a massive migration of the rural population to the cities, with significant social consequences.

The reason of the rapid and extensive expansion of soy production in Latin America lies mainly in the growing demand for animal protein coming from Europe, China and India and now the big challenge is to turn the soybean production more sustainable environmentally and socially, trying not to penalize the economies of the producing countries and the revenues of the agricultural stakeholders.

The biggest soy producers in the world are the United States, averaging a production of 69,682 TMT of beans, followed by Brazil, averaging 30,236 TMT of bean production and Argentina which produces 17,547 TMT of soybeans, ranking as the third largest producer of soybeans in the world.

Argentina current soybean planted surface is about 31 million hectares, whilst in 1990 it was only 4.8 million hectares, according to the Asociación de la Cadena de la Soja (ACSOJA), the soy industry association.

Given the complexity of economic, environmental and social topics interrelations, it is necessary to take into consideration all the three dimensions to identify sustainability-focused policies and measures in Argentina.

At the same time, the analysis of the expansion of the soy production from Latin America to African countries represents an element of continuity in the evaluation of the phenomenon at global level, and the identification of possible similarities or differences – necessarily context-dependent – can help avoiding similar negative impacts and improving the sustainability of the production since the beginning of its expansion.

2. OBJECTIVES OF THE STUDY

1) Objective of the study is to assess the social resilience of the rural communities cultivating soy in Argentina and to evaluate the current social and environmental sustainability of the soy system, in order to identify the key point to consider to move towards a more sustainable development of the soy production system and, more in general, of the agricultural production in Argentina.

To do that, two different communities – situated in different regions and characterized by very different system scales and organizations – are analyzed:

- a) the medium-big and small producers in the soy production “core area” (Provinces of Buenos Aires and Santa Fe),
- b) the medium-big, small and family farmers in the North of the country (Provinces of Tucumán, Salta and Chaco).

2) The analysis of the changes brought by the introduction of the soy cultivation and of its effects on the Argentinean agricultural sector, together with the assessment of the resilience of the rural communities will help reading the soy expansion phenomenon in Argentina and from Latin America to Southern Africa, highlighting key points to work on for identifying technical production alternatives and strategies to move towards a sustainable production system on the basis of the characteristics of resilience of the communities considered.

3. MATERIALS AND METHODS

3.1 THEORETICAL FRAMEWORK: THE RESILIENCE APPROACH

The theoretical approach followed to assess the social sustainability of the soy cultivation in Argentina is the Resilience approach. The reason for applying this methodology lies in the fact that the Resilience approach enriches the social assessment by focusing on the specific capabilities of the communities in managing changes. It embraces the dynamic character of communities and human-ecosystem interactions (Maguire and Cartwright, 2008) providing a deeper understanding of how a community's positive response to changes can be strengthened and supported.

Within the three pillars of Sustainability (Economic, Environmental, Social), the Social dimension has been receiving research attention only fairly recently. Central governments and local public institutions, as well as the private sector, are showing an increasing interest in the topic. The development of sustainable communities all over the world is also receiving the attention and the support of governments and research institutes (Dillard, Dujon, King, 2009).

To implement strategies supporting a community's sustainability both in social and environmental terms, a social assessment is necessary.

Social assessment is a process of collecting, organizing and analyzing information about a community. The social assessment process ensures that social issues are considered in the implementation of a new policy or other change (Rietbergen-McCracken and Narayan, 1998). A social assessment is conducted using social analysis, evaluation and monitoring through processes of stakeholders engagement (Taylor et al. 1995). Public involvement and community engagement are integral parts of social assessment, and are essential for its success. In conducting a social assessment, information is collected on the community's social characteristics, its organization, the relationships between different groups within the community and how those different groups take decisions. To understand these community characteristics, a social assessment usually collects information on population characteristics, social organization, community history, lifestyles, community resources, and attitudes, beliefs and values (Burdge and Vanclay, 1995).

Given the present global context, characterized by a multiple and fast succession of events, it's becoming evident how the ability of facing changes is fundamental for a community's survival.

Rural areas, in particular, show common traits that make them vulnerable to changes. Since the provision of natural resources is under increasing pressure due to economic instability, continuing population growth, competing claims on land, and climatic challenges, attention for adaptation towards change is growing. In rural communities, a growing attention is also addressed to support small farmers sustainability and market access, given their active role in facing food crisis (IFAD, 2003).

Non-sustainable practices, perpetrated for years in rural areas make sustainability-based policies necessary. The impact of these policies is particularly significant in developing countries and is going to affect the rural communities, where unsustainable practices defined new equilibriums among the different stakeholders.

Social assessment, anyway, shows some limitations in describing the impact of change in a community. As stated by Burdge and Vanclay: *“Social assessment practitioners have identified a range of ‘indicators’ that can be used to identify areas of possible vulnerability; these indicators are generally focused on the negative or weak aspects of a community. However, communities and their characteristics and systems are dynamic and are made up of many interrelated processes, and therefore, social changes are particularly difficult to capture through vulnerability-based indices”* (Burdge and Vanclay, 1995).

In these contexts, while implementing the social assessment of a rural community, a relevant contribution can be given by the resilience approach. This approach in fact *“Rather than focusing on the potential points of weakness, [...] identifies the resources and adaptive capacities that a community can utilize to overcome any problems that may result from change. [...] rather than relying on external interventions to overcome vulnerabilities, a resilience approach builds upon the capacities (resources, flexibility) already established within a community. The resilience perspective embraces the dynamic character of communities and of human-ecosystem interactions, considering their multiple potential pathways”* (Maguire and Cartwright, 2008).

That’s why in the recent year the Resilience approach is often combined with SIA, in order to enrich the analysis with a dynamic perspective.

A resilience analysis may provide an assessment of whether socio-economic systems are becoming more or less resilient and predict/forecast the potential impacts of future shocks. Such analysis may therefore support policies and actions aiming at developing resilient socio-economic systems (UNESCAP, 2008).

The resilience approach can then be particularly suitable when applied to studies facing the topic of sustainability, where social, environmental and economic aspects are integrated.

3.1.1 Origins of the term resilience and first applications

“The term resilience was first applied to ecosystems by Holling (1973) and based on his work, as well as the work of organizations such as the Resilience Alliance and the Stockholm Resilience Center, resilience has become an important concept in the global dialogue on climate action” (UNESCAP, 2008).

According to Carl Folke *“the resilience perspective was revived in the early 1990s through research programs of the Beijer Institute, where it came across as essential in interdisciplinary studies on biodiversity (Perrings et al., 1995; Folke et al., 1996), complex systems (Costanza et al., 1993), property rights regimes (Hanna et al., 1996; Berkes and Folke, 1998) cross-level interactions and the problem of fit between ecosystems and institutions (Folke et al., 1998; Costanza et al., 2001) and in relation to economic growth*

and socioeconomic systems (Arrow et al., 1995; Levin et al., 1998). As a consequence, the Beijer Institute and the University of Florida, where Holling was located, started the Resilience Network, a research program that later developed into the Resilience Alliance (www.resalliance.org) with its journal *Ecology and Society*” (Folke, 2006).

3.1.2 Present definitions of Resilience

A more recent study, conducted by Maguire and Cartwright, provides an overview of the origins and different perspectives of resilience, including an updated definition of its approach. The study states: *“the resilience approach identifies the resources and adaptive capacity that a community can utilize to overcome the problems that may result from change. The approach builds upon the inherent capacities of a community, rather than only relying on external interventions to overcome vulnerabilities”* (Maguire and Cartwright, 2008).

The study also discusses the relationships between vulnerabilities, adaptive capacity and social resilience, which are defined as follows:

- **Vulnerabilities:** the components that may weaken a community’s ability to respond adaptively to a change.
- **Adaptive capacity:** the resources and ability of a community to cope with change
- **Social resilience:** the ability of a community to adaptively respond to change rather than simply returning to a pre-existing state (Maguire and Cartwright, 2008).

This last definition is partially new, since most of the researchers still consider the resilience as the capacity of returning to the state previous the change.

Some of the most common definitions of resilience are reported below:

- *“A measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables”*, as applied to ecosystems;
- *“The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self organization and the capacity to adapt to stress and change”*, as applied in the context of climate change;
- *“The ability to absorb disturbances, to be changed and then to re-organize and still have the same identity (retain the same basic structure and ways of functioning). It includes the ability to learn from the disturbance”*, as applied to socio-ecological systems (UNESCAP, 2008).

Different definitions of Resilience imply different analytical perspectives, which can be summarized into three major views/categories:

1. Resilience as stability: Buffer capacity
2. Resilience as recovery: Bouncing back
3. Resilience as transformation: Creativity

(Adger, 2000; Folke, 2006; Maguire and Hagan, 2007)

A common aspect in all perspectives is the ability to withstand and respond positively to stress or change.

Resilience as stability

This view, developed from early ecological studies, defines resilience as the ability to return to a pre-existing state. This view of resilience is measured as the amount of disturbance a system can tolerate ('absorb') before it shifts to another state (Holling, 2003 in Folke, 2006, p.254).

Resilience as recovery

The recovery view of resilience relates to a community's ability to 'bounce back' from a change or stressor to return to its original state. Resilience here is measured as the time taken for a community to recover from a change (Maguire and Hagan 2007; Pimm 1984).

The stability and recovery views of resilience have a deterministic understanding of resilience in that they see a community as having an inherent character, which enables it (or does not enable it) to cope with a stressor. This view implies that a community as a whole either is or is not resilient. It fails to take into account the dynamic nature of change and communities, which is recognized in the third view: resilience as transformation (Maguire and Cartwright, 2008).

Resilience as transformation

This more recent view considers social resilience to be the capacity of a community to respond to a change *adaptively*. Rather than simply returning to a pre-existing state, this can mean changing to a new state that is more sustainable in the current environment. For example, an agriculture-based rural community may develop different economic activities (e.g. tourism) or innovative farming practices that better suit the current environment. The transformation view of resilience is concerned with concepts of renewal, regeneration and re-organization (Folke 2006). Folke argues: "in a resilient social-ecological system, disturbance has the potential to create opportunity for doing new things, for innovation and for development". A resilient community is able to use the experience of change to continually develop and to reach a higher state of functioning. Rather than simply 'surviving' the stressor or change, a resilient community may respond in creative ways that fundamentally transform the basis of the community. This perspective recognizes that given the dynamic character of communities, they are unlikely to return to a pre-existing state, but will transform in an adaptive way to external change.

Social resilience recognizes the powerful capacity of people to learn from their experiences and to consciously incorporate this learning into their interactions with the social and physical environment. This view of resilience is important because it acknowledges that people themselves are able to shape the 'trajectory of change' (Herrera *et al.* 2006) and play a central role in the degree and type of impact caused by the change.

A more recent definition of resilience we refer to comes from the Stockholm Resilience Centre:

« Resilience is the capacity of a system, be it an individual, a forest, a city or an economy, to deal with change and continue to develop. It is about the capacity to use shocks and disturbances like a financial crisis or climate change to spur renewal and innovative thinking. Resilience thinking embraces learning, diversity and above all the belief that humans and nature are strongly coupled to the point that they should be conceived as one social ecological system » (Stockholm Resilience Centre, 2014)³.

Resilience multidimensional character

Other authors focus on the complex character of Resilience stating that it is more than the ability to adapt to a change; resilience involves transformation, encompassing the capacity for learning, innovation, renewal, re-organization (Folke, 2006) and attainment of a state that is sustainable in the current (social, political, biophysical) environment (Maguire and Cartwright, 2008).

The multidimensional nature of sustainability is recognized once resilience is considered as having economic, political, spatial, institutional and social dimensions (Adger, 2000).

Resilience vs. vulnerability

“While social assessment practitioners have identified a range of ‘indicators’ that can be used to identify areas of likely problems, these indicators are generally focused on the negative or weak aspects of a community. However, communities and their characteristics and systems are dynamic and are made up of many interrelated processes, and therefore, social changes are particularly difficult to capture through vulnerability-based indices (Burdge and Vanclay 1995). Instead of attempting to predict specific changes, a resilience approach accepts that change is inevitable and unpredictable. Rather than focusing on the potential points of weakness, the resilience approach identifies the resources and adaptive capacities that a community can utilize to overcome any problems that may result from change. A crucial difference is that rather than relying on external interventions to overcome vulnerabilities, a resilience approach builds upon the capacities (resources, flexibility) already established within a community” (Maguire and Cartwright, 2008).

This focus on resources and capacities does not ignore the components of a community, which may be vulnerable to a particular change. The resilience approach is balanced in that it includes both the vulnerabilities within a community as well as the resources and adaptive capacities, which enable the community to overcome these vulnerabilities and manage change in a positive way (Folke, 2006).

Resilience dynamic character

The resilience perspective embraces the dynamic character of communities and human-ecosystem interactions and sees multiple potential pathways within them. It provides a powerful way of

³ Stockholm Resilience Centre, *What is resilience? An introduction to social-ecological research*, 2014.

understanding how a community's positive response to change can be strengthened and supported (Maguire and Cartwright, 2008).

The social resilience approach is a way of understanding dynamic systems of interaction between people and the environment (Folke, 2006).

As already reported, *"social resilience has economic, political, spatial, institutional and social dimensions"* (Adger, 2000). These dimensions are mirrored in the communities' structure and behavior.

A resilient community is then able to respond to changes or stress in a positive way, and is able to maintain its core functions as a community despite those stresses. A particular change may have vastly different consequences in different communities, and different communities will demonstrate different degrees of resilience to the change (Kelly, 2004).

Given the above mentioned characteristics of communities, the resilience model naturally needs to be dynamic and context-dependent: the ways in which processes occur will vary between communities and within the same community in response to different types of change (Brooks, 2003).

3.1.3 Analytical approaches to resilience

Resilience analysis, in particular its assessment, can be made difficult, as stated by the Resilience Alliance:

"Given the dynamicity of a community's resilience and its continuous evolution, an assessment of resilience is never complete. It must be revisited regularly as system dynamics change and as understanding grows. [It is] a process, rather than... a final product" (Resilience Alliance, 2007).

Two studies considered possible ways of assessing resilience.

The more recent is a six-step process for resilience based social assessment, suggested by Maguire and Cartwright (Maguire and Cartwright, 2008), here summarized.

1. Defining the issue: the community and government agency should work together to identify who is included in the 'community', [...] what is the process of change that is likely to take place, what will be the issues arising from this change process for the community, what values and attitudes does the community have towards this change and the change process, what levels of government are important in this context and which of the resources are likely to be affected by the change.

2. The internal community structure: identification of the key social groups who are likely to be impacted by the proposed change, the relationships within and between social groups, the informal systems of governance in place in the community [...], the values, attitudes and beliefs held by different groups in the community about the resource and towards change.

3. Community history: the community can look at how it has responded to change in the past, and work together with government to ensure that the community is able to respond adaptively to the current change.

4. Community vulnerabilities: communities and governments can identify vulnerable components within a community, the resources and adaptive capacities which enable the community to overcome these vulnerabilities should be jointly considered (e.g. unemployment, high degree of reliance on one industry, [...] geographical isolation, limited access to services, high levels of debt, [...] low levels of connectedness between community members).

5. Community resources: a community's resources influence on adaptive capacity and resilience is assessed. The assessment process aims at identifying community groups or leaders who play an important leadership role in change and incorporating them into the decision making process. Community social capital, social inclusion, skills and education levels and quality of life are investigated.

6. Adaptive capacities: the community and government can examine the community's ability to take action, that is, to mobilize its resources for adaptation. Flexibility and redundancy in the system, which will enable the community to respond adaptively to a change also needs to be included.

The diversification of the local economy, the community ability to effectively organize itself and seek creative solutions to change, the timing of the community response to changes and the communication channels within the community must be analyzed (Maguire and Cartwright, 2007).

It is essential that a social assessment process incorporating a resilience perspective is not a one-off task. It needs to be an ongoing process. Community resilience is also the focus of the less recent Community Economic Development (CED) approach, illustrated in The Community Resilience Manual developed by the Centre for Community Enterprise (CCE, 2000).

Within this approach, resilience is defined as "the ability to take *intentional action* to *enhance* the personal and collective *capacity* of its citizens and institutions *to respond to, and influence* the course of social and economic *change*."

The accent is on the *intentionality*, meaning that a community can take actions to improve and increase its resilience. Coherent with its approach, the CCE study includes guidelines to increase the community resilience and to monitor its progresses.

In particular, according to the CED approach, resilience has four dimensions:

- people in the community
- organizations in the community
- resources in the community
- community process.

All four dimensions are linked, reflecting the interdependence between the different components of a community. The first three dimensions describe the nature and variety of resources available to a community. The fourth dimension, community process, describes the approaches and structures available to a community for organizing and using these resources in a productive way.

Each dimension breaks down into a series of more detailed “characteristics of resilience”. These characteristics are the specific factors that are examined in a community to assess the level of resilience. They can be researched and analyzed to provide a portrait of a community’s resilience.

The approach includes two types of indicators:

- 1) The first type relates to facts that we are able to collect about a community. Most of the information for these indicators can be found in government statistics, local statistics, and community reports (community studies and reports, city hall, regional district, other community organizations, etc.).
- 2) The second type of indicators concerns perceptions, attitudes and values. Information for these indicators is collected through interviews and focus groups.

Such perceptual indicators are not generally given great credit in mainstream economic research. In the context of CED (Community Economic Development), however, they are critical. Research has shown that such aspects as the level of optimism or pessimism, organizational co-operation, and quality and style of leadership in a community can have a very profound effect on its ability to change and adapt.

The Manual provides clear indications and supporting tools for statistical data collection, interviews and focus groups.

The CCE approach identifies some significant characteristics of resilient communities, stating that successful communities:

- share characteristics related to the attitudes and behavior of local citizens.
- share characteristics related to awareness and use of both local and outside resources.
- work to develop a range of organizations and groups that address local needs collaboratively.
- involve all segments of their population in ongoing planning, implementation and evaluation.

(CCE Centre for Community Enterprise, 2000).

3.1.4 The dimensions of resilience

As previously stated, resilience is a multidimensional concept. Exploring the relations within its social, ecological and economic dimensions is necessary to better understand their possible integration in an aggregated resilience index, and the relation between resilience and social assessment.

Resilience and social capital

As emerging from the above-mentioned characteristics, a resilient community finds its roots and strength in its inhabitants. A recent paper suggests that social capital can be seen as the main aspect of social resilience. Social capital is ‘the glue that holds society together’, in the form of trust, reciprocity and exchanges, social networks and groups. Social capital is thus strongly interlinked with social resilience, and depending on its nature in a positive, or negative way. Hence, the study of the functioning of social capital,

or the set of social networks and ingredients like trust, reciprocity, and public involvement, is crucial for our understanding of how communities deal with change (Beekman, van der Heide, Heijman, Schouten, 2009).

The relation between social capital and attitude to change is considered according to different perspectives including development and protection against risks.

Development is easier in communities with high levels of social capital. It is important to realize however that social capital can also obstacle development, if the social networks are so dense that change is not appreciated or even discouraged.

As for the risk *“a final mechanism is that social capital works as an informal safety net. The number and impact of risks are reduced because of greater risk-sharing and more trust”* (Narayan and Prichett 1999).

The influence of communities size on their relations is also explored: the smaller the rural community, the larger the chance that all members of the community can share the same networks, and thus share the same trust relations, and shared norms and values (Beekman, van der Heide, Heijman, Schouten, 2009).

The necessity of an active role of governments in promoting social capital is also considered,

As social capital stocks differ from community to community, can change over time, can be built up and broken down as a result of internal social change and external events (Putnam 2000; Field 2003), it is likely that existing social capital stocks at least can be influenced by policies (Callaghan & Colton 2008).

“Because of the complex nature of social capital, governments interest mainly focuses at measuring and monitoring social capital, rather than creating it. However, especially regional governments could play a role in stimulating the growth of existing stocks of social capital” (Beekman, van der Heide, Heijman, Schouten, 2009).

Within this framework the relation between social capital and social assessment is also examined; some authors consider that *“partnerships between governments and communities are the most effective means of implementing the social assessment process. (...) Governments and communities working together during a period of change can ensure that uncertainty, conflict and resistance are minimized, while maximizing the chances of success of the reform process itself”* (Maguire and Cartwright, 2008).

Role of resilience in social assessment

Several authors have discussed the usefulness of integrating the social resilience into the social assessment of a community. A synthesis of the contribution of the social resilience approach to the social assessment is provided by the study of Burdge and Vanclay (1995), confirmed by Schirmer and Casey in 2005, as reported by Maguire and Cartwright (Maguire and Cartwright, 2008).

The study stresses that a social resilience approach generates a richer and more useful social assessment in three ways:

- a resilience perspective is able to capture and contend with the complexity inherent in human-environment systems and social changes in those systems

- Instead of attempting to control change, the resilience perspective recognizes that change and uncertainty are inevitable, and that communities are dynamic
- the resilience perspective provides a way of assessing the resources and adaptive capacities of a community rather than just its vulnerabilities. In this way, it provides a core set of capabilities upon which to build adaptation strategies (Maguire and Cartwright, 2008).

Following the above-mentioned suggestions, the authors state that a resilience approach to social assessment enables us to:

- understand the community's social characteristics;
- understand the broader political and governance conditions and changes that are occurring, and their impact on the community's ability to manage change;
- identify the different groups within a community, including those who are most likely to be affected by a change, and understand the relationships between those groups;
- identify the vulnerabilities within a community which may reduce its resilience to adapt to change;
- identify a community's resources and adaptive capacities which increase its resilience to change;
- develop scenarios to understand how a change might impact on the community, and how that community might utilize its resources and adaptive capacities to respond in an adaptive way;
- identify practical strategies to strengthen the community's resources and capacities;
- monitor and evaluate changes as they occur to identify expected and unexpected social impacts;
- explore a community's values, attitudes and beliefs, how these are influenced by the process of change, and how they may influence a community's response;
- understand what impact external (social, political, governance) conditions have on a community's response to change (Maguire and Cartwright, 2008).

Social-ecological dimensions integration

Several researchers underline the necessity of integrating "social" and "environmental" dimensions of processes. According to some authors, despite the vast literature on the social dimension of resource and environmental management, most studies focused on investigating processes within the social domain only; they treated the ecosystem largely as a "black box" and assumed that if the social system performs adaptively or is well organized institutionally it will also manage the environmental resource base in a sustainable fashion (Folke, 2006).

The limited scope of analyzing resilience only within the social dimension is explicitly considered: a human society may show great ability to cope with change and adapt if analyzed only through the social dimension lens. But such an adaptation may be at the expense of changes in the capacity of ecosystems to sustain the adaptation, and may generate traps and breakpoints in the resilience of a social-ecological system. Similarly, limiting the analysis to the ecological side only can negatively affect the decision making for

sustainability support. That is why work on resilience requires considering integrated social–ecological systems. These integrated systems’ analyses are at an exploratory stage and there is still room for creative approaches and perspectives (Folke, 2006).

Adding the economic dimension to resilience

Social, economic and environmental systems are so intimately connected that socio -ecological – economic subsystems are only sustainable if their relationships enable the permanent co-evolution of each subsystem (Spangenberg 2005). Thus, the nature of the linkages between subsystems becomes important in determining the extent to which co-evolution can occur.

The linkages between subsystems also define 1) whether socio-economic systems can stay within ecological limits and 2) whole-system resilience, by determining how the shocks to one subsystem are transmitted to other subsystems (UNESCAP, 2008).

3.1.5 Resilience assessment: towards its different dimensions’ integration

Confirming the indications provided by the literature analysis on resilience so far considered, the interaction between social, ecological and economic variables still needs a widely recognized aggregated indicator of resilience. A study of UNESCAP summarizes different approaches to assessing and/or measuring resilience in various analytical contexts, along with the results of the analysis. Some problems emerged due to the analysis application mainly to short time scales, which do not allow for an effective dynamic approach. *“Most methodologies are applied to limited geographical and time scales and quantitative approaches have been largely based on valuation. While resilience is defined by the resilience community in specific terms, resilience measures are not always coherent with these definitions and rely on parameters that reflect resilience, rather than measure resilience directly”* (UNESCAP, 2008).

Furthermore the analyses are constrained by the complexity of socioeconomic and ecological systems, and the availability of data; this is particularly significant since resilience is strongly related to analyzing the specific and often very different community characteristics.

Although certain studies create indices that attempt to provide an indication of the relative subsystem resilience (either social, ecological, or economic), there is no index of resilience for unified social – ecological - economic systems. Developing a unified systems index would fill an important gap left by available indices insofar as it would consider shocks that are transmitted across and feedback into subsystems, which affects the resilience of each subsystem.

The construction of a *resilience index* from an integrated systems perspective may be considered.

One approach for creating a resilience index linking social – ecological - economic systems would be to develop a conceptual basis for the selection and weighting of indicators that measure the resilience of each subsystem and to combine them in order to capture the adaptive capacity of the integrated system.

The UNESCAP paper leaves some open questions:

- *Have there been previous attempts to create such an index, or related indices?*
- *What would be the value-added of such an index?*
- *Is such an index feasible, plausible, policy relevant?*

(UNESCAP, 2008).

The above-mentioned CCE Manual represents another significant step towards the integration of different dimensions of a community's resilience.

3.1.6 Resilience connection to sustainability in rural areas and food systems

In rural areas, the strict connection between social, ecological and economic dimensions appears particularly evident, and their joint consideration in a resilience analysis seems an obvious consequence.

This interaction is described in the analysis of different case studies reported by Antonio Andreoni (Andreoni, 2008). The author shows that rural systems are more resilient in comparison with the urban areas, since they can better maintain their equilibrium with the ecosystem and bear the effects of external economic shocks.

Other authors state that *'the rural resilience concept is complex to theorize and to catch in an univocal set of indicators, and is far more difficult to measure'* (Beekman, van der Heide, Heijman, Schouten, 2009).

An interesting definition considers the relation between resilience and food systems *"Resilience is the ability of a food system to deliver a combination of economic, environmental and social goals. A food system needs to be resilient to sudden shocks and also more gradual changes, both coming from outside the system (exogenous) and generated by the unsustainable behaviour of the system itself (endogenous)"* (International Sustainability Unit, 2011).

The same authors focus on the relation between sustainability, resilience and secure food systems.

Four key risks that challenge the global food system today are listed:

1. exposure to energy and input prices;
2. erosion of natural capital;
3. extreme weather events and climate change;
4. poverty, inequality and underdevelopment.

The authors further consider that *"these risks are inter-linked and often reinforcing, which means that they require an integrated response.... The world needs food systems that deliver a range of economic, environmental and social goals, while being resilient to risks and disruptions."*

This implies that a resilient food system should include both sustainability and food security issues.

The authors also stress the importance for resilience to operate at increasing complex spatial and institutional levels: *resilience must operate at multiple scales, from the farm or fishing boat, to the village, watershed, region, nation or global trading system - at each level complexity increases"*. Within such a

complex context, adaptive capacity will be key to overcome the challenges of the coming decades. *“Food systems that are diverse, modular and flexible are more likely to have the adaptive capacity that will be needed [...]. The focus of policy should [then] be broadened from growth and efficiency to risk, recovery and flexibility”* (ISU, 2011).

Since food production systems are so varied and interconnected, a clear definition of its boundaries is also needed.

Different and specific agriculture and fishery production systems around the world have been examined in the ISU report, which specifically analyzes the economic impact of resilience on rural areas and related food systems. The analysis shows that *“although it is difficult to measure, the economic value of resilience can perhaps be best seen by looking at the costs of the current food crisis - higher food prices, increased subsidy bills, widespread malnutrition and political instability have cost society billions. This could be termed the cost of irresilience. The economic value of resilience is the ability of the global food system to maintain its functionality in the face of risks and shocks. This may have some upfront costs and may even mean accepting a lower level of economic output year-to-year”* (ISU, 2011).

The results also indicates that - under the pressure of the need for increased food production and the danger of food crisis consequent to natural and political risks - food systems should evolve in order to prevent the erosion of natural capital, the perpetuation of poverty and in general a greater vulnerability.

Resilience and sustainability of the food systems should then be increased. The study also shows that alternative production systems providing more sustainability and resilience are being implemented around the world, mainly at the smallholders' level. A strategy to spread the adoption of these experiences to a wider arena of farmers and fishers is needed (ISU, 2011). Academics and policy makers are more and more frequently approaching two specific focus while analyzing rural areas, addressing both developing countries and more developed nations: small farmers on one side and rural communities in metropolitan societies on the other.

Different authors support this relation between small farmers in rural areas and the urban context.

“Small-scale farming is creating employment and contributing to rural development [...]. It is better at preserving ecosystems [...] and when the income of small farmers increase, it creates a market for services and goods in the country which benefits other sectors of the economy in ways that increased incomes for large landowners do not” (De Schutter, 2010).

Why rural areas and people matter in urbanized society, is further underlined by stating that *“even though rural areas may only contain 15-30 percent of a nation's population they typically contain most of its land, water, and mineral resources. In an era where food and energy supplies are increasingly insecure, and where environmental sustainability challenges social sustainability, rural environments take on added value and meaning. In highly urbanized societies, rural areas depend on their metropolitan counterparts for a multitude of social, economic and political goods and services but [...] the reverse is also true when it comes*

to supplying the essential inputs that make urban industry and communities possible” (Brown and Schafft, 2011).

The literature review on Resilience highlights the evolution of the meaning given to the term “resilience” and of the correspondent analytical approaches. The importance of focusing on the specific and multidimensional (social economic, environmental) characteristics of a community, when considering its attitude towards change, has become more and more evident.

Despite the difficulties in measuring and express resilience through a synthetic and unambiguous index – and the criticism about the real significance it could have - its role in improving a social assessment for the identification of sustainable policies is recognized. It has been also recognized that a resilience perspective is able to capture and contend with the complexity inherent in human-environment systems and in the social changes affecting these systems.

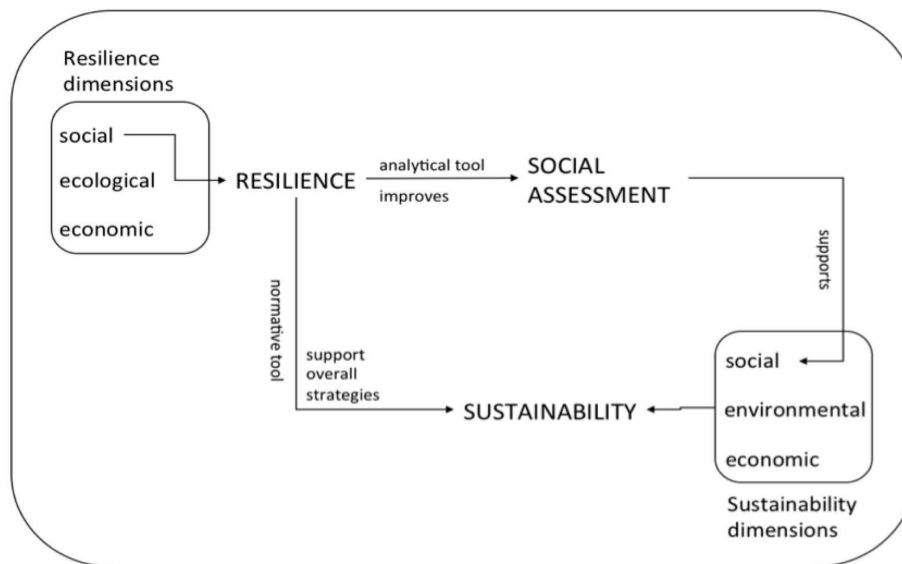
Through a resilience approach it is in fact possible to understand the political and governance conditions and changes that are occurring around the community, and their impact on the community’s ability to manage change. A further step made possible by this approach is the development of scenarios to understand how a change might impact on the community, and how that community might utilize its resources and adaptive capacities to respond in an adaptive way. This can help identifying strategies to strengthen the community’s resources and capacities, instead of focusing only on vulnerabilities.

The resilience approach is dynamic and allows for ongoing monitoring and evaluation of changes as they occur and for the identification of expected and unexpected social impacts.

The multidimensional character of resilience makes it easier to understand the impact of external conditions (social, political and of governance) on a community’s response to change.

The resilience approach can then represent a tool to support the implementation of policies and strategies aimed at environmental and social sustainability, in turn strictly interconnected with economic sustainability. This makes resilience particularly useful for the legislator, when defining their sustainability policies, and for the administrative bodies (central and local governments) as a support to their sustainability strategies implementation (Fig. 1).

Fig.1 Role of resilience in social assessment and connections with sustainability.⁴



3.2 METHODOLOGY

A context analysis was conducted in order to set the system and to define the boundaries for the resilience assessment.

The Resilience Assessment implies different steps, which could be summarized as follows: Defining and understanding the system: defining its boundaries and framing key issues: the resilience of rural communities in Argentina involved in the soy production system is analyzed. More specifically, the resilience of farmers' communities with respect to the introduction of the soy cultivation and to the significant changes it has brought in the agricultural sector organization is the focus of the analysis.

- Defining a list of key qualitative and quantitative information and indicators to assess resilience: a questionnaire was formulated, dividing the semi-structured interviews in different sections referred to different key issues (i.e. population, rural migration, education, culture, income trend, institutions, communication, environment, health, social conflicts, sustainability, certification, etc.). The questionnaire implemented for the data collection was discussed with experts collaborating at the European SALSA project, being the first part of the research included in the project itself.
- Data collection. The collection of specific data and information necessary to the analysis was realized through semi-structured interviews, addressed to key players: producers, processors, traders, farmers' associations, experts and academics. The data collection was carried out in two

⁴ Severi, C., Rota, C., Zanasi, C., 2012: *The Resilience approach contribution to rural communities Social Assessment for Social Sustainability-based strategies implementation*, International Journal on Food System Dynamics, Vol. 3, No 1 (2012).

phases, in the Provinces of Buenos Aires and Santa Fe during the first year and in the provinces of Salta, Tucumán and Chaco in the second year respectively.

In addition, secondary data were found in statistics and literature in order to:

- complete and enrich the resilience assessment
- give an overview of the soy expansion in Southern African countries, highlighting similarities and differences and potentials and risks of the exportation of the Latin America soy system model.

Data interpretation. Results were analyzed observing how the macro-categories transformed, through a qualitative description of the historical evolution of the relationships and of the interconnections among the technical, economic, environmental and social changes caused by the soy introduction.

- Discussion. The discussion of the results, coming from the field work and from the literature analysis together, includes two steps:
 - at first, it is made on the basis of the Resilience Assessment itself;
 - then, analysing the recent changes in the argentinan agricultural sector and considering possible future changes matching the Resilience Approach with the Treadmill of Production view. Crossing the interpretations coming from the application of these theoretical approaches facilitates to focus on specific issues under multiple viewpoints and to highlight the most relevant topics to be addressed for communities resilience enhancement and food system sustainability improvement.

Box 1: Summary of the methodology
Context Analysis
System Boundaries Definition
Resilience Assessment
Phase I: Preparation
Step 1: Identification of the Target Area
Step 2: Preparation for Field Work (Questionnaire)
Phase II: Field Work
Step 3: Identification of the Stakeholders to interview
Step 4: Data Collection (two phases)
Phase III: Data Analysis and Reporting
Data integration: secondary data
African soy expansion: literature review
Data interpretation and Discussion

Quantitative results from the above analysis are then analyzed alongside the more qualitative descriptions and explanations provided by interviewees.

The descriptive qualitative analysis of the case study is fundamental not to lose significant information coming from the interviewees and difficult to reduce to rigid categories and to express through quantitative data.

A brief literature review on the soy expansion towards African countries extends the reflections coming from the Argentinian case analysis allowing a global-driven view of the phenomenon and, more in general, of the sustainability of soy production systems.

The complex of the findings is then considered to identify key points to consider for facilitating the transition towards more sustainable agricultural systems.

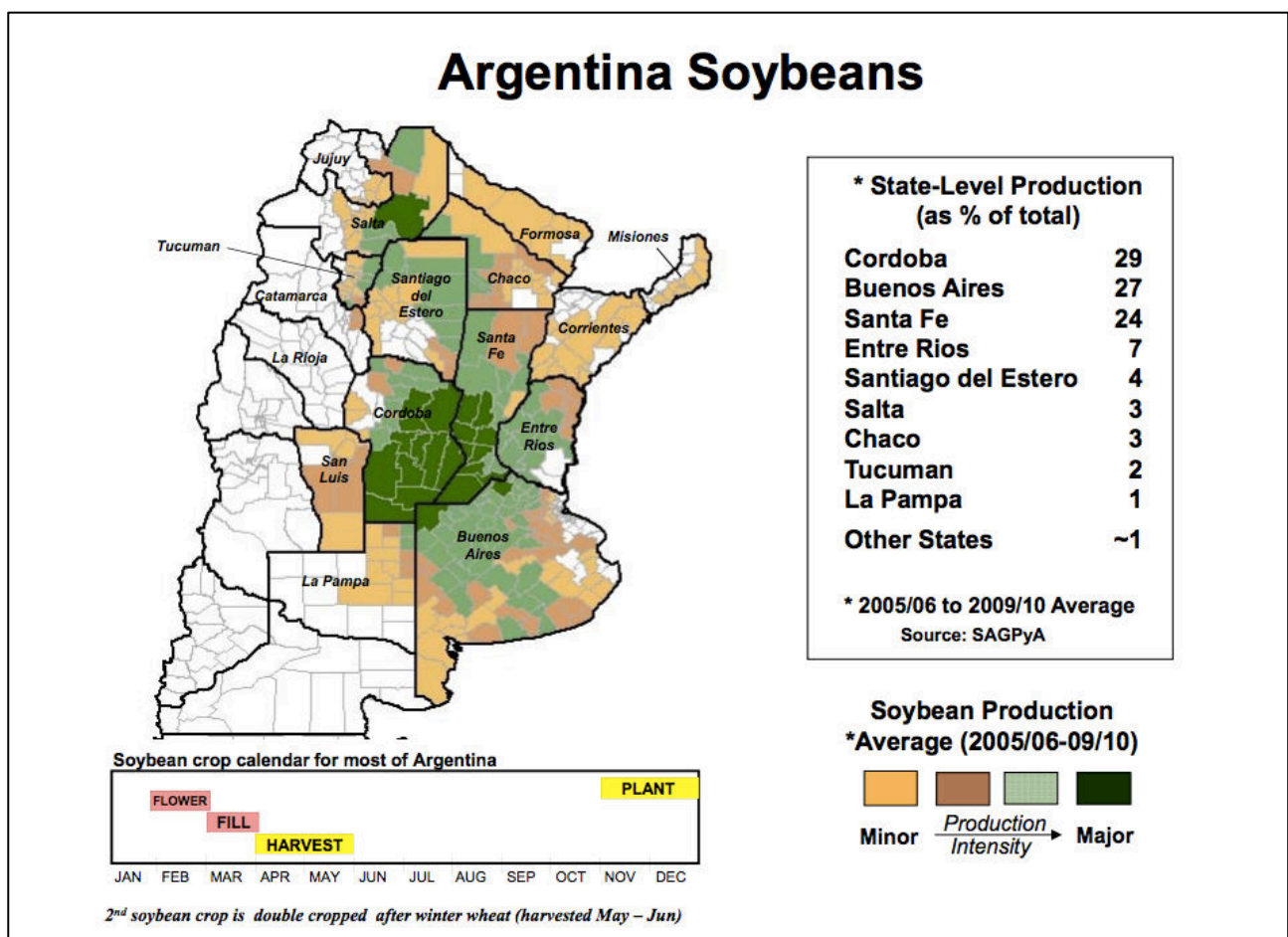
4. RESULTS

4.1 CONTEXT ANALYSIS RESULTS

Given the theoretical framework, the present study focuses on the rural communities cultivating soy in Argentina, where the introduction of the crop first (1970s), and of the GM varieties later (early 1990s), represented a remarkable change the rural population had and still has to cope with.

At present, little more than 80% of the approximately 20 million hectares annually cultivated in Argentina are distributed in Buenos Aires, Córdoba, Santa Fe and Entre Ríos, while the rest distributes in 11 provinces. The annual production varies between 50 and 60 million tons, depending on the size of the investment in technology and on climatic conditions.⁵

Fig. 2 Argentine soybeans production distribution



Source: USDA Agricultural Weather Assessments, World Agricultural Outlook Board.

The introduction of the soybean and its growth first, starting from the years 1970s, and the introduction of GM varieties since the early 1990s, generated a radical reorganization of the rural sector in Argentina.

⁵ Senesi, S., *El sistema de agronegocios de la soja*, Revista Insitucional BCR Bolsa de Comercio de Rosario, N° 1526, September 2015.

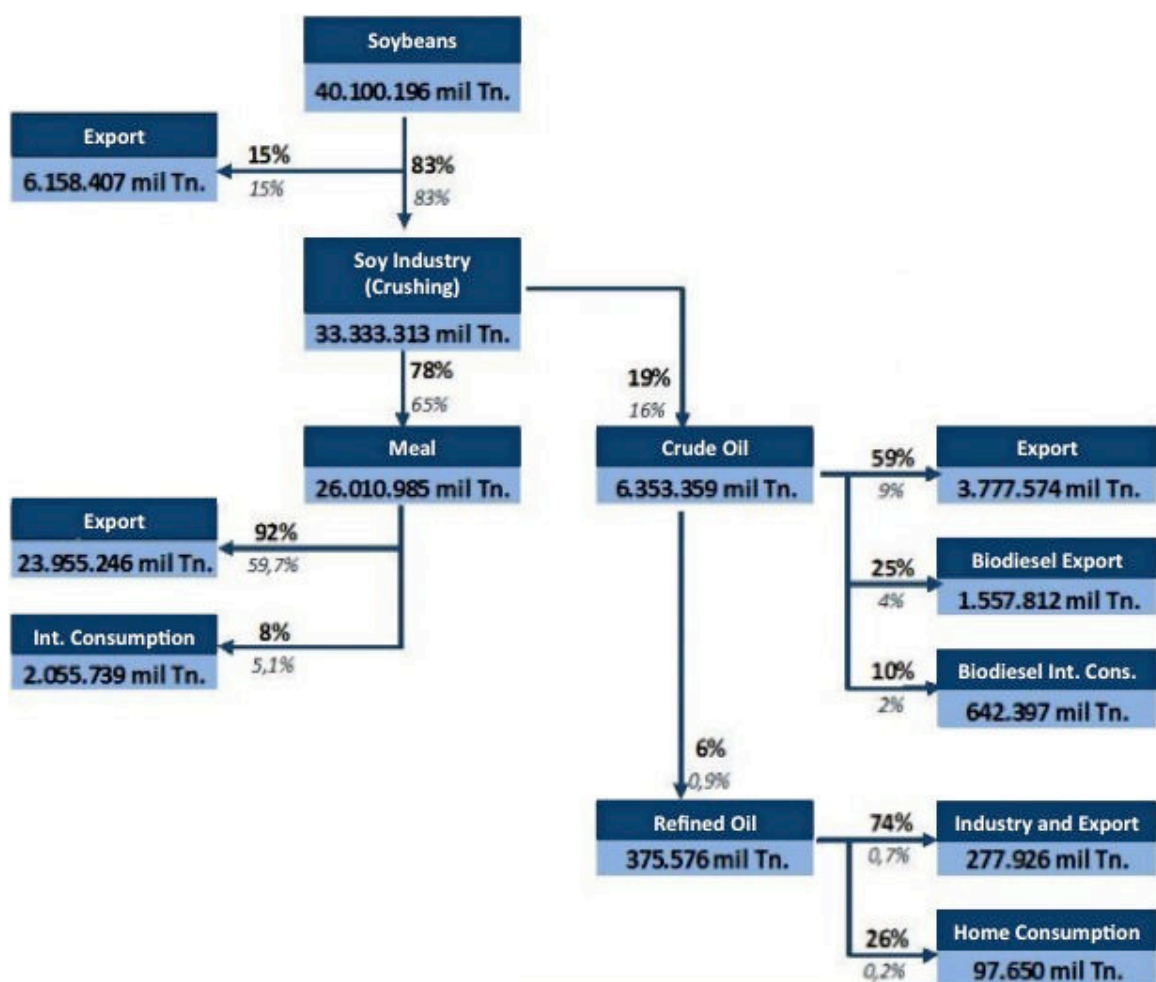
From the seventies to 2012/13, the cultivation of soy growth steadily, passing from 10,6% of the national agricultural production to more than 50%.

The process was accompanied by governmental measures that discouraged other productions, increasing the instability in the internal market. Since 2002, Argentina re-implemented the rights to exportation, establishing the differentiated scheme since 2008, together with measures that influenced the commercialization of cereals, with the aim of addressing the production to the internal market.

Since 2002 a great increase in the global market food price has been pushed by the significant increase in the world consumption of vegetable proteins, deriving from the change in food consumption trends and from the urban population growth, especially in emerging economies such as Asia, Africa and Middle East.

In addition, also the increasing demand of biofuels has been influencing the grains price. The result of a global soy production which, in the last ten years, has increased less than 3% per year versus a demand growing almost twice has determined a change in the tend of soybean price.

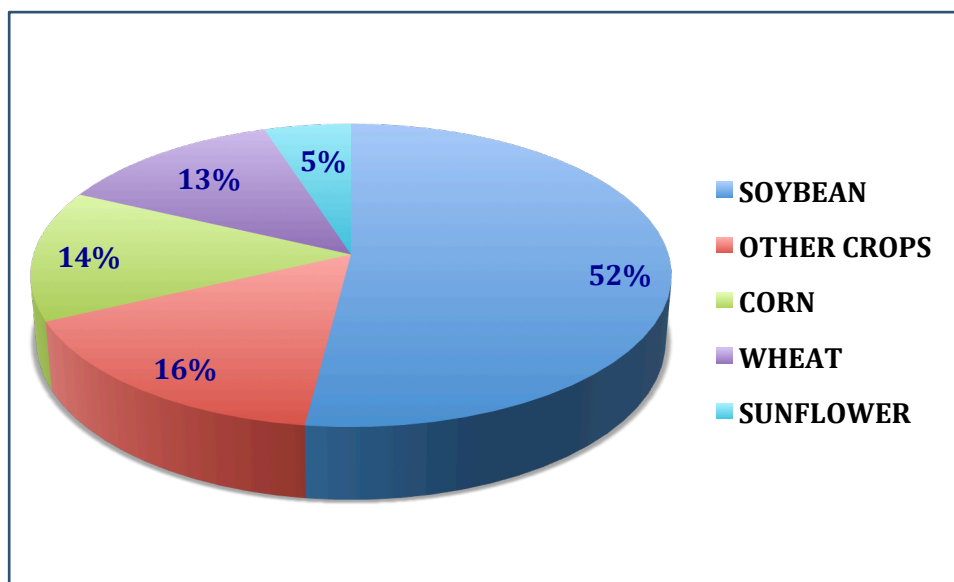
Fig. 3 Flow chart of the soy chain, harvest 2011/2012



Source: Adapted from CESO (Centro de Estudios Económicos y Sociale Scalabrini Ortiz) elaboration, data INTA.

The strong soy production growth has been essentially export-led and the system has extremely reduced the diversification within the agricultural production. Soy cultivation – being its profitability significantly higher - reduced the land availability for other crops and for animal productions. The area covered by soy increased by 141% between 1995 and 2004, while the area covered by corn, rice, oats and beans decreased by 16%, 19%, 27% and 52% respectively.

Graph 1: Covered area per crop. National total 2011/2012



Source: General Directorate of Agrifood – Ministry of Agriculture Argentina.

The assessment of the resilience of the rural communities in Argentina needs a clear definition of the system and, in particular, of the area and of the farms' sizes.

4.1.1 Land organization in Argentina

As confirmed by IFAD, land development has played a fundamental role in the dynamics of Argentina's history and three basic elements characterize the current period:

- The small and medium-sized family farming sector is shrinking rapidly. Although the national government has initiated programs to address this issue, they are not able to solve what has become a structural problem;
- The medium and medium-to-large capitalized farming sector is consolidating and growing, characterized by high levels of technology and production capacity.
- External investors have a growing importance in the agricultural sector: they either purchase land or participate in agricultural business through the sowing pools system (pooled investment funds).

Since 2002 – after recovering from the severe crisis 2001-2001 - the agricultural sector in Argentina has developed within a favorable economic context. In addition to enabling significant growth in production

and productivity, this has generated multiple conflicts in relation to land use, structure and tenure (Sili, M., Soumoulou, L., IFAD, 2011).

The different stakeholders face different problems:

- small-scale producers have to deal with the possession of land, the uncertainty due the absence of clear title, the inability to improve production conditions and quality of life, marginalization and rural exodus;
- medium-scale producers mainly suffer of unfair competition for land from external investors;
- large-scale producers or investors are responsible for concentration of land in terms of ownership and use, frequent violent evictions, unsustainable use of natural resources, and drastic changes in land use (mainly the absence of rotation due to the profitability of soy monoculture) affecting biodiversity.

According to the National Agricultural Census (CNA) there were approximately 80,000 fewer producers in 2002 than in 1988. In 2008 agricultural producers were 276,581 agricultural producers, with a decrease of around 57,000 producers. From 1988 and 2002 the reorganization of the agrarian structure registered a decrease of 82,824 producers in the under 500 hectare sized farms (representing 5 million hectares) and an increase in the 500 to 5,000 hectare ones (representing 4 million hectares), with the number of producers increasing by 2,000 in the latter category. These figures imply both that some of the smallest producers have moved to this category by scaling up (in terms of planted area), and that new producers have emerged to engage in economic activity by acquiring land from the smallest producers. The over 5,000-hectare agricultural enterprises remained practically unchanged, maintaining the same number of agricultural enterprises and the same area. This land concentration process has not been homogeneous. The regions having lost the most producers in the under 500-hectare group were the Pampean region (54,000 fewer producers) and the Northeast region (11,500 fewer producers). The region that gained the most producers in the 500 to 5,000 hectare group was Patagonia (1,525 more producers), and those that gained the fewest were the Northwest and Cuyo regions. From the point of view of land tenure, individual ownership accounts for the highest proportion of land at 75% of the total. Leasing is very significant with 12% of surface area. In third place, undivided estates also account for a substantial proportion. Sharecropping, contingency contracts, occupation under permit and de facto occupation, or squatting, together account for 7% of the total. In terms of how this situation has evolved, a very steep drop in the area accounted for by undivided estates is observable over the period 1988- 2002, followed by a downward trend since 2002 to the present day. Sharecropping and contingency contracts also declined significantly during the same period, though maintaining a total of 5 million hectares between the two. The major emerging phenomenon is the advance of leasing as a mechanism for occupying and farming more land. Leasing grew 64% between 1988 and 2002. Occupations under permit also increased significantly as a percentage, with 5.6 million hectares in the country as a whole (Sili, M., Soumoulou, L., IFAD, 2011).

As IFAD reports, “land distribution, tenure and use are subjects of growing interest in Argentina given the prominence these kinds of issues have acquired in recent decades: the concentration of land by certain business concerns, purchases of vast parcels of land by urban and external investors, the displacement of small producers in agricultural areas, and new models of agricultural management dominated by leasing. (...) The main issue is no longer changes in land ownership or use, but rather the ability to acquire more land through purchase or lease. This has generated a number of consequences: (a) an expansion in the agricultural frontier towards the north, west and south of the country; (b) an increase in the occupation and development of new land, promoted by provincial governments; (c) an across-the-board increase in land prices (in many cases up to 500 per cent); (d) a consolidation and considerable increase in the leasing of farmland (particularly for soybean crops) through pooled investment funds known as sowing pools; (e) the sale of government-owned land at derisory prices; and (f) in this context, multiple ambiguities around the purchase and sale of land. (...) These changes are not occurring independently of the rural development dynamic. Quite the contrary: land is the driver and the instrument of change in the country’s rural model. It is the mechanism enabling the transformation and shift from a family farming model (albeit with major differences across the country) to a large-scale, high productivity business farming model with delocalized management that sees rural space as a production platform rather than a live, dynamic rural territory. ” (Sili, M., Soumoulou, L., IFAD, 2011).

4.1.2 The evolution of land prices

The increase in land values in Argentina in recent years is a clear indication that the global rise in food prices has pushed up the value of land. For instance, one hectare of land in a livestock breeding area that was worth US\$200 two decades ago now costs US\$1,800. In the core area of the Argentine Pampa, the cost of one hectare has risen from US\$2,000 in 1990 to US\$10,000 today. The same holds true in other parts of the country: land in western Formosa that was worth US\$20 a hectare in the 1990s cost US\$150 a hectare in 2007. The same increases have occurred in the irrigated areas of the Northwest and Cuyo, where prices for land with water rights have risen more than 500 per cent in some cases. In this context of rising land values, leasing has undergone considerable growth, in parallel to the evolution of relative prices for agricultural goods.

4.1.3 Main actors of the land market

- **Small-scale producers**

Small-scale producers face structural difficulties in consolidating their productive development for various reasons. One of them is having access to sufficient land to produce food on a scale that will enable the family group to thrive. Land problems affect the following groups in different ways:

- Small-scale producers with formal property title to land.

In these cases, the land was purchased on the formal market, inherited, or handed over under a government owned land grant.

- Small-scale producers with precarious tenure.

These people live with a high degree of uncertainty given the informal nature of their land tenure and the possibility that they will be evicted. Such situations affect their investment capacity and productive development.

- Small-scale producers settled on land in demand by other private actors holding property title.

Small producers have held the land for several decades, at times when the land was not being developed by its registered owners, who were not exercising possession (in most cases unproductive or underemployed holdings).

- **Medium-scale producers**

Medium-scale producers are able to maintain production systems that allow them to continue operating by means of strategies to position themselves in dynamic value chains or by diversifying risk. Generally speaking, there are four types of situations from a land point of view: (a) producers who remain stable; (b) those who increase the amount of land; (c) those who sell their land; and (d) those who lease their land.

- **Large-scale producers**

Large-scale producers often use very dynamic production systems that are part of highly competitive value chains. In terms of how it has evolved, this sector presents a diverse range of situations: (a) some remain stable; (b) others are subdivided among family members; and (c) others sell their lands under various kinds of arrangements.

- **Investors**

External investors may be Argentinian or foreign individuals or corporations having taken over or purchased land anywhere in the country. We can categorize the following situations:

- Investors purchasing medium or large-scale farming operations or parcels of land, which enables them to generate economies of scale that make them highly profitable.
- Investors purchasing small plots or farms to incorporate into their already functioning production systems in order to scale up their operations, to hedge their capital against inflation, for status reasons or simply to enjoy rural activities.
- Sowing pools. These operate as companies, trusts or other legal entities. They produce for export (or domestic consumption) as well as for the value chains in which they are positioned, what enables them to drastically reduce transaction costs and the cost of inputs and services.

4.2 THE AREA OF THE STUDY AND THE RESILIENCE ASSESSMENT

The assessment of the resilience of the rural communities in Argentina needs a clear definition of the system and, in particular, of the area and of the farms' sizes.

The present study focuses on the core area (*área núcleo*) of soybean cultivation in Argentina, corresponding to the provinces of Buenos Aires and Santa Fe and on the Northern provinces, mainly Tucumán, Salta and Chaco and secondarily Santiago del Estero and Formosa.

Medium-big producers mainly characterize the soy core area, where a producer cultivating 500-600 hectares of land is considered a small producer. A plot of 300-400 hectares is considered the economic unit; land plots inferior to 300 hectares are insufficient to implement an economically sustainable activity.

Family farmers (20-50 ha) are not so common in the Argentinean soy business. The small farmers are mainly situated in the North of the country, in the extra-pampas regions (i.e. Chaco and Tucumán).

Fig. 4 Area of the study



Based on the literature review and the main world references in the resilience assessment domain, a questionnaire was formulated, dividing the semi-structured interviews in different sections referred to different key issues (i.e. population, rural migration, education, culture, income trend, institutions, communication, environment, health, social conflicts, sustainability, certification, etc.).

Specifically, the formulation of the questionnaire makes it adaptable to different kind of stakeholders interviewed, from small farmers and big producers to organizations and experts. Such an adaptation was made directly on the ground, skipping the inappropriate items and exploiting the possibility of adding comments and observations by interviewees.

The general construction of the questionnaire is reported in Annex 1.

The questionnaire implemented for the resilience assessment was discussed with experts before its application in the two phases of field data collection:

- Phase I: Resilience Assessment in the soy core area (Provinces of Buenos Aires and Santa Fe), 2012;
- Phase II: Resilience Assessment in the Northern area (Provinces of Tucumán, Salta and Chaco), 2013.

4.3 RESILIENCE ASSESSMENT RESULTS

The results of the analysis are reported following the main items considered in the semi-structured interviews.

4.3.1 The Soy System in the Core Area

The introduction of soy in the 1970s, together with the high level of mechanization and the introduction of GMO in the most recent years (starting from 1990s), modified the whole agricultural system in Argentina, bringing it to the current structure.

Nowadays the Argentinean agricultural sector is dominated by some principal cultivations; among them soybean is the most diffused, followed by corn, wheat and cotton. Soybean is the main production and its cultivation is spread almost all over the country, but the core area (*área núcleo*) corresponds to the provinces of Buenos Aires and Santa Fe.

Soybean is currently the most profitable cultivation, while wheat and maize are more expensive to produce and give lower yields. A big role in terms of profitability and of cultivations differentiation is plaid by the fiscal imposition system that makes it hard to generate a satisfactory income cultivating species different from soy.

In the last years, also breeding animals, cattle in particular, has become less profitable, both because of political choices and of the expansion of the soy cultivation, that reduced the number of beef farms and displaced the beef breeders to more remote lands. Nowadays the beef sector is not profitable anymore, thus the producers are almost obliged to cultivate soybean. One of the main reasons for the beef market situation comes from the choice of the Government to ban beef export, which represented the main

market for the Argentinean beef production. In terms of prices, the difference between the price at the supermarket and the price paid to the producer is huge.

In the recent past, the increased profitability of soy cultivation and the consequent increase in the land value pushed a certain displacement of beef farms to more remote areas and the total number of animal heads decreased. At the beginning of the change process some conflicts arose between breeders and cultivators, then advantages became evident and the situation changed. Also the breeding system is currently changing, moving from grazing to feedlots. That's why in the soy core area the problem of cattle displacement isn't seen as an issue anymore, since feedlots require smaller land lots. On the other hand, in the North of the country the displacement of livestock farms still represents an issue, at times giving rise to social conflicts.

In any case, nowadays it results almost impossible to live off livestock breeding only, since the market is very instable, characterized by continuous fluctuations.

Also the milk products prices are currently low, so breeders prefer to rent the land to soy producers and more in general to agricultural producers. Milk production is less and less profitable and risks disappearing. In addition to the market effects, severe droughts – especially in 2008 and, more recently in 2012 - caused the death of many livestock heads; the government didn't help cattle breeders with subsidies for reconstituting the herds, thus many breeders ceased the activity because of financial constraints.

Subsistence farming completely disappeared in the Pampa area, while it is still present in the northern area of the country.

In the last forty years, the deep changes in the agricultural sector modified the Argentinean landscape also in terms of settlements: nowadays there are more small villages (*pueblos*) and more small cities disseminated between the countryside and the big cities.

In 2010, the urban population started overcoming the rural one, and it is still growing.

Land

The land cultivated with soy is nearly totally privately owned.

The value of the land has strongly increased in the last ten years; thus nowadays - in spite of the high potential demand - the landowners prefer to rent it instead of selling it. Indeed it represents a profitable investment and rents are high. Rent contracts are generally negotiated for 1-3 years. The owner can introduce clauses in order to regulate the land use. Contracts also take into consideration the climatic conditions (i.e. the drought in 2008) and the economic context: in the recent years producers have been almost forced to cultivate soy as a monoculture – avoiding rotation with traditional cultivations, like wheat and corn; this because the higher profitability of soy in respect to the other cultivations represents the only possibility to compensate for the high costs related to land renting and to bear the heavy fiscal imposition.

Technical aspects of the soy production

From a technical point of view, in the whole area of soy cultivation the no-till farming is applied.

Since with that method it isn't possible to work the land, the mechanical control of weeds isn't feasible; thus agrochemicals are necessary.

In Argentina it is estimated an average application of 40 kg/ha of fertilizers. It is expected that the utilization of fertilizers will triplicate by 2020, with an application of 9 millions tons compared to the current 3,5 millions tons⁶.

In terms of dependence from the inputs suppliers, farmers seem to have a fair degree of freedom: they have to buy the inputs – necessary especially for GMO production - but they are free to select their seeds suppliers, choosing among three different possibilities:

- local producers, that actually are seeds multipliers, while the genetics is held by multinationals;
- cooperatives;
- multinationals.

Soybean seeds are 99.9% GMO and are patented. Buyers need to pay royalties, which are generally affordable for medium-big farmers, while they represent a constraint for small farmers.

When GMO seeds are kept longer than one year, they lose germinating power, thus it is common custom to buy them every year.

The organization of the soy supply-chain is changing and vertical integration is increasing: big soy producers and processors are the leading companies, integrating backwards, sometimes buying the lands; the trend is quite evident, but it is a slow process, also in cultural terms.

Some big companies have business also in bordering countries such as Brazil, Uruguay and Paraguay. The original business of those big companies was farming, mainly commodities production. Then they started the vertical integration adding the storage phase (mainly grains), storing their own products at first, then also the ones of other producers. Then they added the commercialization phase too.

This phenomenon is likely to lead the small producers to disappear; the possibility they have is to rent the lands instead of selling them, and fix some rules, i.e. what to cultivate and how; that allows preserving their agricultural activity to a certain extent.

Labor

Following the radical changes in the agricultural sector in Argentina, the soy production has become an entrepreneurial activity and many farmers have started other activities linked to the soy cultivation, in addition to the production phase.

⁶ FARN, Fundación Ambiente y Recursos Naturales, *Informe Ambiental Anual 2015*.

In fact, the diminished need of workforce dependent on the reorganization and on the mechanization of the agricultural sector, brought farmers to significant changes: some of them, generally the biggest or the most skilled ones, started new agricultural professions (e.g. contractual agents), others rented the land and moved to the cities, living off the rents of the lands, and others - generally small farmers - moved to the cities trying to find new jobs, what results generally quite difficult. Taxi-drivers, cleaning services, guardians are often ex-farmers.

Analyzing the labor in the rural areas and the most frequent employment contracts, it emerges that people living in the farms – who represent a very small percentage - are permanent workers mainly: the workers who are employed with a steady job in the land cultivation are not specifically employed for the soybean cultivation, but they are in charge for all cultivations. The most frequent type of contract for specialized workers in the soy sector is the contractual agent (*contratista*), who is in charge for a specific phase of the soy production (seeding, spraying, harvesting) and generally lives far from the land, in villages or cities.

The harvesting is the phase with the highest profitability, followed by the spraying and then by the seeding activity. However, the harvesting requires higher capitals and investments for the equipment. Thus, harvesters are generally businessmen.

Summarizing, the production phase includes basically the **producer** and the **contractual agent**:

Producer: refers to the person who, independently from the relationship with the factors of production (land, capital, labor), takes charge of the risks of the production activity.

Contractual agent: broadly speaking, it is everyone who takes part in the production process and/or in the agricultural business through any type of contract that doesn't involve any production risk. Among those actors we can mention:

- Supplier of agricultural services: he/she provides a service of Capital and/or Work
- Supplier of land or landlord: he/she rents land but he/she doesn't take part in the risk.

Source: Vilella, F., Senesi, S.I., Dulce, E.G., San Martin, R.P., Daziano, M.F., 2009: *El Sistema de Agronegocios de la Soja en la Argentina, su Cadena y Prospectiva al 2020*.

The medium sized and big farmers have generally become tenants, businessmen or both. Tenants rent their lands (leasing contracts) realizing good profits, but a farmer can also decide to keep some hectares of land for himself, cultivating it directly, and at the same time he can become a contractual agent (*contratista*) for a specific production phase, i.e. for spraying or harvesting. The passage from employee to contractual agent generally doubles the revenues and develops entrepreneurial capabilities.

The owners of small lands generally rent them, since small land lots don't allow setting up an economically sustainable activity.

Farms that are divided among the sons of the original owner represent a quite common phenomenon; often the successors don't continue the agricultural activity, preferring to be employed in different fields.

Contractual agents stipulate direct regular contracts with the big groups, but they often pay their own workers cash in hand, without contracting them.

Two systems, differing in property rights, are becoming more and more common:

- Vertical coordination, through contracts
- Vertical integration, where the owner of the transformation plant is also the owner of the land and is often into the commercialization process.

As reported before, the intense process of mechanization of the last twenty years has reduced the number of workers in agriculture. In fact, with the present mechanization, to work 500 ha of land it is sufficient to employ 1-2 full-time workers, plus 6-7 external contractors recruited at the moment of the different specific production phases. Therefore, the scaling up of the production forces to outsource, in order to optimize the costs.

The share of women within the soy system is increasing in terms of agricultural engineers, but all field works still remain traditionally a man's job.

In terms of geographical origins of the farmers, they are generally from the area where they work when referring to the area of Buenos Aires, while in Santa Fe and Entre Rios many of them are immigrants, coming from different areas of the country.

Nowadays, agricultural workers usually live some kilometers far from the field. Some farms employ people (generally families) who live in the farm, but they generally result more necessary for livestock than for cultivating the land.

Skilled labor is not always easy to source: in some areas there is a lack of skilled workers, especially in the North of the country.

Illegal labor is still frequent and represents about 20-30% of the total workforce.

No child labor is reported in the land works. Some interviewees reported that some child labor is exploited by the multinationals in the seeds selection, given the nitpicking of the task, but no official data are available.

In other seasonal and manual works (i.e. in the cotton production) a higher percentage of illegal labor is registered.

With the current legislation, workers can work 8 hours/day, but they often prefer to work more than eight hours, especially in the peaks of the activity. That trend incentives the contractual agents not to contract their workers regularly.

From a cultural and sociological point of view, it is interesting to report that in the past it was common for neighboring farmers to help each other in the agricultural work. Nowadays that continuity among

neighboring farms doesn't persist anymore, because of the reorganization of the properties and of the tenant farming.

Income and Credit

Generally, the farmers' income doesn't depend on soy only, but it derives from a mixed farming activity.

The labor employed in the breeding sector earn less than in cultivation; one of the reasons is that they are not requested to manage any machinery, so they are supposed to be less exposed to risks and are probably considered less specialized.

The average salary in agriculture in 2012 was about 2000 ARS (less than 400 USD), compared to the average salary in commerce of about 3000 ARS (approximately 550 USD).

Currently, the agricultural income is quite stable, with a downward trend more than an upward one: revenues can increase, but also the costs do, so the profit margin decreases or remains the same.

Credit is not available for farmers. Private companies sometimes grant a sort of credit to farmers: they sell seeds and other production inputs to the farmers and accept to be paid after harvesting; in that way the buyers bind the farmers to sell the production to them. This phenomenon is becoming more and more common and is a way to keep the client's business.

Sowing pools (*pools de siembra*) are a very frequent financing form: they are investment funds through which private individuals invest in the soy production system. Small producers often rent lands to the *pools de siembra*, since it is convenient and less risky.

Since there are no subsidies and there is a heavy fiscal imposition on sales (which in 2012 reached a quota of 35%), the family agriculture is not possible for market purposes; it is rather a production for self-consumption, and, in that case, cultivations are generally different from soy. For being a soy producer with income purposes it is necessary to be medium-big sized.

Fiscal imposition and legislation are actually the main concern of the producers. Taxes on export vary every year and there seems to be very little room for dialogue with the government.

Public incentives are granted to cultivate the land, including different cultivations, not only soy, but those incentives are granted for a maximum of 100 hectares that represent a very small land lot; behind that limit, no other incentives are available. The interest rate is low (8% yearly), but 100 ha are too little to represent a significant production.

Besides the taxation constraints and the scarce public support, the living conditions of the farmers in the core area have generally improved with the diffusion of the soy production; nevertheless, it is important to remind that the phenomenon concerns mainly medium and big-sized farmers, while the situation for the small farmers and for the family farmers significantly differs.

In addition to the constraints imposed by the Government through the fiscal imposition, no foreign currency can enter the country; the consequence is a spread of a parallel market (black market): in fact, foreign currency is stored in foreign countries.

No machinery or spare parts can be imported from Europe, thus the quality and the efficiency of the machinery is lowering.

It is forbidden to buy secondhand machinery, thus people are forced to buy machinery produced in Argentina (which, in reality, is only assembled within the country), even if they belong to international brands.

Education, Gender and Culture

The most frequent education level in the core area is the secondary school (*escuela secundaria basica*).

Public schools are affordable for everyone, while the private schools are only accessible to the upper class.

As a consequence, there isn't any private education in rural areas.

Spanish is the official language. English is still spoken by a limited share of the rural population.

Companies have higher requirements with respect to the average education, thus the educational level generally doesn't meet the requirements of the workplaces.

The majority of producers aren't agricultural engineers, but they encourage their children to study agronomy: that trend is mainly addressed to men, while it is not very common amongst women, who represent about 10% of the agricultural engineers at the maximum. That phenomenon isn't a consequence of the current production system and of the current organization of the agricultural sector: in fact, also in the farms of thirty years ago the role of women in the field was marginal.

The tenants have very variable education levels.

Agribusiness is traditionally a man's job (about 60% men and 40% women). Agronomists in the field are 80% men. Contractual agents are 99% men. In the commercial sector, on the other hand, the percentage of women is increasing. In the research field women are numerous.

Agricultural education in the villages is easy since children are in direct contact with the land and they learn how to work it, but the reduction of workforce demand in agriculture and the migration to the cities could threaten this knowledge of disappearing.

Whilst the education level in agriculture is generally quite low, the average education level in economics (offered by the IAE Business School, Instituto Argentino de la Empresa) is higher than in the USA – the first soy producing country - especially in the soy sector.

The agricultural work is traditionally transmitted from a generation to another. Nowadays the young people who grow up in the field are already very specialized, thus they tend to continue the job in a more specialized way.

In the cultivation of soy, producers generally follow the production modalities suggested by their neighbors or by the input suppliers. Some producers represent a sort of reference for the others.

The rural middle class has also good capacities of aggregation. In 2008, for example, the *Mesa de Enlace Agropecuaria* – which groups the four leading national associations of agricultural producers of Argentina - organized a big movement of protest against the willingness of the Government to increase the taxes for the rural sector.

While comparing with the USA the Argentinians claim that there isn't any real difference between the technological levels in the two countries. The real difference is made by infrastructures, which in the USA are decisively better. The USA producers can get credit, while the Argentinean ones cannot. In the USA prices are granted by the State and the market is transparent, to the contrary of Argentina.

In addition, in terms of research, in Argentina the University is very detached from the productive world, while in the USA the United State Department of Agriculture USDA and the University offer very good researches and information for free.

Organizations

Argentina has a significant network of agricultural organizations. Among them, a key role is played by the National Agricultural Technology Institute (Instituto Nacional de Tecnología Agropecuaria, INTA): it is a national extension organization, which covers the whole country; especially in the areas of Rosario and Buenos Aires, they have good and direct exchanges with farmers, offering them a free service.

In the last twenty years, INTA has had a greater impact on the farmers compared with the research made by public university. In fact INTA is in direct contact with producers and its technicians are very well prepared both on the technological and the scientific side. INTA experts are very efficient in giving assistance in the field.

The INTA has also been very helpful in facilitating the switch to soy production, supporting the producers and accompanying them along the change.

Farmers' organizations and cooperatives are formal institutions in the rural areas: AAPRESID (Asociación Argentina de Productores en Siembra Directa) is the Argentinean No-till Farmers Association, with about 1500 members including producers (also small and medium ones), technicians and companies, and AACREA (Asociación Argentina de Consorcios Regionales de Experimentación Agrícola) is a civil organization of farmers who work in small groups to improve each farming enterprise; it counts more than 2000 agricultural producers. AACREA collaborates with schools for spreading the know-how about agricultural technologies and methodologies.

Within those farmers' associations and also within cooperatives, farmers have a strong exchange of know-how. AAPRESID, for example, divulges the no-till system (the organization introduced the no-till practice in

Argentina) supplying a lot of technical information and organizing workshops and field days. It is very accessible in terms of costs and it is spread all over the country.

INTA, AACREA and AAPRESID conduct trials continuously and they often offer their results for free.

As regards the technical assistance, the Extension Services are present and active in the rural areas, but they don't focus on soy only, thus they don't represent the main reference for the soy producers. Also contractual agents offer consultancies together with services.

Environmental and Social impacts of the soy system

Environment and Biodiversity

The environmental impacts of the soy production concern mostly the new areas of cultivation. It is estimated that about 300.000 hectares of native lands are added to the cultivated area every year.

Among the main environmental effects observed, the following are reported:

- Deforestation: about deforestation opinions are conflicting; following the experts of the Soy Observatory deforestation is completely due to the soy production, while soy producers maintain the contrary.

The Soybean Observatory is developing social indicators and releases two reports per year analyzing the environmental and social effects of the soy production system.

National and provincial laws about woodland are in force (around 70% of enforcement), and the awareness of the society is increasing. Sometimes laws foresee funds for compensation, but often they are not granted; nonetheless producers must respect the law, even if funds are not assigned.

After six years of application of the Argentinian Forest Law (Ley de Bosques Nº 26631 2007), serious problems of forest exploitation persist, due to the sustained increase in agricultural activity. In 2014 22 provinces had already regulated their native woodlands through provincial laws, what undoubtedly is a breakthrough. The territorial systems of native forest must identify and protect the areas categorized as low or no intervention, but several cases of illegal exploitation of those areas are registered anyway.

It is important to note that the transposition and the effective application of the national law markedly varies in the different provinces, because of different levels of corruption but also on the specific sensitivity of local administrators towards environmental issues.

- Soil degradation: related to soy monoculture. Even if the Pampean soils are very resilient thanks to their loess origins, several years of monoculture can cause negative effects.

However, many people claim that the soy production causes no problem of soil degradation: to the contrary – they claim – problems as erosion are avoided thanks to the adoption of the no-till method, which doesn't require any land working.

- Loss of biodiversity: not in the areas typically used for agricultural production, but in the new areas (i.e. northern areas), which are more fragile. Loss of biodiversity is mainly related to deforestation, but also to monoculture.

- Water contamination: there is no evidence.

In terms of climatic conditions, the Argentinean agriculture has to face climatic changes and especially severe droughts that in the recent years have damaged the production dramatically.

Civil Society

Among the social impact of the soy cultivation, the use of agrochemicals near towns constitutes the most delicate and debated topic, which is creating a rift between the general society and the agricultural stakeholders.

In 2008-2009 the criticism towards chemicals exploded and minimum distances for spraying near towns were imposed; every municipality defines the minimum-security distances from the villages for fumigations. It is reported that even if regulations are in place, no rigid controls are applied for the time being.

In order to reduce the risk of contamination for the civil society, fumigating machines should be left in the field, far from the inhabited centers, but they are often stolen, thus farmers prefer to take them home.

Also seeds are treated with chemicals to be preserved. Some multinationals expressly require that the producers treat the seeds in the field. All dangerous chemical residues should be treated following the law, but there are no machinery, no facilities and no sites to do it.

Health problems started having some evidence a few years ago and in September 2012 the first trial for health damage linked to the use of agrochemicals was conducted. The request for more strict laws is increasingly meeting the policymakers' interest.

Actually, the impact on the human health also concerns the agricultural workers: wrong doses or badly conducted operations (i.e. fumigation in windy conditions) and the lack of use of protections are frequent incorrect uses of agrochemicals. Workers often don't wear protections while using agrochemicals and many of them still spray chemicals using open tractors, without cabin, exposing themselves to toxic products. It is culturally difficult to get workers used to the employ of protections: some companies supply protection equipment but workers don't use them.

It has to be said that level of toxicity of the agrochemicals has decreased a lot, compared to the past, also because of legal impositions; the majority of the chemicals used belong to the Class IV, green stripe, the lowest one, which is still toxic anyway.

One of the problems that still remain is that the same receipt is applied to different areas: for example, the same agrochemicals are distributed in the same way and quantity, even if they should be different because of different soil characteristics or different cultivation requirements. This is seen as levity of the multinationals, which give general instructions that can be generally applied everywhere.

Another significant social impact of the soy system development is the radical change in the settlements' structure. Following the reorganization of the rural sector, and the intense migration from the countryside,

the human settlements changed drastically in structure and shape: in addition to an obvious increase of the urban population in the big cities, also small villages (*pueblos*) and small cities developed, leaving the countryside almost empty. Since there were no more reason for living near the lands, the move to villages and cities allowed people to access better services, e.g. schools.

GMO debate and organic soy

In Argentina 99.9% of seeds are GMO, what is generally seen as a positive technical enhancement. People don't know if GMOs affect human health and don't show any concern about it. Producers say that working with GMOs is easier than cultivating non-GMOs. In addition, it is difficult to find non-GMO seeds and yields are lower, thus, producers would be willing to use non-GMO seeds only if the production was paid much more than the GMO one.

Nevertheless, even if they represent a very small percentage (about 4%) of the total soybean, a certain quota of non-GMO seeds is produced. Non-GMO seeds are used for organic production. Some producers have specific contracts with buyers that specifically require organic soy. Often, those who produce organic soy are exporters themselves and can realize a good margin of profit, otherwise – given the high production and management costs and the low yields – Non-GMO and organic production wouldn't be rentable.

Some enterprises believe that from the health point of view organic production is better. From the environmental point of view, the opinion is contradictory: working the land – necessary for organic production, since organic soy cannot be produced through the no-till cultivation system – causes soil erosion, especially if the land are sloping, and a lot of fuel is used both for the tillage and for the harvesting (20 l/ha of fuel consumption for harvesting conventional production versus 34 l/ha of consumption for organic production, equivalent to 19 liters of fuel per ton of soy).

Argentina produces a basket of organic products different from soy but it is still small: the upper middle class is starting being more sensitive, but the average consumer is not willing to pay more and doesn't appreciate the product that doesn't look good, for example because of insects bites.

In Argentina the consumer has other problems and priorities, thus he doesn't consider the GMO/non-GMO debate as an issue. Specifically, there is no internal demand for organic soy.

Organic soy producers in Argentina don't know the reasons why their buyers require organic products; they suppose it is a request of the final consumer, but they are not really aware.

The opinion of many Argentinean experts is that it would be necessary to give clearer information to the European consumers, with precise and clear academic data.

Summarizing the problems related to GMO soybean that also producers recognize, two main issues can be reported:

- Excessive uses of glyphosate till 2012 made weeds become resistant. Nowadays, the alternatives to glyphosate are expensive and not really effective.

- Monoculture: as already reported, producers would like to cultivate other cultivations, i.e. wheat, but it is difficult to sell different products since the agricultural sector is strongly influenced by political choices and fiscal imposition.

Market

Argentina's economy is continuously fluctuating between positive peaks and crisis; the only sector that maintains approximately stable is agriculture.

Argentina is the third soy-producing country in the world, after the USA and Brazil. The USA produce mainly grains; Argentina and Brazil produce mainly meal and oil.

The Argentinean soy production is completely addressed to the export. Its principal markets are the European Union for meal and biodiesel and China and India for grains and oil. Europe is still the market of reference, even if 60% of the Argentinean production is already destined to China. Chinese started importing soy in 2001 and the production in Argentina boomed. Currently China is the main buyer in terms of quantities and it is in the position of making the difference on the market.

Small farmers generally sell grains to exporters or to the industry in Argentina. Producers know neither the final destination of the product nor the price that the exporter realizes.

Because of the heavy taxation previously discussed, producers often sell their products on the black market and the trend doesn't seem to move towards a change, unless the Government adopts different measures.

Communication

Communication about technical aspects of the agricultural production is quite spread and generally of good quality at all levels among neighboring producers (big, medium and small farmers) and between them and cooperatives' associations; however, it is accessible within the agricultural system but there is no dialogue with the rest of the society.

Radio and television rural channels give technical information and suggestions every day, even if the government monopolizes the television: during the year 2012, seventeen speeches with simultaneous broadcast were transmitted, every time stressing negative aspects of the agriculture (pollution, etc.).

Some association, such as AAPRESID and AACREA, are working to open the dialogue with the government; they organize periodic working groups. The results they achieve are public, but the civil society isn't used to listen to them: results are mainly divulged through the television and at schools, but the society doesn't feel directly involved in agricultural technical issues, and maybe people find the information difficult to understand.

Sustainability

The definition of sustainability is very variable and its meaning is not unique and clear for the Argentinean population. In the last five years the mentality towards social, economic and environmental sustainability has changed a lot, but there isn't a unique vision of what is sustainable yet.

Talking about sustainability, people immediately think about what could improve their own lives in their specific context, not at the general society level. There is a sort of debate in process, but it is still circumscribed.

Also soy producers are concerned about sustainability, but they tend to link it directly (and often exclusively) to the no-till farming system, seeing the cultivation method as synonymous of sustainability. Seeding without moving the soil - they maintain - protects the soil avoiding erosion, facilitating the retention of the rainwater and consuming a lower amount of fuel; but of course it implies a higher use of herbicides.

Also mechanization is seen as a tool for improving sustainability: using more powerful machinery means to employ less manpower, but it also means shorter times for agronomic operations, thus using less fuels and others polluters. Evidently, this view doesn't take into consideration the social impacts of a lower need for workers and the consequent social sustainability.

The agricultural stakeholders consider the agricultural system as a resource for future generations and they look at the use of more eco-friendly agrochemicals as a way to increase the efficiency of the production. They highlight that economic efficiency and sustainability must necessarily go at the same pace.

Technicians are organizing meetings with the owners of the lands, trying to sensitize them about what to sow, how to manage animal nutrition and manure, etc., but it is a significant and slow social and cultural change, mainly for people who were engaged in animal breeding.

Certification

Certification in agriculture is increasing, even if it is still limited. Costs are affordable, also because there are incentives and the improvements brought to the production systems allow saving money, but economic returns in terms of product price are not significant. This last element is the main reason why certifications are not very popular.

Producers are willing to test changes and innovations, but only if they give a clear and granted economic benefit they will adopt them.

Some big groups are already certified (i.e. with the Roundtable for Sustainable Soy – RTRS certification scheme) claiming that it is easy for them to comply with the requirements of the certification; however, it is a bit more difficult to certify the suppliers, since there is a high level of outsourcing and it is very difficult to keep everyone under control.

AAPRESID is increasing the number of certified farms. Their certification, Agricultura Certificada (Certified Agriculture) regards the whole farm and certifies the producer, not the products. Producers receive a premium for certifying Agricultura Certificada (i.e. 12\$ Brazil, 10\$ India, 5\$ Argentina). Such a certification scheme is very similar to the RTRS one, thus they are trying to unify them. AAPRESID is also trying to agree with the government on a reduction of the taxation for certified producers. The need for a certification comes in part from specific request of the market, but there is also an awareness of the farmers themselves.

AACREA, to the contrary, doesn't believe in the efficacy of certification standards as the RTRS one, considering them mainly a commercial measure.

There is a debate about the utility of the certification: it can represent a barrier since it makes necessary to have more workers dedicating time to it, distinct transports, etc. Some producers' organizations, such as AACREA are not so certain that certification gives the expected results and that the consumer is really sensitive to it. Certification – they claim - must result also in economic advantages.

One of the reasons why producers often don't certify is that the minimum certification requirement is the respect of the law (protection equipment, working time, etc.): producers use to work shifts, doing two shifts of 12 hours each in the peak production phases (i.e. during the seeding time), while following the legislation workers should work 8 hours/day. Workers themselves prefer to work more than eight hours; that incentives the contractual agents not to contract them regularly.

In Argentina, for the time being, there are no controls, neither on what is required by the law.

As regards environmental certifications, some big groups (i.e. Cargill) require a declaration by the side of the producers that no deforestation was done after 2008, but for the time being no inspection is made. They are likely to start in a few years, but it is a slow process.

Debate and Social Conflicts between Agricultural Stakeholders and Civil Society

As reported in the paragraph Environmental and Social impacts of the soy system, the use of agrochemicals near towns is raising polemics and conflicts between the agricultural stakeholders and the civil society. Some big organizations, such as Greenpeace, as well as some small local groups are fighting against the soy sector.

In addition to what previously reported, it is relevant to note that in Argentina people feel a social gap between rich and poor, pointing at the agricultural sector as the cause of that rift. Soy producers are seen as the rich and are considered causing environmental problems for producing a commodity, which is not even part of the Argentinean diet.

4.3.2 The Soy System in the Northern Region

To integrate the analysis of farmers in Argentina, different stakeholders of the northern region of the country were interviewed in the second phase of the data collection. With specific reference to the soy production, the majority of the producers are represented by medium-big farmers. As in the Pampean region, where big groups owning large farms play the most significant role in terms of production.

Some small farmers – generally cultivating different crops, such as sugar cane - are situated in the northern provinces (i.e. Chaco and Tucumán), where social problems linked to land conflicts still remain. Those areas are not traditionally addressed to agriculture, but some subsistence farming is still present.

Land

In the Chaco area, big entrepreneurs are trying to obtain more and more land. Foreign businessmen know the area better than the local policy makers: they know where the resources (water, oil, charcoal) are. Private companies are driving the soy rapid expansion in the area.

In many parts of the northern region the unclear definition of the land property rights is still causing problems and conflicts between indigenous people (*pueblos indígenas*) and farmers; as a consequence, sometimes the traditional owners are forced to abandon their lands. Native inhabitants are displaced not only because of the soy production expansion, but also for cattle breeding and sugar cane cultivation. In the region animal breeding involve large areas characterized by very productive vegetal species, i.e. Bermuda grass.

Deforestation generates conflicts with the local populations who strongly oppose this practice, since the forest represents their natural habitat. The locals ask to limit the deforestation to some parts of the land, avoiding cutting the whole forest. For the native populations it's fundamental to live in the forest: without wood they have no land and cannot survive. They have no property rights, they just ask land and forest in order to live of what the nature offers, harvesting the natural land production for self-consumption. Nevertheless the Government sells the land to the companies without consultations with the locals. Deforestation is done in order to provide more land for the cultivation of soy, without crop rotation and without any reintegration of soil nutrients.

As a reaction to the described situation, Campesino movements are frequent in the North.

From a technical point of view, in the northern region the crop yields are lower than in the soy core area because of different soil and climate characteristics. As a consequence also the cost of the land is very different: 10,000 USD/ha in Buenos Aires versus 300 USD/ha in the North.

Technical aspects of the soy production

As described for the core area, also in the North soy is mainly cultivated as a monoculture. It is important to remark that when the producer is also the owner of the land – a not very frequent case – rotation is

made in order to preserve the soil which represents his capital and his future income; on the contrary, when land is rented the producers simply aim at exploiting the land obtaining the maximum profit, since they are not as concerned about its preservation as the landowners. This unsustainable practice is partially encouraged by the high costs related to the land rent and the retention to be paid to the government, forcing a soy monoculture, since alternative cultivations are not so profitable as soy.

In addition, there isn't any political support to the maintenance of the rotation and laws change continuously.

The soy monoculture is substituting other important crops: the wheat production, for instance, barely covered the domestic demand in 2012, while Argentina used to be a strong exporter of wheat.

The exported soy production is mainly a basic product, which isn't processed with sophisticated techniques; the crushing is the only process that is made, but it doesn't require manpower and generates neither labor nor stimulates technological progress.

Labor

In the northern provinces (i.e. in Salta) many soy producers come from the core area, namely from Buenos Aires. Agricultural workers are mainly men and they are generally employed through monthly or temporary labor contracts. Cases of illegal and child labor are reported by the people interviewed: children are mainly employed to delimit the boundary lines of the fields for fumigation, therefore they are exposed to agrochemicals.

Income and Credit

The income coming from the cultivation of soy in the North strongly differs from the core area's one. In Buenos Aires also a small producer cultivating 50-100 ha can gain a good income, while in the North yields are definitely lower. The land value strongly differs, being around 10.000 USD/ha in the core area and coming down to 300 USD/ha in the North.

Access to credit is difficult for the small producers of the North, since they have a low financial power, but also weaker cultural tools, a limited access to Internet and a more limited mobility.

A national program for technical and financial support is in place – but a few respondents mentioned it - while microcredit is decreasing.

Education, Gender and Culture

In the North of Argentina public rural schools are present, but they generally cover the primary school only, forcing young students who want to continue their studies to move to the cities. The quality of the rural schools is generally low and climatic factors sometimes prevent students to reach the school.

In Tucuman the average education level of the small producers is the primary school. The province has many schools and first aid centers. Sugar factories often have villages associated to schools as well. A significant cultural aspect is that the farmers of Tucuman generally think of themselves as sugar producers, even if only a fraction of their revenue comes from sugarcane.

With regards to the contents of the educational programs, the theme of the respect of the native culture is perceived as a very delicate one: the teachers often come from outside the villages, from the big cities, and don't know either the local languages or the local traditions.

The agro-technical school prepares youngsters with an already shaped farming mentality and fifty percent of the students continue working in agriculture.

The agricultural work is principally addressed to men, who also take care of beef, while women are responsible for goats and courtyard animals.

The North of the country is prevalently dominated by a male oriented culture, while the Northeast (i.e. Misiones and Formosa) is a little more open towards women.

The general cultural approach of the North strongly differs from the one of Buenos Aires: northern people unlikely accept interventions from outsiders and want to create alternatives and find solutions by themselves.

The interviewees also stress the importance to consider that, more in general, Argentina's mentality is very much oriented to the present, people aren't generally used to reflect on long-term perspectives, such as the ones involved in sustainability.

Organizations

Associations of producers and of native populations try to play an active role in the North, but they find obstacles by the Government. Fundapaz (Foundation for Development in Justice and Peace) is a non-profit organization that supports the farmers' and natives' organizations in submitting projects to access public funds. It is mainly active in Salta, Chaco and Formosa and partially in Santiago del Estero.

These organizations are both formal and informal. The latter are often the most effective and it is necessary to get through them for any effective action. Governmental pressure on the community chiefs, in order to contrast the cohesion of the informal organizations and reduce their opposition to land occupation, is reported. Sometimes episodes of conflict and violence are reported. NGOs and Foundations are the only ones that take care of the rights of *campesinos* and of the indigenous people. The natives live on "no man's lands", but demand the collective property right that the law doesn't consider.

The cases involving the native peoples rights' protection are very diversified and in some rare cases indigenous communities were able to organize by complying with the Governmental laws.

The province of Misiones shows a strong culture of association, but the small farmers – cultivating lots of about 10 ha – don't produce soy; big groups are the only ones cultivating soy in Misiones.

The extension services aren't present in the area.

Environmental and Social impacts of the soy system

Environment and Biodiversity

From an environmental point of view, the soil of the northern area – ranging from rainforest to deserts - is different from the one of the Pampa region and the environmental impacts are more evident.

The main environmental impacts of the soy cultivation are the loss in biodiversity and the change in the land use. Salta is the most sensitive area, since it has a great biodiversity that is threatened by the deforestation.

Whereas cattle breeding generally affects traditional pastures, soy is advancing on woodland mainly, and the civil society's pressure on forests is high; Greenpeace, for instance, put a strong pressure, which resulted in the so-called Woodlands Regulation that is supposed to regulate the land exploitation identifying three classes of exploitability of woods. Nowadays the legislators are evaluating the possibility to make the regulation less strict. Petitions are announced to stop deforestation.

As a social reaction to deforestation, *Campesino* movements are frequent in the North. The cause of the indigenous people doesn't seem to be taken into consideration neither by the Government nor by the civil society.

Further significant social impacts are:

- diminished rural employment and increased unequal income distribution. The difficulties in finding a job in agriculture contribute to increase the unemployment. The consequent concentration in suburban areas, together with poverty and iniquity, increase social marginalization and crime rate. To a certain extent, the marginalization seems to be boosted by the welfare subsidies – which appear to be strongly fed by the fiscal retention on soy. Since the subsidies foster the indolence of the poorest segment of the population, who doesn't take any active part in the construction of the Argentinean economy, they are considered a recessionary policy by many interviewees.
- conflicts with *campesinos* and with indigenous populations. In many parts of the northern region the land property rights are not clearly defined; this is still causing problems and conflicts between indigenous people (*pueblos indígenas*) and producers; according to the respondents sometimes the traditional owners are forced to abandon their lands. Native inhabitants are displaced not only because of the soy production expansion, but also as a consequence of cattle breeding and sugar cane cultivation.

Civil Society

Some organizations are actively addressing the soy issue, trying to contrast its expansion. Greenpeace, as previously remarked, plays an active role in advocating its regulation. Other local groups are particularly active in fighting the soy advance, as for example MOCASE, Movimiento Campesino de Santiago del Estero.

Nevertheless, the deforestation issue doesn't seem to concern the whole Argentinean society but only specific organized groups, particularly sensitive to the environment's protection issues. In the northern region deforestation is a huge problem, together with the lack of land property rights regulation. Some NGOs support the issue of the indigenous populations, while the general civil society doesn't seem interested. Similarly, the GMO debate is not particularly relevant to the civil society. Citizens mainly show concern about health issues linked to the use of agrochemicals for fumigations.

GMO debate and organic soy

In September 2013 Monsanto presented its new variety of GM soy, the INTACTA RR2 PRO, resistant both to Roundup herbicide and to the principal leaf-eating worms. In addition, it is also drought resistant, making it very appealing especially in Northern Argentina, where severe droughts have dramatically damaged the production in the recent years. Thereby, the soy producers are clearly happy to use it.

Outside the soy production chain, the civil society isn't generally interested in the GMO debate. People – especially those living in villages close to the cultivated lands - are more specifically susceptible to the use of agrochemicals for fumigations and show concern about health problems.

According to some respondents, it would be necessary a policy allowing choosing among three possibilities: buying GM seeds, buying non-GM seeds and multiplying their own seeds directly.

Organic agriculture is difficult to achieve in the northern region, since it requires water, which is a very scarce resource because of the severe drought problems. In addition, the demand for organic soy is limited, since it isn't generally consumed in grains but processed for animal nutrition. Thus, soy is almost hundred percent GM.

Market

The respondents of the northern region reported the same general observations described in the paragraph "market" related to the core area.

Six big producers in the Pampean region produce more than 50% of the Argentinean soy, while in the northern region farms are generally smaller and obtain lower yields.

China is the most important market for Argentinian soy export, followed by Europe. India is becoming a significant market too.

Should the Argentinian soy exports dramatically reduce, farmers would be able to shift to another cultivation, but they would need to discuss it with landowners: with the current soy system they generally are not the owners of the land, they are contractors and only own the machinery. In addition, shifting to different cultivations that machinery would be left underused.

Communication

Respondents report that communication and information on soy impact are often partial and biased possibly due to the strong economic and political impact of this crop for Argentina.

In the rural areas, radio is the main medium, while the television and the newspapers reach a significantly lower number of people.

Nowadays technical services tend to rely upon information and communication technologies like computers, smartphones, Internet, etc. The existing digital divide between large and small farmers makes it difficult for the small farmers to access the information on technical and economic information supporting their activity.

Sustainability

The population of the Northern Argentina doesn't seem to be aware of the sustainability; people seem to be primarily concerned with the effects of fumigations on human health.

Certification

In the opinion of soy producers, certification is not profitable. Nevertheless, some of them are certified just to demonstrate that they are law abiding in case of controversy, but they don't see any economic advantage. Those producers are generally big groups who were already managing the activity following the certification's requirements, thus they only had to make slight improvements to obtain the certification label. With regards to some specific aspects, certification can result useful to improve the knowledge of the law regulations (i.e. how to register the workers, etc.) and from a technical point of view since complying with the certification criteria showed an increased efficiency of activities like fertilization (lower amount of fertilizers to obtain the same yield).

Different other impacts affect the adoption of certification schemes for soy in relation to the basic law requirements. According to the law the plastic boxes and containers must be washed three times and shredded, to make sure they won't be further utilized; that reduces the risk of agrochemicals residuals. Later the waste disposal companies should collect the containers, but in some provinces where the treatment is compulsory there are no disposal companies and producers aren't in condition to respect the law. The producers try to use products that require small dosages, to reduce the use of plastic. For example, a way to reduce the plastic consumption is to use the granular glyphosate.

A comparison between certified and non-certified soy shows that the cost of production is nearly the same, but the cost of infrastructures can make the difference, being higher for certified soy.

The increase in productivity coming from the compliance with the certification scheme is indirect, and little tangible and it can be evaluated in the medium-long term.

Considering the producers on the whole – not only the biggest groups – they aren't willing to certify or in many cases they cannot cover the costs of certification. Unless the European market pays more for certified soy – the producer stated - they would sell their soy to China.

AC and RTRS are among the most important certification schemes for soy in Argentina. The AC (Certified Agriculture) certification issued by AAPRESID – the Argentinian Association of Producers adopting the no-till system – takes into consideration technical aspects only, while the RTRS certification also includes the social and environmental dimensions. RTRS requires the use of paper registers recording all the technical data of the farm and plans an audit every year, although the certification is valid for five years. The registers are customized, because RTRS defines which data must be recorded, but it doesn't state how; for that reason, at the beginning data recording can be a difficult and time-consuming task. According to some producers, the use of registers isn't useful to the everyday activity; they can be useful just in case of complaints for damages to the environment and also to provide the personnel the knowledge necessary to manage emergencies. In terms of sustainability, data recording isn't considered useful. Given the extra-work implied, RTRS certification can be suitable for medium-big producers, but it isn't easy for small producers to deal with. Medium-big producers certify to sell their products to Europe – The Netherlands mainly – but they do not obtain any price bonus. The RTRS certification scheme is perceived as EU-oriented. The producers claim that the certification should guarantee social and economic advantages and contribute to a better distribution of the income along the chain.

Debate and Social Conflicts between Agricultural Stakeholders and Civil Society

Nowadays the soy producers' reputation among the public opinion is low as a consequence of policy makers and environmental activists adverse campaigns. The farmland isn't perceived as natural anymore, it's rather considered as "chemical", therefore toxic. The producers maintain that there is misleading information, led by the national Government that takes the side of environmentalists. At provincial level there are differences in the approach to the subject, even if the majority shows sympathy for the environmental cause. A dialogue between the agricultural stakeholders and the Government would be necessary.

Role of politics

Among the interviewed stakeholders it's a common opinion that the role of politics is fundamental to regulate the agricultural production in Argentina: given the fact that soy is the most profitable product addressed to the export and no other cultivation can be competitive, the market by itself can't create alternatives; it's a public politics' matter. The agricultural stakeholders denounce a lack of politics supporting the agricultural sector: politics should support the diversification of the production to make it

sustainable both for big and small producers. Given the absence of diversification in politics and legislation, the current agricultural system results accessible by big producers only. Some producers fear that the soy monoculture will end in an economic collapse as it happened in the past for other cultivation as for example coffee and tobacco, unless a Government intervention will encourage a more differentiated agricultural sector structure. The main obstacle they see is the fact that the revenue coming from the retention on the soy production strongly contributes to the public expenditure and its reduction could generate strong and negative social and economic consequences.

With the current system, three actors benefit from the soy politic: the *pools de siembra*, the big producers and the national Government.

At provincial level, specific political differences have repercussions on the producers: some local administrations are more in favor of the soy cultivation than others.

Argentineans think it is necessary to make the EU politicians aware of the need to influence the Argentinian government towards a more differentiated market for agricultural products, also involving small and medium-sized farmers.

The role of Market and Institutions

The prices control and the market's measures of intervention influence the incentives of the economic actors and the production's structure. In some cases the impacts of decisions aren't considered in advance and at the end differ from the original intentions of the governmental body, which applied them.

Prices play a fundamental role within the economy, making the difference among different production alternatives. Producers plan their production on the basis of prices and the regulation and the intervention of the government affect their choices.

Therefore, prices define the use of the natural resources – namely the land use – often resulting in progressive deterioration due to the soy expansion, being the soybean the most profitable and economically stable crop.

According to the Argentinian Secretariat of Environment and Sustainable Development, the specialization in certain cultivations and in monoculture, as well as the widespread deforestation and the farming of soils scarcely suitable for articulate, increased the vulnerability to the climate changes, and pose one of the biggest challenges in maintaining the long-term productivity of the national agricultural sector (FARN 2014).

4.3.3 Summary of the Results

The introduction of soy, together with the high level of mechanization and the development of GMO soy in the most recent years, modified the whole agricultural system strongly encouraging a big-scale highly mechanized production. The profitability of soy rapidly increased, while producing both beef and milk became drastically less profitable than soy; this came also as a consequence of political decisions like the ban of beef export, dramatically reducing the access to the international market, where beef prices are higher than in Argentina. These factors jointly contributed to a high increase in the land value and to a diminishing need of workforce. Many milk producers rented the land to soy producers. Beef farms were displaced and the number of cattle decreased. Also the breeding system is changing, moving from grazing to feedlots. Given the passage of many producers to the soy cultivation, and given the fact that rotation with other cultivations is less profitable than soy monoculture, a general tendency to monoculture is spreading, bringing many consequences; among them:

- loss of biodiversity,
- land depletion,
- rigidity in the supply and
- strong dependence of the Argentinian agriculture on the international demand for GM soy.

In addition, the scaling-up increases the economic efficiency, but the quality of the production decreases, since less attention is paid to the specific requirements of the different cultivations.

As mentioned before, the diminished need of workforce, brought farmers to significant changes: some of them, generally the largest or most skilled ones, started new agricultural professions (e.g. contractual workers), others rented the land and moved to the cities, living off the rents of the lands. Others, generally small farmers, moved to the cities trying to find new jobs, like taxi-drivers, cleaning services and guardians, not without difficulties. The real problem is not the exodus from the countryside, but the farmers' integration in an urban context.

The concentration of the agricultural sector and the tendency of small farmers to disappear have brought to a current lack of skilled labor, which makes it difficult for contractual agents to find skilled workforce. An additional element which seems to exacerbate the loss of agricultural knowledge and, more in general, of technical education, is the current social support system: the Government grants contributions to the indigent families, assuring housing and basic services. Following the opinion of some interviewees, that system incentives poor people not to look for a job, preferring to maintain the right of access to public incentives.

At the same time, a significant sociological and demographical phenomenon has been observed in the last thirty years: following the reorganization of the rural sector, and the intense migration from the countryside, the human settlements changed drastically in structure: in addition to an obvious increase of the urban population in big cities, also small villages (*pueblos*) and small cities developed, leaving the

countryside almost empty, since there was no need of living near the lands anymore; furthermore moving from the countryside to villages and cities allowed people to have access to more efficient services, e.g. schools.

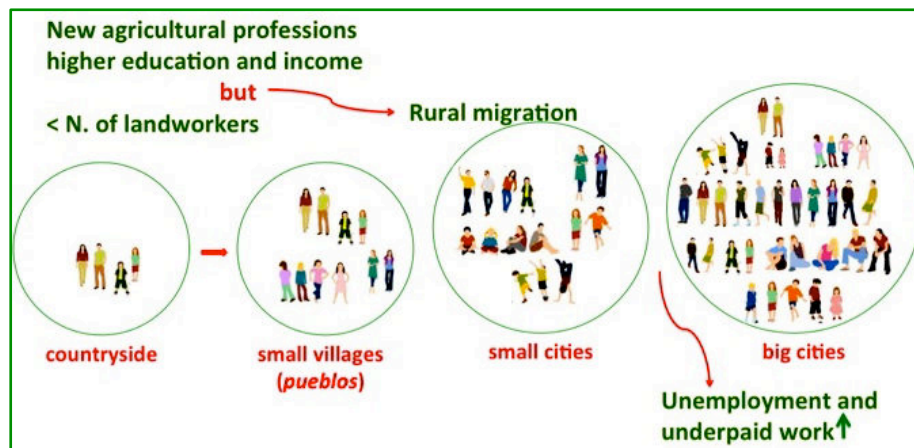


Fig. 5: Argentinian rural migration scheme (Severi *et al.* 2015)⁷

Rural communities in the analyzed areas have shown a good capacity to adapt to changes and to re-organize in a new and efficient way, but nowadays they have lost their original structure. What was once a community living in the field and sharing a common environment, services, education and culture is now a fragmented part of the society, which is actually still involved in the agricultural production, but in a very specialized way. In addition, moving from the countryside to villages and cities, the whole lifestyle of those communities changed, assuming more and more urban (or peri-urban) characteristics.

Subsistence farming completely disappeared in the Pampa area, while to a certain extent it is still present in the northern area of the country. With specific reference to the soy production, also in the northern region medium-big farmers represent the majority of the producers. As in the Pampean region, big groups play the most significant role in terms of production. Some small farmers – generally cultivating different crops, such as sugar cane - are situated in the northern provinces (i.e. Chaco and Tucumán), where social problems linked to land conflicts still remain. Those areas are not traditionally addressed to agriculture, but some subsistence farming is still present.

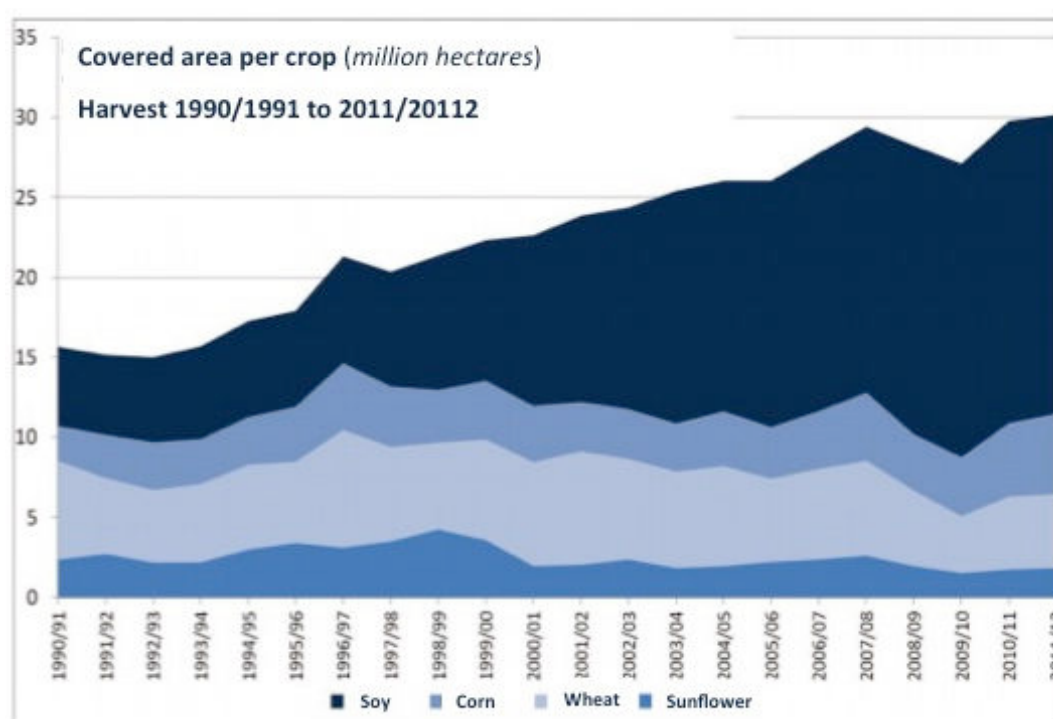
⁷ Severi C., Lamine C., Napoléone C., Zanasi C., *Does the soy system in Argentina fit the transition towards food-related sustainable practices? A Resilience assessment of the rural communities to help evaluating the sustainability of the neoliberal model*, Poster presented at the XXVI ESRS Congress, Aberdeen, 18-21 August 2015.

4.4 COSTS AND PROFITABILITY OF SOY: SECONDARY DATA INTEGRATION

In this paragraph an analysis of the costs and of the profitability of soy completes the picture, lying outside the resilience assessment. In fact, the analysis wasn't included in the field data collection through semi-structured interviews and was carried out after the resilience assessment, basing on secondary data and literature. The reason for adding specific economic data lies in the difficulty of obtaining precise figures during interviews.

According to the Scalabrini Ortiz Center of Economic and Social Studies (CESO)⁸, the total cultivated area at national level increased of 276% between the harvest 1990/1991 and 2011/2012, counting for 14,4 millions new hectares, 95% of which were destined to soy cultivation. Such an increase corresponded to an upward trend in land price.

Graph 2 Areas covered with soybean, corn, wheat and sunflower



Adapted from CESO, Source General Directorate of Agrifood – Ministry of Agriculture Argentina.

The changes in international prices, exchange rates or taxation directly affect the rents perceived by the landowner and the extra-benefits for the producer.

The higher rents influence the whole agricultural sector, forcing farmers involved in other kind of productions (breeding, horticulture, etc.) paying rents equivalent to the soy production, what raises the costs of the sector with repercussions on the final sale price of foods.

In 2013 the rent price in dollars resulted 215% higher than in 2001.

⁸ CESO, Centro de Estudios Económicos y Sociales Scalabrini Ortiz, *Costos y Rentabilidad del cultivo de soja en la Argentina*, Informe Económico Especial N. II, July 2013.

The study we refer to, identifies three phases in the evolution of costs and profitability of the soy sector:

- I. convertibility (1994-2001),
- II. recovery and superprofits (2001-2007)
- III. current phase (2007-today).

I. During convertibility the agricultural production expanded thanks to the technological advances of the direct seeding. Costs decreased more than proportionally than prices, generating a significant increase in profitability.

The direct cost in dollars of the agricultural production significantly decreased, driven by the reduced cost of seeds (-37%) and agrochemicals (-30%) even though some compensated by the increase in agricultural labor (11%). The structural costs such as administration increased of 17,9%.

During this phase the production prices decreased (-19,4%) even though less than costs, while the export rights didn't modify, maintaining at 4%.

As a result the national average benefit of the producer in 2001 resulted 26,6% higher than 1994. Nevertheless, the distribution of the profitability within the sector wasn't homogeneous, since this was the phase where the global structure of the sector radically modified following the technological change that implied the no-till method and the GM soybean.

Small tenants and owners producing food for internal market, who didn't have the capital necessary to adopt the new technological paradigm, faced a decrease in profitability margins, while the expansion of the cultivated area was pushing the rent levels.

That generated a process of concentration of the production in the hands of big groups providing services.

II. After the convertibility phase, a new context generated benefiting producers. However some significant increases in costs were registered, i.e. the cost of the harvest service (124%) and the one of agrochemicals (100%), while the labor cost lowered (-3,2%).

From the income point of view, a huge rise characterized the phase of "superprofits". Comparing 2000/01 and 2007/08 benefits of producers raised more than 180% in dollars and adding the profits coming from the devaluation, the benefits of the owner-producers increased 790% in Argentinian pesos.

III. At present the situation of the soy sector continues being positive. In spite a couple of years of bad harvests due to severe droughts – recently improved (2015 season) - both the production of grains and the cultivated areas are at historical record levels. It is important to underline, however, that the extraordinary situation of the "superprofits" phase has ended, and the soybean sector represents now the normality, still being an extremely profitable activity within the Argentinian economy.

In terms of costs, the period 2008-2012 showed an increase in labor (117%) and in the seeds cost (20,5%), with an 87,7% increase in structural costs.

The retentions rate remained fixed at 35%, and it's still valid (Table 1).

Table 1 Export taxes on grains

Product	Wheat	Corn	Sunflower	Soybean
Grain	23%	20%	32%	35%
Meal	13%	15%	-	-
Oil	-	15%	30%	32%
Biofuel	-	-	-	32%

The profitability in dollars of the soy cultivation for a medium-sized maintained the same, since the increase in costs was more than compensated by the rise of international prices 60%), while the profitability in pesos registered a 67,8% increase, representing the best profitability in the last three decades.

For those producers who aren't owners of the land it is necessary to include rents among their costs.

Starting from the season 2007/08, which was one of the best in the recent period, we can observe that for a producer with national average yields (with a productivity 50% lower than the soy core area), the cost of rents increased 10,8% in dollars. In the last production seasons, producers have been paying the land use once and one-third the costs occurring till the final production.⁹

More recently (starting from the 2012/13 season) a marked decrease in the international price quotation of soy and its sub-products has been registered.

Even though the world demand of soy is high, several factors put downward pressure on prices. On one hand the excellent harvests registering in the United States, Brazil and Argentina make the offer and the stocks of soy increase. On the other hand, the strong fall of oil price and the appreciation of the US dollar generate an additional pressure on the drop of the international prices of all agricultural commodities.¹⁰

It is important to remember that the production and commercialization costs can be very different for producers on the basis of:

- type of administration
- scale of the farm (small, medium, big)
- technology employed
- soil aptitude for agriculture
- distance from the port of the soy farm.

Land renting for soy cultivation is extremely frequent, representing the most common way of production in many provinces.

Different forms of rent are possible, for instance:

⁹ CESO, Centro de Estudios Económicos y Sociales Scalabrini Ortiz, *Costos y Rentabilidad del cultivo de soja en la Argentina*, Informe Económico Especial N. II, July 2013.

¹⁰ CES, Centro de Estudios y Servicios, Bolsa de Comercio de Santa Fe, *Situación de la Campaña de Soja 2014/2015 en el Centro-Norte de la Provincia de Santa Fe*, Report March 2015.

- fixed sums of money
- fixed quantities of soy
- percentage of the soy production.

It is then evident that the reality faced by every tenant varies following the modality defined by the contract and that landowners are the main beneficiaries of the process of benefits expansion in dollars of the current phase of the soy sector.

4.5 THE EXPANSION OF THE SOY PRODUCTION FROM LATIN AMERICA TO AFRICA: LITERATURE REVIEW RESULTS

Given the relevance of the relationships between Latin American and African countries in the expansion of the soybean cultivation, a brief literature review was conducted in order to highlight the main topics related to the phenomenon and to open a discussion to be deepened through further research.

4.5.1 Potentials and Trends

As we have seen, soybean expansion has been a strong driver of deforestation and biodiversity loss in South America, what exposed the system to a growing criticism and pressure from the national and international civil society's opinion and from many environmentalists groups.

Together with other technical and economic aspects, such a pressure brought the Latin American countries (mainly Brazil and Argentina) to expand the soy production to the African countries, with strong similarities in environmental, institutional, and social conditions.

The cooperation between Latin America and Southern African countries linked to the soybean expansion is characterized by knowledge transfer, cooperation, and direct investment.

The study conducted by N.I. Gasparri *et al.* in 2015 suggests that the emerging soybean frontier in Southern African countries may pose major challenges for conservation¹¹.

Land-use change is increasingly driven by economic globalization (Lambin & Meyfroidt 2011), linking social-ecological systems across large distances via trade, institutional cooperation, migrations, and other forms of "telecouplings" (Liu et al. 2013). Conservation and land management policies implemented in one region may thus lead to a displacement of land-use pressure (Lenzen et al. 2012; Meyfroidt et al. 2013), as in the case of the Amazon forest protection, which lead to new lands cultivation in African countries.

In fact, a response to rising conservation concerns linked to the soybean cultivation, policies limiting deforestation have recently been implemented in Brazil, Argentina, and Paraguay, with different degrees of effectiveness.

Southern Africa is a region deputed to the soy expansion, thanks to the availability of its large areas environmentally similar to Southern America soybean cultivation areas. In fact, extensive areas of the Zambezi-Kalahari region were identified as equivalent to the dry Chaco.

¹¹ Gasparri, N.I., Kuemmerle, T., Meyfroidt, P., le Polain de Waroux, Y., Kreft, H., The Emerging Soybean Production Frontier in Southern Africa: Conservation Challenges and the Role of South-South Telecouplings, *Conservation Letters*, XXXX 2015, 0(0), 1–11.

Soybean cultivation area in Southern Africa increased exponentially, from 20,000 ha (early 1970s) to 150,000 ha (early 1990s), and 750,000 ha in 2013. The corresponding production rose from about 13,000 t (early 1970s) to 260,000 t in 1990 and 1,248,000 t in 2013 (FAO 2014). Although both soybean area and production are still small compared to Latin America, soybean expansion in Southern African countries after 2000 occurred at markedly higher rates than Latin America and global trends.

As confirmed by the nonprofit organization Technoserve, the demand for soybean products is increasing also in Southern Africa and projections of future demand foresee a reinforcement of this trend (Technoserve 2011). The Republic of South Africa has the largest market, with soybean imports (mainly from Argentina) approaching \$700 million in 2011 (FAO 2014). The unsatisfied demand creates a favorable context for increasing soybean production, and the recent exponential growth in Africa has taken place in the Republic of South Africa mainly, but also Mozambique, Democratic Republic of Congo, Zambia, Zimbabwe, Malawi, Rwanda, and Burundi have registered a significant soybean expansion.

From the environmental point of view, it is important to stress that African savannas and dry forests represent basins of unique biodiversity, including some of the world's last wilderness complexes. Only about 18.5% of the lands highly suitable for soybean are protected, many of which are increasingly threatened by agricultural expansion. Therefore, the expansion of large-scale industrial agriculture may lead to drastic habitat loss, and adversely affect biodiversity (Gasparri et al. 2015).

4.5.2 South-South telecouplings in the global soy production system

At global level interactions between distant places are increasingly widespread and influential, often leading to unexpected outcomes with profound implications for sustainability (Liu et al. 2013).

South-South telecoupling is a recent phenomenon, which differs from traditional North-South development cooperation. Telecouplings between Latin America and Southern African countries may have important consequences for future agricultural development, involving flows of knowledge and capital into infrastructure development, land acquisition, agricultural research, and institutional reforms (Gasparri et al. 2015). Although telecoupling is at an early stage, Latin America investments in Southern African agriculture are increasing and telecouplings could soon become a significant driver of soybean expansion in Southern Africa, as the case of Brazil-Mozambique (Embrapa 2010) and Argentina-South Africa (Technoserve 2011) are showing.

Brazil and Argentina are establishing a presence in different Southern African countries in three ways:

- I. via land acquisitions. Despite some prominent land deals, however, such transactions remain uncommon;
- II. via knowledge creation, technology adaptation, and capacity building. New knowledge is necessary to identify areas suitable for production and to optimize production. For example, Embrapa has developed a wide range of technical support and capacity building programs in Africa, and

adaptation of LA technology to SAFR is also carried out by the Argentine National Institute for Agricultural Technology INTA;

- III. by the improvement of investment conditions through improving infrastructures and governance. The ProSavana project, for example, includes plans for road development and harbor infrastructure in Mozambique (Gasparri *et al.* 2015).

4.5.3 Soybean production in LA and SAFR: similarities, differences and interconnections

The current emergence of the soybean diffusion in Southern Africa shows similarities with the Latin American soybean boom in of the 1990s. Beyond environmental similarities between the two regions, many of the factors that conditioned soybean expansion in Latin America are present in Africa today. Some examples are the economic liberalization and market deregulation, as well as investments supporting agricultural modernization, technology diffusion and infrastructures. The World Bank is financing agricultural development projects in Southern Africa, including the First Agriculture Development Policy Operation and the Integrated Growth Pole Project in Mozambique and similar projects in Malawi, Tanzania, and Zambia.

However, some significant differences between Latin America and Southern Africa represent constraints to the soybean expansion in Southern Africa: agronomic conditions, including pests (e.g., rust) and soil quality (e.g., acidity) still play an important role in limiting the soy expansion. Currently, the average soybean yield is around 1.5 t/ha, compared to about 3 t/ha in Brazil and Argentina (FAO 2014).

The LA-SAFR cooperation is very active in technology transfer for soybean production and suitable soybean varieties for sub-Saharan Africa conditions are under study

Among others, agricultural extension services actions were carried out by Embrapa (Brazilian Agricultural Research Corporation) “Paralelos” program in Mozambique for mapping agricultural potential (2010-2014) and by INTA (National Institute of Agricultural Technology, Argentina), which, since 2011, is engaged in the conduction of experimental plots in South Africa for the development of local soy varieties and the adaptation of no-till techniques. These interventions are supported by the governments, which signed bilateral agreements. The Embrapa-Mozambique Project is based on the parallelism between the two countries – Brazil and Mozambique – in terms of geographical characteristics and perspectives for development. The project includes many topics, i.e. land management systems, soil surveys, land-use and land-cover mapping, agroecological zoning, environmental impact assessment, agricultural intensification and land degradation monitoring, among others (Embrapa 2010).

Another example is the Brazil-Angola cooperation agreement in agriculture, facilitated by the FAO, for the development of a national innovation system and the training of researchers (2014).

Brazil signed agreements with both Mozambique and Angola, defining technical and scientific cooperation including technical assistance in agriculture. The agreements also include some pillars of the cooperation, i.e. the local labor involvement and the respect of the working conditions.

Private companies, development agencies and governments are also involved in the development of roads and port infrastructure in the Nacana corridor of Mozambique as part of the Prosavana plan (triangular agreement by Brazil's ABC, Japan's JICA, and Mozambique's MINAG, 2011-2016) (Gasparri et al. 2015).

In addition to agronomic differences, also socioeconomic conditions and development priorities constitute a difference between LA and SAFR. Furthermore, in LA the main actors involved in soybean are agribusiness companies producing for the global market, with very little involvement of smallholders (especially in Argentina, where small farmers almost disappeared, as emerged also from the present study), resulting in land property concentration and frequent social conflicts. In SAFR, soybean production is being promoted not only for the global market, but also to improve food security and livelihoods locally, although soybean production is currently dominated by commercial farms (Gasparri *et al.* 2015).

5. DISCUSSION

Starting from the results of the Resilience Assessment considering the two areas of investigation (soy core production area in the provinces of Buenos Aires and Santa Fe and the Northern Provinces of Tucumán, Salta and Chaco) in Argentina, the discussion is then articulated through additional observations coming from the suggestions of the Treadmill of Production theoretical approach, which in this study represents an additional way to analyze the recent changes in the Argentinian agricultural sector and consider possible future changes.

5.1 RURAL COMMUNITIES AND SOY SYSTEM IN ARGENTINA

5.1.1 Radical changes in the rural communities structure and loss of traditional agricultural knowledge

Since the introduction of soy, rural communities in Argentina have been able to reorganize and to adapt to the new structure of the agricultural sector, though not without radical consequences in terms of social and economic reorganization of their lives. Even if at a first sight they could be interpreted as highly resilient communities, the deep changes in their original structure and organization brought to a likely irreversible subversion of their characteristics, making them something different from the communities that could be observed before the soy introduction and expansion. Hence an attentive analysis and reflection make observe that the rural communities were not resilient enough to adapt to the new system organization while maintain their inner characteristics.

Considering the soy system as a whole, it appears extremely rigid, what makes it very vulnerable. In a scenario where the soy demand from the international market is likely to significantly reduce, the whole system could face enormous negative consequences; lands impoverishment due to years of soy monoculture and the almost total disappearance of traditional farmers - able to follow the whole production process of a cultivation - will presumably make the agriculture recovery process very difficult and long.

In fact, most of the elements of the traditional cultivation systems have disappeared moving towards a hyper specialization of the sector, where the different phases of the production cycle are more and more assigned to subcontractors, who have a very specialist training and employ expensive machinery only depreciable on a large-scale production. In such a context it is hard to think that a return to small-medium scale production would be possible, both because of the material investments done and of the loss of traditional knowledge of the whole production cycle, from soil preparation and seeding to harvesting.

Some producers fear that the soy monoculture will end in an economic collapse as it happened in the past for other cultivation (i.e. coffee and tobacco), unless the public policy intervenes.

Many interviewees, both small and big producers, claim that the agricultural sector isn't really depending on soy, in the sense that when a more profitable cultivation emerged, producers - being accustomed to any

kind of change, economical, political and climatic - would be able to quickly change production adapting to the new market trends. In fact, that characteristic appears evident while observing how the population of Argentina reacted to radical and heavy changes in the past, but we have to take into consideration the radical changes in the agricultural production system brought by soy, which could represent a big limit in turning to different production methods and cultivations.

It is also true that nowadays the hyper-specialization and the strong dependence on the export and on the technical inputs suppliers make the soy system in Argentina very fragile and vulnerable towards a scenario of market change.

5.1.2 Migration and radical change in the agricultural population structure

As already mentioned, the soybean expansion led to land distribution and tenure controversies and to a massive migration of the rural population to the cities, with major sociological and demographical consequences.

The reorganization of the rural sector, characterized by a diminished rural employment rate – coming from the high mechanization level - and the increased unequal income distribution led in fact to an intense migration from the countryside. The human settlements changed drastically in structure: in addition to an obvious increase of the urban population in big cities, also small villages (*pueblos*) and small cities developed, leaving the countryside almost empty, since there was no need of living near the cultivated lands anymore; furthermore moving from the countryside to villages and cities allowed people to have access to more efficient services, e.g. schools.

Rural communities in the analyzed areas as a whole, especially in the provinces of Buenos Aires and Santa Fe, have shown a good capacity to adapt to changes and to reorganize in a new and efficient way, but with deep fragmentation and radically denaturing their original shape. In this sense, we can affirm that rural communities were not resilient enough since what was once a community living in the field and sharing environment, services, education and culture is now a fragmented part of the society, which is actually still involved in the agricultural production, but in a very specialized way. In addition, moving from the countryside to villages and cities, the whole lifestyle of those communities changed, assuming more and more urban (or peri-urban) characteristics.

Moreover, for a significant share of the migrant population, the difficulties in finding a job in agriculture contributed to the unemployment increase. Small farmers who move to the cities generally face difficulties in finding a new job. The ones who have the chance to get a job are generally employed in low-paid positions, i.e. taxi-drivers, cleaning services, guardians, etc.

Long-term unemployed people are consequently more prone to accept underpaid or illegal jobs. The concentration of rural population in suburban areas, together with poverty and iniquity, has also increased social marginalization and crime rate. To a certain extent, the marginalization seems to be boosted by the

welfare subsidies – which appear to be strongly fed by the fiscal retention on soy. To this regard, many interviewees – especially big groups and experts from universities and NGOs - pointed out that the subsidies foster the indolence of the poorest segment of the population, who doesn't take any active part in the construction of the Argentinean economy. Such subsidies are therefore considered a recessionary policy by many interviewees, essentially economically active.

Given the above-described perception, it is evident that such a welfare measure foments a class conflict and contributes to exacerbate a rift within the Argentinian society.

Some questions arise from the analysis and are reported for stimulating the reflection and the debate relatively both to the Argentinian case and the emerging African one, which is likely exposed to similar dynamics:

- How far has urbanization undermined community?
- What if the rural communities continued being eclipsed as a side effect of urbanization and industrialization?
- How would social life be regulated?
- What structures would buffer persons and families – used to stronger mutual aid customs than urban people - from outside forces?

The authors D.L. and. K. A. Shaft, in their book *Rural People & Communities in the 21st Century* (2011), reminds us in fact that “a community is a group of people organized around certain commonly held interests and attributes that help to create a sense of shared identity. According to Philip Selznick (1992), community implies a web of affective relationships that are qualitatively different from those constituting other kinds of human groups. Being a part of a community implies a long-term, continuous social interaction that contributes to the formation of personal identity, and to social and economic production and reproduction. As a result, members share a sense of belonging, of “we-ness”. Community also involves commitment to a shared culture, including shared values, norms and meanings” (Brown and Schafft, 2011). The authors also stress the importance of schools in rural communities. As we have seen, rural schools are still present and, in some cases, efficient in the Northern provinces of Argentina, while they have almost disappeared in the soy core area in Buenos Aires and Santa Fe.

According to Brown and Schafft, while schools are critical local institutions for all communities, their role in rural communities is especially significant, contributing to the community's employment and making the local areas attractive places to live and raise families. As a consequence, the presence of a school can have direct effects on property values, and secondary effects on the local economic activity. It appears then clear that, in addition to the education mandate, schools in rural areas also play a strong role in the development of local communities.

More than any other local institution, schools help to establish a community's identity as well as its social boundaries and help integrating other community institutions (Brown and Schafft 2011).

5.1.3 Land occupation and activities and population displacements

Under current conditions, where the small and medium-sized family farming sector is shrinking rapidly, small farmers (family farmers have almost disappeared) aren't able to face the dynamics imposed by the export-oriented soy system since they can't produce the amounts required by the market individually. It becomes then essential belonging to farmers associations as AAPRESID (Asociación Argentina de Productores en Siembra Directa), the Argentinean No-till Farmers Association, which counts 1500 members including producers, technicians and companies, and AACREA (Asociación Argentina de Consorcios Regionales de Experimentación Agrícola), a civil organization of farmers who work in small groups to improve each farming enterprise; it counts more than 2000 agricultural producers. Within those farmers' associations and also within cooperatives, farmers have a strong exchange of know-how. AAPRESID, for example, divulges the no-till system (the organization introduced the no-till practice in Argentina) supplying a lot of technical information and organizing workshops and field days. It is very accessible in terms of costs and it is spread all over the country.

For those small farmers adhering to associations it would be difficult to individually move towards different production methods, since the associations generally set out the line to follow and provide both technical knowhow and production inputs, i.e. seeds and fertilizers.

These associations are especially effective in the soy core area, while in the Northern provinces associations of producers and of native populations are mainly engaged in trying to play an active role in opposing land occupation by big producers coming from the core area, but they are hindered by the Government.

As reported about the land issue in the Northern region, in the Chaco area big entrepreneurs are trying to obtain more and more land and driving the soy rapid expansion in the area.

In the North the unclear definition of the land property rights is still causing problems and conflicts between indigenous people (*pueblos indígenas*) and farmers. Native inhabitants are displaced not only because of the soy production expansion, but also for cattle breeding – activity displaced from the core area of Buenos Aires and Santa Fe - and sugar cane cultivation.

Deforestation generates conflicts with the local populations who strongly oppose this practice, since the forest represents their natural habitat. They have no property rights, they just ask for as much land and forest as necessary to satisfy their needs (self-consumption). Nevertheless the Government sells the land to the companies without consultations with the locals. Deforestation is done in order to provide more land for the cultivation of soy, without crop rotation and without any reintegration of soil nutrients. As a reaction, Campesino movements are frequent in the North.

The cases involving the native peoples rights' protection are very diversified and in some rare cases indigenous communities were able to organize by complying with the Governmental laws.

In general government decisions and measures don't consider indigenous people also because the lack of land property rights. If land rights were regulated the contractual power of indigenous people would probably be stronger and the Government would likely have interest in including them in decision processes.

As we have seen in the results, indigenous people are not the only ones displaced by soy. Cattle breeders as well have been displaced and marginalized to the northern regions to exploit the land (the Pampa region especially) for soy. Nowadays the beef sector is not profitable anymore, thus the producers are almost obliged to cultivate soybean too. One of the main factors influencing the beef market relates to the choice of the Government to ban beef export, officially to protect the internal market and guarantee beef consumption to Argentinians.

The joint effects of soy expansion and Government decisions on beef are the reduction of the total number of animal heads – and consequently of the available beef amount - and a change in the breeding system, moving from grazing to feedlots. As a consequence the internal price of beef increased, making it unaffordable for the poorest share of the population and, more in general the quality of beef decreased. This represents a major problem for the Argentinian society, since beef has always been a basic food in the Argentinian diet.

In terms of land use, in the soy core area the problem of cattle displacement isn't seen as an issue anymore, since feedlots require smaller land lots. On the other hand, in the North of the country the displacement of livestock farms still represents an issue, at times giving rise to social conflicts.

In any case, nowadays it results almost impossible to live off livestock breeding only, since the market is very instable, characterized by continuous fluctuations.

Also the milk products prices are currently low, so breeders prefer to rent the land to soy producers and more in general to agricultural producers. Milk production is less and less profitable and risks disappearing.

5.1.4 New agricultural sector configuration

As observed in the results, the different stakeholders face different problems, such as the possession of land, the uncertainty due the absence of clear title and the marginalization and rural exodus of small farmers. Medium-scale producers mainly suffer of unfair competition for land from external investors, while large-scale producers or investors are responsible for concentration of land in terms of ownership and use, frequent violent evictions, unsustainable use of natural resources, and drastic changes in land use (mainly the absence of rotation due to the profitability of soy monoculture) affecting biodiversity.

With respect to land tenure and use, it is interesting to report a relevant cultural aspect put into evidence mainly by small-medium sized farmers interviewed during the data collection: while small traditional farmers have always been attached to their lands, from an affective point of view, the large-scale producers

– who often aren't the owners of the land – don't mind about lands, thus are not interested in preserving the soils fertility and quality, because their unique interest is exploiting them as far as they are productive and then moving to other lands. It becomes then evident that it is very hard to for big groups to think in a sustainability-oriented way and convince them to adopt more sustainable production practices, unless they are compensated by a higher market price.

To the contrary, small traditional farmers are naturally sustainability-oriented – even when they are not completely aware of the sustainability meaning and principles – but the current system forces them to less sustainable practices to avoid being cut off the agricultural sector.

Although it is clear that the land dynamic varies by region, some situations can be considered to be common to several areas:

- Problems relating to occupations, possessions, evictions, uncertainty in the absence of title, the lack of reliable cadastres, etc. characterize all the non-Pampean regions, markedly evident also in the analyzed northern provinces. The poorest population segments suffer from the effects of these problems and are caught in a vicious cycle of poverty that is very difficult to reverse.
- The Pampean region mainly faces problems related to changes in tenure and delocalized production models (e.g. sowing pools) primarily due to a lack of control over the legal entities that control the land.
- The country - especially the agricultural suited areas of central and northeastern Argentina – is undergoing a transition from a rural development model with locally anchored small and medium producers to an agricultural large-scale and export-oriented model dominated by a business approach and a high degree of delocalization.

5.1.5 Rigidity of the Soy System and Dependence on Export – Possible Consequences for the Argentinian food security

As discussed in the previous paragraphs, the current agricultural model shows rigidity in the land use, in the farm size – having the small farms almost disappeared – in the use of expensive machinery that wouldn't be suitable to small farms, and in the adoption of labor extensive production techniques in the field.

Our findings show that the socio-cultural substratum of the traditional rural communities is nearly lost and lead to think that the present agricultural workers – so specialized and so different from the traditional farmer's model – wouldn't be able to bounce back and go back to the field, managing a whole production process.

We can therefore assert that the new social, economic and technical configuration of the rural communities, consequent to the soy cultivation expansion has become far less resilient than in the past.

The strong soy production growth is essentially export-led and the system has extremely reduced the diversification within the agricultural production. Soy cultivation reduced the land availability for other crops and for animal productions, which, unlike soy, are part of the Argentinean diet. An evident consequence is the reduction of the internal supply and the increase of the beef price; thus meat isn't affordable for the majority of the population anymore.

The following questions arise:

1) Is the soy cultivation taking lands away from other productions, threatening the food security for the population of Argentina?

At present food is sufficient – in quantitative terms - for the whole Argentinean population, but problems of food distribution still remain, especially in the northern provinces of Chaco and Salta. Indeed, 5% of the population (about 2 million people) is undernourished (The World Bank, 2013). Moreover, recent studies showed that soy expansion is negatively correlated to beef consumption in Argentina, as a consequence of increased beef prices (Demadonna, A. 2014). The data is particularly noteworthy considering the fundamental role of beef within the Argentinian diet, both from a dietary and cultural point of view. Nowadays only the richest share of the population can afford a regular consumption of good quality beef, while it is becoming more and more frequent the consumption of low-quality meat coming from feedlot breeding instead of the traditional and worldwide-appreciated livestock grazing system. In addition, the substitution of other crops traditionally included in the Argentinian diet with soy – which doesn't make part of the diet at all – is contributing unbalancing the country global food consumption. In fact, devoting so much land to an agricultural product destined for export has reduced the amount of land used for the farming of traditional crops, those sold domestically, and those that fed the small farmers and local agricultural communities. As land for cultivating lentils, potatoes, and other nourishing foods and traditional staple crops has been lost, diets have actually changed.

2) Given the high dependence on foreign markets, what could happen if the export-oriented soy system failed?

Presumably the progressive loss of technical know-how for the cultivation of other crops would make it difficult to bounce back to cultivating those crops again. Given the reduced number of agricultural workers and the disappearance of farmers from the field, it could be difficult to bounce back to the field works. In addition, the expensive machinery employed in the soy cultivation would not be fully exploited, and not amortized.

A significant consequence of the decrease of export would be an immediate decrease of the agricultural income. On the basis of what reported by some big groups, Europe is still the market of reference for soy as an ingredient in feed – even if 60% of the Argentinean production is already destined to China - but till now it hasn't imposed any specific qualitative standard.

5.1.6 Environmental impacts

The above observations show how strong and likely irreversible the social impact of soybean has been. At the same time, severe environmental impacts are direct consequence of the soy expansion and influence, in turn, social and economic aspects. As reported in the results of the resilience assessment, the following impacts are strongly affecting the natural ecosystem:

- Deforestation.

National and provincial laws about woodland are in force (around 70% of enforcement), and the awareness of the society is increasing. Sometimes laws foresee funds for compensation, but often they are not granted; nonetheless producers must respect the law, even if funds are not assigned.

After six years of application of the Argentinian Forest Law (Ley de Bosques Nº 26631 2007), serious problems of forest exploitation persist, due to the sustained increase in agricultural activity. In 2014 22 provinces had already regulated their native woodlands through provincial laws, what undoubtedly is a breakthrough. The territorial systems of native forest must identify and protect the areas categorized as low or no intervention, but several cases of illegal exploitation of those areas are registered anyway.

It is important to note that the transposition and the effective application of the national law markedly varies in the different provinces, because of different levels of corruption but also on the specific sensitivity of local administrators towards environmental issues.

- Soil degradation, mainly related to soy monoculture.

- Loss of biodiversity.

It particularly affects the areas newly destined to agricultural production (i.e. northern areas), which are more fragile. Loss of biodiversity is mainly related to deforestation and monoculture.

While cattle breeding generally affect traditional pastures, soy is advancing on woodland mainly, and the civil society's pressure on the issue is high. As a social reaction to deforestation, also campesino movements are frequent in the North. These aspects demonstrate how interrelated environmental and social dimensions are and suggest the importance of including ecological thinking in policies definition and implementation.

5.1.7 A Treadmill of Production Theory perspective

For a more comprehensive reading of the Argentinian case, we also borrowed the suggestions coming from the Treadmill of Production theory, which identifies three main actors in the economic system - capital, labor and state – and analyzes them one by one.

Capital is considered as fully committed to economic expansion due to the competitive pressure in market economies. In such a competitive environment it is necessary to continuously reinvest for remaining profitable. As Obach reminds, this reinvestment generally means expanding production or developing less costly means of production. Cost reductions can sometimes involve environmental efficiencies - as in some

cases has been proved in the case of integrated production – but more frequently this process requires the introduction of labor-saving technologies employing more chemicals and energy. As a consequence, an increase in production generally goes hand in hand with more resource-consuming practices and generates more hazardous by-products. As emerged from the Resilience Assessment, that's the case of the GM soy expansion in Argentina, even if the supporters of the no-till production method claim that it allows fuel savings and soil preservation, avoiding invasive soil working.

Greater productivity doesn't automatically guarantee greater return to labor, but it can allow workers attaining improved living standards. Actually the GM soy expansion in Argentina implied a reduction in the number of land workers on one side – contributing to the migration of people from rural areas to cities -, but at the same time the ones who continued staying within the agricultural production system often improved their living standards, thanks to a higher specialization and higher professional placement.

The third central actor in the ToP model is the State, which is supposed to have interest in supporting economic growth as a response to the pressure from labor and capital. In fact government officials depend on capital for accumulating public resources through taxation, which in turn allow satisfying the public demand for services. The accumulation of additional revenue can be obtained by either taxing producers at a higher rate or through economic expansion. Given the need to maintain popular support, state actors generally tend to facilitate economic growth. In this sense, the case of the soy cultivation and, more in general, of the agricultural sector in Argentina, represents a very peculiar case, given the apparently contradictory behavior of the Argentinian government. In fact the extremely high taxation imposed on agricultural good is evidently unpopular and make the government loose the support of the agricultural stakeholders. The same retention system, however, is the one allowing having the resources to maintain the welfare system: subsidies are granted to the poorest class of the Argentinian population, which represents around 50% of the total population. As suggested by some interviewees – both GM and organic soy producers and NGOs representatives - granting those subsidies is a measure to maintain the political support of a big share of the population. Evidently such a welfare measure foments a class conflict and contributes to exacerbate a rift within the Argentinian society. Anyway, given the significant share of the population concerned by the subsidies system, it is difficult to identify a correction action without taking into consideration the strong reactions it could cause and the consequent social and political consequences it would bring.

Deverre and Sainte Marie¹² remind us that the agricultural modernization in Europe was made possible by a strong public intervention, based on mechanisms favoring the rapid adoption of the innovations proposed by the research, the administration of the prices of production and the support to exportations. A strong public intervention would be necessary in Argentina as well, starting from an effective application of

¹² Deverre, C., Sainte Marie, C.: *L'écologisation de la politique agricole européenne. Verdissement ou refondation des systèmes agro-alimentaires?*, Revue d'Etudes en Agriculture et Environnement, 89 (2008 - 4).

compensation funds for production with lower environmental impacts. Another possible relevant intervention would be the support to the preservation of extensive breeding systems and the promotion of innovative and sustainable production methods such as integrated and organic farming; the present study clearly shows that Argentina is moving exactly in the opposite direction.

As for the rural workers, the Argentinian case shows a split between the ones who left – or were forced to leave – the agricultural production and the ones who remained; the former are facing difficulties in finding a new job in the urban areas, with consequent significant economic and social problems, while the latter often have improved their living standards. Treadmill theorists view labor as the weakest link in the treadmill chain under most circumstances, but in this case it is important to remind that unemployed people – as the displaced farmers – join the ranks of the poorest share of the population, the one benefiting of the welfare subsidies and generally politically supporting the government.

While discussing the case of the soy in Argentina, it appears particularly evident that the approach we use to look at the impacts showed different trade offs, making it difficult to formulate precise indications for a sustainable and fair development model for the rural communities analysed.

Interpreting the results in the light of the theoretical framework of the Ecological Economics, based on the notions of strong sustainability and of critical natural capital, the following considerations apply. The soy cultivation is mainly realized on fertile soils previously destined to other crops directly or indirectly (as in the case of feed for beef) contributing to the Argentinian diet. After having exploited all the agricultural land, soy also expanded on less fertile soils and, above all, on woodlands. The deforestation highly perturbed the areas traditionally necessary to indigenous people, for their subsistence and also affected the entire society, depriving it of natural areas essential from both social and environmental points of view, strictly related to health issues. In this sense, the substitution of original natural areas with soy appears negative. But if we look at it from another point of view, we can observe that the phenomenon of the soy expansion brought two main positive results: first, it strongly contributes to the Argentinian economy and second, at global level, it is significant for the world foodstuffs production and consumption. In this view, its positive effects are evident. It is however undeniable that its negative ecological impact is nearly irreversible, except in case of expensive and very long-term measures aimed to the restoration of the original natural capital.

Looking at the soy production in a holistic way, including the three dimensions of resilience and, in parallel, the three pillars of sustainability, we go back to the main principles expressed in the theoretical framework, reminding how strongly the social and the ecological resilience are intertwined in the identification of the mechanisms that guarantee social sustainability, which, in turn, is strictly interrelated with environmental and economic sustainability.

The UN Millennium Ecosystem Assessment of 2005 emphasizes the importance of extending the economic notion of financial value to include nature's goods and services. The bottom line is that poverty alleviation

and future economic development can only be achieved with a stronger emphasis on management and governance of ecosystems and their capacity to generate essential services.

Many authors, among which C. Deverre and C. de Sainte Marie¹³ and B. K. Obach¹⁴, analyze the process of the growing integration of environmental objectives into the agricultural policies (named «ecologization»), often comparing the two conceptual frameworks of the Treadmill of Production and the Ecological Modernization theories.

Analyzing the technical aspects of the agricultural trends, B. K. Obach reminds us that, according to Schnaiberg¹⁵, the growth in ecologically damaging chemical-intensive production processes, including chemical usage in agricultural production, is a central element of the treadmill theory (Obach, 2007). As results evident from the analysis of the soy production in Argentina, the use of agrochemicals is central in the cultivation of GM soybean, and constitutes one of the main issues raised by GMO opponents and by the civil society's criticism. From a production point of view, the adoption of the technology package for soybean cultivation has been a critical source of productivity and efficiency gains for producers who were able to stay in the agricultural sector. The same technology, on the other hand, makes the farmers dependent on the seed and chemicals providers forcing them to adapt - if able to comply to the necessary skill required by GMO production- or to leave the agricultural production, creating a gap between farmers and contributing to the social de-structuring. In addition, further technological advances are needed in order to maintain the productivity gains creating a "technological treadmill" exacerbating social and, most likely, also environmental impacts, unless technological advances were driven towards more ecologically sustainable production methods. Within this picture, it would be interesting to evaluate the organic soy alternative model application in Argentina assessing the applicability of the Treadmill of Production theory. To that end it would be necessary a specific data collection and a more in-depth research.

In this study the US case analyzed by Obach¹⁶ is considered- which evidently strongly differs from the Argentinian one - as an example to drive our analysis: Obach compares the ToP and the Ecological modernization applying the approaches to the development of the organic farming in the USA, wondering if organic is a treadmill or an ecological modernization.

What can be said given the present study results is that the current GM-soy system is actually a treadmill and different results for organic soy can only be hypothesized. The evidence is that the evolution of the soy production system in Argentina has brought to a hyper-specialization and to an extreme intensification of the production process. We can expect that organic soy could be a more sustainable option and could help

¹³ Deverre, C., Sainte Marie, C.: *L'écologisation de la politique agricole européenne. Verdissement ou refondation des systèmes agro-alimentaires?*, Revue d'Etudes en Agriculture et Environnement, 89 (2008 - 4).

¹⁴ Obach, B. K. (2007) Theoretical Interpretations of the Growth in Organic Agriculture: Agricultural Modernization or an Organic Treadmill?, *Society & Natural Resources: An International Journal*, 20:3, 229-244.

¹⁵ Gould, K. A., Pellow, D. N., Schnaiberg, A., *Interrogating the Treadmill of Production: everything you wanted to know about the treadmill, but were afraid to ask*, Revised paper from Madison symposium on the Treadmill of Production (2003).

¹⁶ ID. Obach, B. K. (2007).

retrieving some of the technical knowledge and of the social and environmental positive aspects linked to traditional cultivation practices, but it could also submit different issues and questions as the ones reported by Obach about the US case, which can be applied to the soy cultivation in Argentina:

Could the development of organic soy cultivation reflect the process suggested by ecological modernization theorists, including the involvement of civil society organizations actors, private business, consumers, and the state, willing to achieve ecological sustainability?

Or should it rather be a market-driven process whereby profit-seeking entrepreneurs, with the aid of the state, co-opted a grass-roots movement seeking institutional change?

On the basis of the results of the resilience assessment, we can deduce that the awareness of the stakeholders towards sustainability alone wouldn't be sufficient to drive such a transition, being the role of the market – and the price system *in primis* – often indicated as the incentive that could really support a change in the soy production process.

It is undeniable anyway that social movement organizations (i.e. indigenous people and campesinos movements), civil society and environmentalist organizations are more and more active and could play a significant role in the definition of a policy designed to move towards a more socially and environmentally sustainable method of farming.

As mentioned before, in contrast to this possible view, treadmill theorists consider a system being driven by capital, labor, and the state together, with a common interest in expanding production with little regard for the ecological implications. From this perspective organic soy could be, at best, “a social change movement co-opted by the dominant treadmill forces, who redirect it in order to increase profits and expand production” (Obach 2007).

In fact, the government of Argentina isn't institutionalizing organic/sustainable practices at all, what makes it difficult to think of a development of organic food production under the argument put forth by ecological modernization theorists.

In the described context, following the considerations coming from the ToP interpretation, it appears hardly thinkable to redirect production towards alternatives to the GMO soybean in ways that could truly allow ecological sustainability.

To this regard, environmental movements and the civil society could play a role in putting pressure on the government, as they actually did in the above-mentioned case of the US organic farming development studied by Obach. But as he reports, “while treadmill theorists acknowledge the role that the environmental movement has played in raising awareness about environmental problems, they argue that its ability to redirect production has been very limited” (Obach 2007). Given the current conditions of the agricultural system in Argentina, characterized by technical and organizational rigidity and strongly influenced by socio-political interconnections, is difficult to say how effective movements pressure could be

in influencing governmental measures. Nevertheless, the criticism coming from organized movements and general civil society is more and more frequent and widespread and its relevance will likely increase in the short/mid-terms.

Researches about the consumers of organic food in the US show that while organic consumers express support for environmental protection, personal health is more commonly cited as the chief motivation for buying organic products. In the Argentinian case, soy is mainly exported, thus it is necessary that foreign consumers, especially the European consumers, put pressure on the Argentinian producers by asking for more sustainable production. The fact that Europeans aren't direct consumers of soy – being it principally destined to feed– makes it hard to raise awareness about the importance of consuming sustainable soy. In addition we should ask how much consumers are informed and if the information they have access to is clear and transparent enough to put them in the position of consciously contributing to the demand for more sustainable soybean.

Despite civil society organizations capacity to exert some influence on the policy definition, the treadmill of production framework doesn't consider them as key actors, being labor, capital, and the state the only powerful forces that drive the treadmill (Obach 2007). In Argentina the big soy producers generally consider social movements inadequate and substantially unable of influencing policy and market, situation that correspond to the one defined by the ToP theory.

According to treadmill theorists capital is supposed to exploit any potentially profitable social development, and a growing consumers interest in organic products could represent an incentive to its development. In Argentina ideologically motivated small-scale farmers have developed organic practices and are struggling to protect and increase their production and to promote the expansion of the organic sector. An increased demand for organic soy from Europe could then represent the incentive for affecting the current GM soy system, but an adequate price system (i.e. premium price) would be necessary.

In the hypothetical expansion of the Argentinian organic soy market a limit would surely be represented by the impossibility of direct-to-consumer sales - through farmers' markets or through local food cooperatives - generally a fundamental and ecologically beneficial distribution system for an organic production at its first steps. Given the transnational dimension of the soy market addressed to export, big traders should likely be the key element in organic feed and food sales, what makes the risk of an "organic treadmill" evident, as reported by Obach in the US.

In addition, in the case of a substantial expansion of the organic soy production, a certain degree of mechanization would probably become necessary, characterizing a more energy-intensive production process. As the size of organic farms increases, hand labor carried out by small-scale organic growers is likely to be mechanized further.

Another relevant point is that traders would need larger quantities of organic products than those small local producers can provide, requiring a large-scale monoculture production; this would represents a partial

conventionalization of the organic production traditionally oriented to small-scale organic producers cultivating different varieties of crops and extensively adopting crop rotation techniques. Transports made by large agribusiness corporations selling at long distances necessarily affect the environment. Thus, to certain degree, organic farming and GM soy production would probably share common limits and negative socio-environmental impacts.

Referring to the US case, Obach reports that “as the organic industry operates along increasingly conventional lines, the ideals that were originally associated with organic agriculture—small-scale production, community, environmental sustainability, and social justice—are falling away (DeLind 2000; Pollan 2001). Although survey data from organic farmers indicate that noneconomic considerations, like environmental protection, still play a role in their decision to utilize organic practices, in recent years financial considerations have been increasingly cited as the primary motive for adopting organic methods (Klonsky 2000). This underscores the treadmill claim that profitability ultimately supercedes all other considerations within a capitalist economic framework” (Obach 2007).

While ecological modernization theorists see environmental benefits achieved through the behavior of environmentally conscious entrepreneurs effectively responding to market demands, treadmill theorists identify the overriding profit imperative undermining what was a potentially socially transformative alternative agriculture movement.

As articulate before, the Argentinian soy case can be effectively analyzed in the light of both the theoretical approaches (ToP and Ecological Modernization), showing that the majority of soy producers are negatively impacting on the environment and are, focused on profit maximizing objectives while, at the same time, soy cultivation contributes to the country’s economy and to the wealth of a large share of the population. This trade off related to soy cultivation emerges from both the theories interpretations, offering contents for further discussions.

The Argentinian state’s role in the development of more sustainable production methods isn’t effective, since it is generally absent or even penalizing, offering scarce support to a sustainable agriculture.

Although ecological modernization theorists interpret the state’s role as one of facilitating environmentally sound agricultural practices, treadmill theorists would argue that the state’s efforts to rationalize organic production are more about aiding industry than protecting the environment.

The Ecological Economics focus the state intervention on irreplaceable critical natural capitals, which must be preserved. Given the lack of economic interest in preserving natural areas such as the Argentinian woodlands and given the fact that at present organic or sustainable soy doesn’t generate additional profit for producers, the Treadmill of Production sees the role of the state in terms of support to the production system and to its most profitable production alternatives. Nevertheless, the growing sensitivity of the civil society about health issues linked to the use of agrochemicals and the campaigns promoted by environmental activists are starting putting some pressure on the government. To what extent those

actions will result in specific measures is however difficult to predict.

As emerges from the previous discussion, the ToP interpretation results helpful in better understanding the current rigidity of the soy system in Argentina.

In fact, the agricultural sector showed a good economic adaptability, at the expenses of the social and environmental sustainability of the production system. The results interpretation also puts into evidence how the likely incapability to revert from GMO based production techniques interferes with the possibility of supporting the small producers and constraints the transition towards more sustainable production systems.

The analysis of the soy expansion phenomenon under a diachronic perspective, articulated through different theories - namely Treadmill of Production, Ecological Economics and Ecological Modernization – also draws attention to the articulation between the international market and price system and their impact on a concrete possibility of change in the agricultural practices in Latin America and, quite conceivably, in Africa as well.

Given the above discussion, the role of organic agriculture in representing an alternative and feasible ecologically sustainable model of feed and food production system, seems not so clear.

An evaluation of more sustainable alternatives to GM soy, involving the economic, social and environmental arguments proposed by the ToP and Ecological Economics and Ecological Modernization theories should become the objective of further research.

5.1.8 Resilience of the Rural Communities and Vulnerability of the Soy System: an overall reading

Summarizing the discussion and looking at the rural communities and at the soy system in a global vision, which in terms of both resilience and sustainability must include the three dimensions (social, environmental, economic) and consider the interrelations among them, the following observations come out as a result of the resilience assessment conducted:

- The agricultural sector as a whole showed a good capacity of adaptation and a creative reorganization; this resulted in the sector being economically efficient but not without serious social and environmental costs (cfr. the discussion above), consisting in the disruption of the original rural communities structure and of the original natural ecosystem.
- The basis of the traditional rural communities structure are almost irreversibly undermined, what will pose serious limits to the capacity of bouncing back to more traditional-like sustainable agricultural practices.
- The soil depletion – mainly due to monoculture - needs rapid interventions to restore fertility.
- Environmental and social impacts of the soy production system are more and more criticized and give rise to movements whose weight in government decision-making processes will probably increase.
- The hyper specialization of the soy sector and its rigidity due to the adaptation to the international

demand for soy make it very vulnerable in a likely scenario of changes in the international market demand and competition, a trend we can already observe and that threatens the persistence of the economic sustainability and profitability of the Argentinian soy system.

Given the resilience of the rural communities and their capacity to adapt and to reorganize on the basis of new social, economic and political contexts, and taken into consideration the risky rigidity of the soy system, measures should be taken in order to get the agricultural stakeholders ready for changes.

Interventions apt to reduce the rigidity of the soy system would support the communities in enhancing their resilience and to prepare in a gradual way to face new possible changes. In that way, what could otherwise be a sudden shock could be bypassed trying to avoid radical crisis in the agricultural sector. To this end, suggestions coming from the interviews for the resilience assessment are reported and articulated as follows:

a. First, it appears necessary a **diversification** of the agricultural production, both within the soy sector and outside it. Within the soy production system, research should help in improving the productivity of non-GMO seeds and in reducing the production costs of non-GMO soy. The diversification must go towards a sustainable production, both from the economic and the environmental point of view. Different sustainability-related standards could represent a good alternative, influencing different aspects:

- From an **environmental** point of view, it would reduce the use of agrochemicals and would increase the rotation, with a consequent improvement of the soils quality and consequent degradation prevention.
- From an **economic** point of view, sustainable certified soy should represent a better-paid alternative for producers and open new niche markets both for food and feed production. In addition, it could be affordable also for small farmers, given the necessity of smaller land lots and the smaller investments required for the machinery related to sustainable production like e.g. organic soy.
- From a **social** point of view, supporting less capital intensive soy production systems could help reintegrating in the agricultural activity the small farmers who had to leave the land because of the impossibility of adapting to the big-scale soy production. The above-mentioned need of smaller investments could put the small farmers in the position of starting the activity, with little, or even with no credit. In addition, the dimension of a more labor intensive agricultural production like organic would be more suitable for family farms and could justify the permanence of workers in the rural areas. In such a way, a possibility of building up again the traditional agricultural know-how would emerge. Evidently, the process should go with specialized technical assistance, in order to train farmers and update their technical knowledge.

Moreover, the reduction of agrochemicals generally foreseen by sustainable production method would reduce the pressure on the agricultural sector from the civil society, worried about the health impacts of the current soy production system. The reintroduction of small farmers in the agricultural system could also help in bridging the gap between the agricultural sector and the civil society and in making the entire society more cohesive.

b. The policies on prices and fiscal imposition on the agricultural production in Argentina should support the transition towards more sustainable agricultural practices, allowing the producers to choose among different cultivations and putting them in the position of exploiting the rotation to renovate the soil fertility. The Argentinean Government should lead interventions on price policies, and the importing countries could facilitate the process of transition towards sustainability, granting better prices for certified productions.

c. In order to implement the strategies reported at point b., the quality of the soy supplied by the producing country and the qualitative requirements of the European buyers should match. An exchange of European views and preferences on one side and of Argentinean needs and constraints on the other one is necessary in order to establish a good and fruitful **dialogue between Argentina and Europe** for implementing sustainability policies. European buyers' willingness to pay higher prices for certified sustainable products has to be clearly assessed.

d. Academic and Private Research and Communication

As reported in the results, the opinion of many Argentinean experts is that it would be necessary to give clearer information to the European consumers, with precise and clear academic data, about the current production system. Moreover, a clear definition of sustainability and definite technical guidelines are essential to support the institutions and the producers in their decision-making processes. The excess of certification schemes, often at least partially overlapping, and a lack of easy to understand and tangible advantages, get the producers confused. A homogenization of the certification standards would be beneficial, in addition to the measures previously identified.

Furthermore, the academic research – especially but not only in Argentina – should dialogue more with the private sector, since it appears clear that they could enrich each other by matching the huge information available, towards a better quality of the research itself and an improved applicability of the results.

Good information and communication would also improve the knowledge of the consumers, both in Europe and in Argentina, and put them in the position of expressing their preferences with awareness of the facts.

The four main strategic areas illustrated have direct impacts on the three dimensions of the sustainability – social, environmental and economic – and, as a consequence, on the resilience of the rural communities, which, in turn, are necessarily interconnected with the rest of the civil society living in the urban and peri-urban areas.

5.2 EXPORTING THE LA SOY EXPANSION MODEL TO SOUTHERN AFRICAN COUNTRIES: POTENTIALS AND RISKS

As emerges from the literature review on the soy expansion from Latin America to Southern Africa, several similarities and the strong interest and participation of Latin American and African governments in bilateral agreements and South-South cooperation projects could lead to the assumption that the Latin America soy production model can be exported to Africa.

Nevertheless, agronomic and socioeconomic conditions differences, together with different development priorities, could represent an obstacle or even constitute the origins for serious mistakes.

Furthermore, in Latin America the main actors involved in soybean are agribusiness companies producing for the global market, with very little involvement of smallholders, while in Southern Africa soybean production is being promoted not only for the global market, but also to improve food security and livelihoods locally. To this respect, given the Latin America experience, it is important to reflect on the effective achievability of such an objective, also considering that African soybean production is currently dominated by commercial farms.

The South-South cooperation objective of technology transfer and modernization of family farms for food security and rural poverty alleviation could be difficult to satisfy applying the Latin America soy production model, characterized by agribusiness instead of family production, which to the contrary has been confined to a very marginal role.

In addition, a strong constraint for agribusinesses expansion in Southern Africa is mainly identified with the political context and governance (Chamberlin et al. 2014, Deininger et al. 2014). The experience of Latin America shows that agricultural intensification in a context of improved economic and social regulations, yet without a robust environmental policy, can promote rapid deforestation. An increased attention to conservation within an agricultural expansion and intensification, as well as effective environmental policies for balancing agricultural production and conservation needs, are necessary to mitigate potentially large trade-offs.

It appears then necessary to take into consideration environmental and social impacts and to identify sustainable production alternatives, helping preserving and enhancing the resilience of the rural communities in the African countries.

6. CONCLUSIONS

The Resilience approach permitted to put into evidence the social and the environmental impacts of the soy cultivation in Argentina, providing an interpretation of the numerous interconnections among the social, economic and environmental dimensions of the sustainability and highlighting the vulnerabilities of the soy production system.

The agricultural sector as a whole have showed a good capacity of adaptation and a creative reorganization that has demonstrated being economically performing, but the radical reorganization of the rural areas and of the agricultural system brought to a drastic change in the social rural organization consisting in a deep disruption of the original rural communities structure and of the original natural ecosystem.

The soy system, on the other hand, appears extremely rigid – because of the hyper specialization and of the marked dependence on export - thus very vulnerable to changes in the international demand for soy.

Nevertheless, the current Argentinian agricultural model doesn't fit the transition towards agricultural sustainable practices. Although a segment of the stakeholders do benefit of the current system, the radical reorganization of the agricultural sector it brought limits its capability to adapt to change towards more sustainable practices. The adoption of alternative production methods (e.g. organic) is currently limited both by technical constraints and economic disadvantages, which would require the intervention of the Argentinean government and a dialogue between Argentina and its major markets, i.e. Europe and China. The current system is also strongly criticized by the Argentinean civil society that blames it to be the cause of environmental problems and of health risks.

In order to reduce the vulnerabilities and to enhance the resilience of the system towards a sustainable development of the soy production sector and, more in general, of the agricultural production in Argentina, both the public institutions and the private sector (also including farmers' and civil society organizations) should contribute to the identification of effective and sustainable strategies.

Among the possible interventions, the following appear necessary:

- diversification of the agricultural production in Argentina;
- revision of the fiscal pressure and of the pricing policies in Argentina;
- intensification of the dialogue between Europe and Argentina and clear identification of the consumers requests;
- improved efficacy of academic and private research and better communication to raise awareness in Europe and in Latin America.

Despite the difficulties in measuring and expressing resilience following a standardized categorization, the approach resulted very effective in allowing capturing the multiple and complex interconnections among technical, economic, social and environmental aspects of the soy production system in Argentina.

To enhance the resilience of communities it is necessary to plan and develop strategies that minimize vulnerabilities, to develop communication, to support government/private partnerships and to develop strategies that diversify risk. The notion of resilience of the community system is highly relevant to the concept of sustainable development and sustainable food production systems.

The comparison of the soy expansion in Latin America and Southern Africa revealed the necessity to take into consideration environmental and social impacts and to identify sustainable production alternatives, helping preserving and enhancing the resilience of the rural communities in the African countries.

Further research should investigate more deeply other sustainable production alternatives to support agricultural diversification enhancing the resilience and the sustainability of the sector.

It would be interesting to evaluate the effects the organic soy alternative would have in Argentina (what if it was promoted and institutionalized). Afterwards the organic soy alternative could be analyzed through both the Treadmill of Production and the Ecological Modernization theories, what would require specific methods and data collection.

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ANNEXES

ANNEX 1

RESILIENCE ASSESSMENT QUESTIONNAIRE

SOCIAL SUSTAINABILITY AND SOCIAL RESILIENCE OF RURAL COMMUNITIES IN THE SOY SECTOR: THE CASE OF THE SMALL FARMERS IN BUENOS AIRES AND SANTA FE PROVINCES

FARMER/PRODUCER/ORGANIZATION QUESTIONNAIRE

Name of producer/farm/organization _____

Farm dimensions: () small () medium () big

Ha of soy cultivation 2010/2011: _____

Ha of soy cultivation 2011/2012: _____

Soy production (tons) 2010/2011: _____

Soy production (tons) 2011/2012: _____

Municipal district of the farm _____

Adhesion to any association/cooperative? () yes () no. If yes, which one? _____

POPULATION	
Population density (Pop./Km ²) _____	
Population change (description)	

Age structure	
Males	Females
Total %	Total %
0-14 years %	0-14 years %
15-24 years %	15-24 years %
65-over %	65-over %
Migration (general description of the argentinean population trend)	

Rural migration trend in the last 30 years:	
from rural areas to the cities in Argentina	

from rural areas to other countries

ECONOMIC ACTIVITY

Main activity in the area and percentage of employed people

Other economic activities and % of employed people

activity	% of employed people

Unemployment rate _____

Economic sector structure: how is it today and which were its main changes in the last 30 years

Subsistence agriculture diffusion

Non-paid family work diffusion

Land distribution

current situation

how it changed

% of **public land** in the area

% of **private land** in the area

Property: are you the owner of the land you cultivate?

() yes () no () only of a part of it

Frequency of **sale of land** and medium price

Frequency of **land leasing** to big soy producers

Have you ever heard about the new agriculture investment structure "sowing pools", called "**pools de siembra**"?

() yes () no

If yes, is it common in this area?

() yes () no

Crop pattern	
crop	% of land cultivated

Use of land:
☐ monoculture
☐ rotation
☐ other _____

Is monoculture sustainable?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Does monoculture exclude small producers?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

"No till" package costs (\$/crop production cycle):
- seeds,
- pesticides,
- machinery
- other _____

Are "no till" package costs affordable to small farmers?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Is there any possible alternative (i.e. conventional farming, non-GMO, etc.)?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Are they feasible?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Are they competitive?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Is the revenue adequate/sufficient/fair?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____

Is "sustainable* soy" feasible for small-scale producers?
☐ yes ☐ no ☐ I don't know/n.r. ☐ other _____
*(*Sustainable = it satisfies nutritional needs, enhances environmental quality and the natural resources, makes the most efficient use of non-renewable resources and on-farm resources, it sustains the economic viability of farm operations and enhances the quality of life for farmers and society)*

Are the costs of "responsible" or "sustainable" certification affordable for small producers?
☐ yes ☐ no ☐ I don't know/n.r.

Is the bureaucracy of "responsible" or "sustainable" certification manageable for small producers?
☐ yes ☐ no ☐ I don't know/n.r.

<p>Knowledge required for mechanized cultivation of soy (e.g. patents): is it in the hands of small farmers?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> I don't know/n.r. <input type="checkbox"/> other _____</p>
<p>Soybean seeds:</p> <p>- how are farmers supplied?</p> <p>_____</p> <p>- who makes the price?</p> <p>_____</p> <p>- what is the bargaining power of small farmers?</p> <p>_____</p> <p>- can farmers choose between GM and non-GM seeds?</p> <p>_____</p> <p>- what do farmers chose and why?</p> <p>_____</p>
LABOUR
<p>Employment in rural areas:</p> <p>current rates (% of the active population) _____</p> <p>trends: <input type="checkbox"/> stable <input type="checkbox"/> increasing <input type="checkbox"/> decreasing</p> <p>Percentage of precarious jobs (% of the total employed people) _____</p> <p>Percentage of short-term jobs (% of the total employed people) _____</p>
<p>Contracts: what are the most frequent employment contracts?</p> <p><input type="checkbox"/> permanent worker with officially registered contract</p> <p><input type="checkbox"/> seasonal worker (crop season) for the whole production cycle</p> <p><input type="checkbox"/> temporary worker for a specific production phase (seeding, harvesting, etc.)</p> <p><input type="checkbox"/> job "on call"/daily workers (paid per days of work)</p> <p><input type="checkbox"/> other _____</p>
<p>Are the workers of the farm from this area?</p> <p><input type="checkbox"/> yes, all af them <input type="checkbox"/> no, none of them <input type="checkbox"/> some of them</p> <p>If there is no worker from this region, why?</p> <p><input type="checkbox"/> lack of skilled labour in this area</p> <p><input type="checkbox"/> other _____</p>
<p>Do you know if the agricultural property and/or production generates any social impact (positive or negative) for the workers and for the community (at local or regional level)?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>If yes, which impacts? Can you give some example?</p> <p><input type="checkbox"/> workers health</p> <p><input type="checkbox"/> unemployment due to mechanization</p> <p><input type="checkbox"/> I don't know</p> <p><input type="checkbox"/> other _____</p>
<p>Incidence of black labour (%) _____</p>

Incidence of child labour (%) _____
LABOUR OPPORTUNITIES FOR MIGRATING POPULATION
Percentage of young people migrating to cities _____
Degree of rehabilitation of small farmers moving to cities: - in which sectors can they find a job? _____ - what are the most common contract conditions? _____ - what is the medium salary? _____ - what's the frequency of employment in dangerous jobs? _____
SMALL FARMERS' INCOME TREND AND SELF-SUFFICIENCY
Small farmers' income trend: () stable () increasing () decreasing
Do small farmers have access to formal credit sources? () yes () no () other _____ Is there any differences between male and female access to credit? () yes () no () other _____ What is the percentage of formal credit users among small farmers? _____
Are there public incentives/public subsidies for small farmers? () yes () no () I don't know
Is there any microcredit* experience in this area? () yes () no () I don't know <i>*pequeños préstamos realizados a personas humildes o pobres a los que no conceden préstamos los bancos tradicionales. Los microcréditos posibilitan que muchas personas sin recursos puedan financiar proyectos laborales, por su cuenta que les reviertan unos ingresos.</i>
Landless population percentage _____
How can farmers who lease or sell their own land produce food for themselves? _____ _____
Is self-sufficiency still common? () yes () no () I don't know
Degree of small farmers self-sufficiency (% of self-sufficient small farmers): _____
COMMUNITY/CULTURE
Spoken languages: () Spanish () Italian () German () English () Local dialect _____ () other _____

Education degree in rural areas:

What is the medium degree?

Grado de educación	Males (%)	Females (%)
Escuela primaria (6-12 años)		
Escuela secundaria básica (12-15 años)		
Educación secundaria orientada (15-18 años)		
Educación superior, o universidad (>18 años)		

Education right: is education guaranteed and affordable for everyone?
☐ yes ☐ no ☐ I don't know

Are Extension Services present on the area?
☐ yes ☐ no ☐ I don't know

Are training activities for farmers realized in the area?
☐ yes ☐ no ☐ I don't know

Is technical assistance satisfactory?
☐ completely satisfactory ☐ sufficient ☐ scarce ☐ insufficient ☐ totally absent

Knowledge of sustainability issues:
 Are you aware of sustainability issues? Do you know what they are about?
☐ Yes, I'm aware and well informed
☐ I've heard about sustainability issues, but I'm not really informed
☐ I've never heard about sustainability issues
☐ other _____

INSTITUTIONS

Are there **formal institutions** (associations, consortiums, trade-unions, etc.) in this area?
☐ yes ☐ no
 If yes, which ones?

Are they effective?
☐ yes, very effective ☐ sufficiently effective ☐ scarcely effective ☐ totally ineffective

Are there **informal institutions** (e.g., lobby groups, informal associations or groups) in this area?
☐ yes ☐ no ☐ I don't know/n.r.
 If yes, what kind of intitutions are they?

Are they effective?
☐ yes, very effective ☐ sufficiently effective ☐ scarcely effective ☐ totally ineffective

Are the following groups present and active in the area?

- grassroots organizations ☐ yes ☐ no
- indigenous groups ☐ yes ☐ no
- campesino movements ☐ yes ☐ no

- other_____ () yes () no
<p>Key players:</p> <p>Who are the individuals or organizations who have key leadership role?</p> <p>_____</p>
ENVIRONMENT
<p>Are there national laws protecting native woodlands?</p> <p>() yes () no () I don't know</p>
<p>Are there provincial/territorial rulings protecting native woodlands?</p> <p>() yes () no () I don't know</p>
<p>Are there funds for compensation (to preserve native vegetation covered areas)?</p> <p>() yes () no () I don't know</p>
<p>Are cases of burned lands frequent?</p> <p>() yes () no () I don't know</p>
<p>Are there displaced cattle farmers?</p> <p>() yes () no</p> <p>If yes, where are they located? _____</p>
<p>Loss of biodiversity:</p> <p>Which of the following processes have you observed in this area?</p> <p>() plant species loss</p> <p>() loss of traditional knowledge of their medicinal properties</p> <p>() increase of illnesses treated through chemical pharmaceutical products</p> <p>() extra financial burden for rural families (to buy chemical pharmaceutical products)</p> <p>() animal species loss</p> <p>() other _____</p>
<p>Which of the following environmental problems are frequent in this area?</p> <p>() erosion problems</p> <p>() desertification</p> <p>() droughts</p> <p>() other _____</p>
<p>Do you know if the agricultural property and/or production generates any environmental impact (positive or negative) at farm, local or regional level?</p> <p>() yes () no</p> <p>If yes, which impacts? Can you give some example?</p> <p>() soil erosion</p> <p>() water contamination</p> <p>() degradation of the streets</p> <p>() deforestation</p> <p>() I don't know</p> <p>() other _____</p>

HEALTH

Are there public health systems in the area?

☐ yes ☐ no

Are they accessible?

☐ yes, for everyone

☐ partially (not for the whole local population)

☐ not easily accessible

☐ other _____

Are you aware of any insurgence of health problems related to pesticide spraying/agrochemicals for GM soy cultivation?

☐ yes ☐ no ☐ I don't know/n.r.

If yes, what kind of problems? _____

Are you aware of any insurgence of health problems related to water contamination?

☐ yes ☐ no ☐ I don't know/n.r.

If yes, what kind of problems? _____

COMMUNICATION

Do you know who the local communities and the neighbours of your farm are?

☐ small farmers

☐ rural establishments

☐ soy producers

☐ producers of other cultivations

☐ I don't know

☐ other _____

Does the property of the farm communicate with the local community and other members of the society?

☐ yes ☐ no

If yes, what type of communication is done?

☐ visits of agricultural technicians to the community and to the local leaders

☐ information by letters/mail

☐ meetings

☐ other _____

If no, why there is no communication?

☐ it is not necessary

☐ difficulty of articulation and lack of manpower qualified for this dialogue

☐ lack of time

☐ costs

☐ other _____

OTHER

<p>Are you aware of any cases of violence linked to the soy sector?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> I don't know/n.r.</p> <p>If yes, what kind of violences? _____</p>
<p>Do you think small farmers are marginalized?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> I don't know/n.r.</p>
<p>Are land conflicts frequent?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> I don't know/n.r.</p>
<p>Is there (or was there) any conflict related to the occupation of the land in your property?</p> <p><input type="checkbox"/> yes <input type="checkbox"/> no</p> <p>If yes, how is it (or was it) solved?</p> <p><input type="checkbox"/> legal proceedings</p> <p><input type="checkbox"/> evaluation of the rights of the communities with agreed resolution</p> <p><input type="checkbox"/> the problem was not dealt with</p> <p><input type="checkbox"/> there was the consent of the traditional users of the land</p> <p><input type="checkbox"/> other _____</p> <p>If the problem was not dealt with: what kind of difficulty was met in finding a solution?</p> <p><input type="checkbox"/> legal costs (lawyers)</p> <p><input type="checkbox"/> possible loss of production area</p> <p><input type="checkbox"/> other _____</p>
<p>Main political and market changes (before/after soy introduction, during soy area's expansion, ante/post GMO):</p> <p>a) how did the community adapt to or cope with these changes?</p> <p>_____</p> <p>_____</p> <p>b) Regarding social sustainability, did living conditions and livelihoods remain the same, improve or worsen?</p> <p><input type="checkbox"/> stable <input type="checkbox"/> improved <input type="checkbox"/> worsened</p>

ANNEX 2

RÉSUMÉ DE LA THÈSE EN FRANÇAIS

TITRE DE LA THÈSE:

Résilience et Durabilité sociale des Communautés Rurales: le cas des producteurs de soja en Argentine et l'expansion de la production de l'Amérique Latine à l'Afrique.

ABSTRACT

Le soja est l'un des produits alimentaires les plus importants et en croissance rapide sur le marché mondial. Grace à l'introduction de variétés de soja GM, l'Argentine est devenue le troisième producteur mondial, ce qui a entraîné des impacts relevant au niveau environnemental, social et économique.

Objectif de l'étude est d'évaluer la résilience sociale des communautés rurales cultivant du soja en Argentine et d'évaluer la durabilité actuelle du système du soja.

Au même temps, l'analyse de l'expansion de la production de soja de l'Amérique latine vers les pays africains représente un élément de continuité dans l'évaluation du phénomène au niveau mondial.

Le cas d'étude du système de soja en Argentine - fortement influencé par l'introduction des OGM et par les changements qui en découlent dans l'utilisation des terres, la modernisation et l'organisation du travail - avec son accent particulier sur les communautés rurales, souligne que la résilience social et la résilience écologique sont étroitement interconnectées pour garantir la durabilité sociale, qui, à son tour, est en corrélation étroite avec la durabilité environnementale et économique.

Le secteur agricole argentin a montré une bonne capacité d'adaptation et de réorganisation démontrant être économiquement performant, mais les coûts sociaux et environnementaux qui en découlent sont lourds, consistant en une perturbation profonde de la structure originale des communautés rurales et de l'écosystème naturel.

Le système du soja est extrêmement rigide - en raison de la hyper spécialisation et de la dépendance marquée de l'exportation - ce qui le rend très vulnérable aux changements de la demande internationale de soja.

Le système actuel est fortement critiqué par la société civile, le blâmant d'être la cause de problèmes environnementaux et de risques pour la santé humaine.

Pour contraster efficacement les conséquences négatives du modèle du soja, un rôle important doit être joué par les politiques, qui devraient définir des mesures de développement durable pour améliorer la résilience des communautés rurales et favoriser une transition vers des systèmes de production alimentaire plus durables.

Mots clés

Résilience, Communautés Rurales, Argentine, Soja, Durabilité, Systèmes Alimentaires, Transition

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1. INTRODUCTION

1.1 CONTEXTE DE L'ÉTUDE

La présente recherche trouve ses racines dans le projet européen SALSA¹⁷, qui vise à améliorer la durabilité environnementale et sociale et la compétitivité économique pour les acteurs de l'UE et de l'Amérique Latine impliqués dans les chaînes d'approvisionnement du soja et du bœuf. Le projet aborde le problème de la réduction de la charge environnementale des deux chaînes alimentaires qui lient principalement l'Amérique latine et l'UE et qui influent fortement sur le développement social et économique des petites exploitations familiales et des PME en Amérique Latine.

Compte tenu de la multiplicité des facteurs internes et externes liés à la production agricole, il est extrêmement utile d'évaluer la capacité des communautés rurales à gérer les changements à venir d'origine externe, afin d'identifier des stratégies et les politiques de développement durable.

Pour évaluer la résilience des communautés rurales productrices de soja en Argentine et évaluer la durabilité du système de production actuel, nous appliquons l'approche de la Résilience.

Le concept de résilience est une approche scientifique qui apparaît pertinente pour traiter de systèmes humains et naturels interconnectés.

L'approche de la résilience peut être adoptée dans l'évaluation de la capacité du tissu social des communautés rurales à gérer les changements d'origine externe, avec l'objectif d'identifier des stratégies efficaces en matière de durabilité sociale, environnementale et économique.

Une analyse documentaire a été réalisée sur la définition de l'approche de la résilience et sur son application à l'évaluation sociale dans les zones rurales (Severi, Rota, Zanasi, 2012). L'analyse a montré que l'approche de résilience est dynamique et dépend du contexte et qu'elle enrichit l'évaluation sociale en mettant l'accent sur les capacités spécifiques des communautés à gérer les changements. La perspective de la résilience prend en compte le caractère dynamique des communautés et des interactions hommes-écosystèmes.

Compte tenu de ces caractéristiques de l'approche de la résilience, une évaluation de la résilience apparaît appropriée pour améliorer l'analyse de la durabilité du système de production argentin du soja.

1.2 LE CONTEXTE ARGENTIN ET LE SYSTÈME DE PRODUCTION DU SOJA

L'agriculture est un secteur extrêmement important dans l'économie argentine, représentant 4,06% de la valeur brute ajoutée au niveau national. La culture du soja en Argentine a été initialement introduite dans les années 1960 comme source de protéines pour l'alimentation animale.

¹⁷ "Knowledge-based Sustainable vAlue-added food chains: innovative tooLs for monitoring ethical, environmental and Socio-economical impActs and implementing Eu-Latin America shared strategies" (SALSA, KBBE.2010.2.5-02), EU Seventh Framework Programme.

Après cette phase expérimentale, une très forte expansion a permis au soja de devenir la production la plus importante de l'agriculture nationale, en particulier grâce à la révolution technologique des années 1990, caractérisée par les techniques culturales de semis direct et par les semences OGM. En conséquence, les cultures traditionnelles ont été déplacées, ainsi que les producteurs qui n'ont pas adopté ces nouvelles techniques de production à forte intensité capitaliste.

Dans un tel contexte, de nouveaux schémas d'organisation de production sont apparus et la production de soja est devenue de plus en plus orientée vers l'exportation.

Les pays d'Asie – la Chine et l'Inde – et l'Union Européenne dirigent la demande de marché des grains et de l'huile de soja, et de la farine de soja, respectivement.

Traditionnellement, l'Union européenne a été la destination des exportations de farine de soja argentine: en 2008, elle représentait 58% de la valeur totale des exportations, tandis qu'en 2013 cette position relative est tombée à 33%. L'Argentine a récemment perdu sa position concurrentielle sur le marché européen en raison du manque de qualité des protéines dans les grains, générant une perte dans le revenu du pays.

Néanmoins, le soja est toujours l'une des cultures les plus importantes et les plus rentables en Amérique Latine et aussi l'une des plus controversées. Le soja représente une partie importante de l'économie de nombreux pays, mais il est également responsable d'impacts environnementaux énormes sur des écosystèmes précieux tels que l'Amazonie, le Cerrado, le Chaco et les Pampas. Les impacts sociaux et les questions de santé publique font également l'objet de critiques fréquentes et d'activisme au sein de la société civile. L'expansion du soja a également conduit à la concentration des terres et à une migration massive de la population rurale vers les villes, avec des conséquences sociales importantes.

Le grand défi actuel est d'améliorer la durabilité écologique et sociale de la production de soja, en essayant de ne pas pénaliser les économies des pays producteurs et les revenus des acteurs agricoles.

Compte tenu de la complexité des aspects économiques, environnementaux et sociaux et de leurs interrelations, il est nécessaire de prendre en considération ensemble ces trois dimensions de la résilience pour identifier des politiques et des mesures axées sur la durabilité en Argentine.

Dans le même temps, l'analyse de l'expansion de la production du soja de l'Amérique Latine vers les pays africains permet l'évaluation du phénomène au niveau mondial, et l'identification de similitudes ou de différences éventuelles – qui sont évidemment à remettre en contexte – peut aider à éviter des impacts négatifs similaires et à améliorer la durabilité de la production.

2. OBJECTIFS DE L'ÉTUDE

1) L'objectif de l'étude est d'évaluer la résilience sociale des communautés rurales cultivant le soja en Argentine et d'évaluer la durabilité sociale et environnementale actuelle du système du soja, afin d'identifier les points clés à considérer pour aller vers un développement plus durable du système de production du soja et, plus généralement, de la production agricole en Argentine.

Dans ce but, deux communautés différentes - situées dans différentes régions et caractérisées par des échelles de système très différentes - sont analysées:

- a) les moyens-grands et petits producteurs dans la "zone centrale" de production du soja (Provinces de Buenos Aires et de Santa Fe),
- b) les agriculteurs moyens-grands, petits et de l'agriculture familiale dans le nord du pays (provinces de Tucumán, Salta et Chaco).

2) L'analyse des changements provoqués par l'introduction de la culture du soja et de ses effets sur le secteur agricole argentin, ainsi que l'évaluation de la résilience des communautés rurales contribuera à la lecture du phénomène de l'expansion du soja en Argentine et de l'Amérique Latine vers l'Afrique australe, en mettant en évidence les points clés à considérer pour identifier les stratégies et les techniques alternatives de production pour aller vers un système de production durable sur la base des caractéristiques de résilience des communautés considérées.

3. MATERIELS ET METHODES

3.1 CADRE THÉORIQUE: L'APPROCHE DE LA RESILIENCE

L'approche théorique suivie pour évaluer la durabilité sociale de la culture du soja en Argentine est l'approche de la résilience. La raison de l'application de cette méthode réside dans le fait que l'approche de résilience enrichit l'évaluation sociale en mettant l'accent sur les capacités spécifiques des communautés dans la gestion des changements. L'approche de la résilience embrasse le caractère dynamique des communautés et des interactions homme-écosystèmes (Maguire et Cartwright, 2008).

Parmi les trois piliers du développement durable (économique, environnemental, social), la dimension sociale a reçu l'attention de la recherche plutôt récemment. Les gouvernements centraux et les institutions publiques locales, ainsi que le secteur privé, montrent un intérêt croissant pour le sujet.

Pour mettre en œuvre des stratégies de soutien à la durabilité d'une collectivité à la fois en termes sociaux et environnementaux, une évaluation sociale est nécessaire.

Dans le contexte mondial actuel, caractérisé par une succession multiple et rapide des événements, la capacité de faire face aux changements est fondamentale pour la survie d'une communauté.

Les zones rurales, en particulier, présentent des traits communs qui les rendent vulnérables aux changements. Dans les communautés rurales, une attention croissante est adressée à soutenir les petits agriculteurs et leur accès au marché, compte tenu de leur rôle actif pour faire face à la crise alimentaire (FIDA, 2003).

Dans ces contextes, une contribution pertinente à l'évaluation sociale d'une communauté rurale peut être donnée par l'approche de la résilience, particulièrement lors de l'application au sujet de la durabilité où les dimensions sociale, environnemental et économiques soient intégrées.

3.2 METHODOLOGIE

Une analyse du contexte a été menée afin de définir les limites du système pour l'évaluation de la résilience.

L'évaluation de la résilience implique différentes étapes, qui pourraient se résumer comme suit:

- Définition du système;
- Définition d'une liste d'informations et d'indicateurs qualitatifs et quantitatifs clés pour évaluer la résilience;
- Collecte de données.

Un questionnaire a été formulé, en divisant les entretiens semi-structurés dans différentes sections visées à différentes questions clés (population, exode rural, éducation, culture, tendances des revenus, institutions, communication, environnement, santé, conflits sociaux, durabilité, certification, etc.). Le

questionnaire mis en œuvre pour la collecte de données a été discuté avec des experts collaborant au projet européen SALSA, étant la première partie de la recherche inclus dans le projet lui-même.

En outre, des données secondaires ont été utilisés afin de:

- Compléter et enrichir l'évaluation de la résilience
- Donner un aperçu de l'expansion du soja dans les pays de l'Afrique australe, en soulignant les similitudes et les différences aussi que les potentiels et les risques de l'exportation du modèle du soja dès l'Amérique Latine vers l'Afrique.
- Interprétation des données.

Les résultats ont été analysés en observant comment les macro-catégories se sont transformées, à travers une description qualitative de l'évolution historique des relations et des interconnexions entre les changements techniques, économiques, environnementaux et sociaux causés par l'introduction de soja.

- Discussion.

La discussion des résultats comprend deux étapes:

- tout d'abord, il est fait sur la base de l'évaluation de Résilience elle-même;
- ensuite, en analysant les changements du le secteur agricole argentin en ajoutant à l'approche de la Résilience le point de vue de la théorie de l'Engrange de la production. L'application de ces deux approches théoriques facilite la mise au point des questions spécifiques à prendre en compte pour améliorer la résilience des communautés et la durabilité du système alimentaire.

Une brève analyse documentaire sur l'expansion du soja vers les pays africains étend les réflexions provenant de l'analyse du cas argentin permettant une vision globale du phénomène et, plus en général, de la durabilité des systèmes de production du soja.

Le complexe des résultats est enfin considéré pour identifier les points clés à considérer pour faciliter la transition vers des systèmes agricoles plus durables.

4. RÉSULTATS

4.1 RÉSULTATS DE L'ANALYSE DU CONTEXTE

Compte tenu du cadre théorique, cette étude se focalise sur les communautés rurales cultivant le soja en Argentine, où la première introduction de la culture (1970), et des variétés génétiquement modifiées plus tard (début des années 1990), on représenté un changement remarquable pour la population rurale et une réorganisation radicale du secteur agricole.

Aujourd'hui environ 80% des 20 millions d'hectares par an cultivées en Argentine sont distribués entre Buenos Aires, Córdoba, Santa Fe et Entre Ríos, tandis que le reste se distribue dans 11 autres provinces. La production annuelle varie entre 50 et 60 millions de tonnes.

Dès années soixante-dix jusqu'à 2012/13, le soja a enregistré une croissance constante, passant du 10,6% à plus du 50% de la production agricole nationale.

La forte croissance de la production de soja a été essentiellement conduite par les exportations et le système a extrêmement réduit la diversification au sein de la production agricole. La culture du soja – due à sa rentabilité nettement plus élevée – a réduit la disponibilité des terres pour d'autres cultures et pour les productions animales.

4.2 LA ZONE DE L'ETUDE ET L'ÉVALUATION DE LA RESILIENCE

Cette étude se focalise sur la zone centrale (área núcleo) de la culture du soja en Argentine, correspondant aux provinces de Buenos Aires et de Santa Fe et sur les provinces du Nord, principalement Tucumán, Salta et Chaco et secondairement Santiago del Estero et Formosa.

Les moyen-grands producteurs caractérisent principalement la zone de production centrale du soja, où un producteur qui cultive 500-600 hectares est considéré un petit producteur. Une parcelle de 300-400 hectares représente l'unité économique; parcelles inférieures à 300 hectares sont insuffisantes pour mettre en œuvre une activité économiquement durable.

Les agriculteurs familiaux (20-50 ha) sont Presque absents dans le secteur du soja argentin. Les petits agriculteurs sont principalement situés dans le nord du pays, dans les régions extra-pampas (c'est-à-dire Chaco et Tucumán).

Le questionnaire mis en œuvre pour l'évaluation de la résilience a été discuté avec des experts avant son application dans les deux phases de collecte de données sur le terrain:

- Phase I: Evaluation de la résilience dans la zone centrale du soja (Provinces de Buenos Aires et de Santa Fe), 2012;
- Phase II: Evaluation de la résilience dans la région du Nord (provinces de Tucumán, Salta et Chaco), 2013.

4.3 RÉSULTATS DE L'ÉVALUATION DE RESILIENCE

4.3.3 Sommaire des résultats

L'introduction du soja, ainsi que le niveau élevé de mécanisation et l'introduction du soja OGM, ont modifié l'ensemble du système agricole encourageant fortement une production sur grande échelle hautement mécanisée. Ces facteurs ont contribué à une forte augmentation de la valeur des terres et à un réduit besoin de main-d'œuvre. Les fermes bovines ont été déplacées et le nombre d'animaux a diminué.

Compte tenu que la rotation avec d'autres cultures est moins rentable que la monoculture du soja, une tendance générale à la monoculture se répand, apportant de nombreuses conséquences; parmi eux:

- perte de biodiversité,
- épuisement des terres,
- rigidité de l'offre et
- forte dépendance de la demande internationale de soja GM.

L'intensification de la production augmente l'efficacité économique, mais la qualité de la production diminue, puisque moins d'attention est accordée aux besoins spécifiques des différentes cultures.

Comme mentionné précédemment, la diminution de demande de main d'œuvre a apporté des changements importants: certains agriculteurs, généralement les plus grands ou les plus qualifiés, ont entrepris des nouvelles professions agricoles (par exemple, les travailleurs contractuels), d'autres louent la terre et se sont déplacés vers les villes. D'autres, généralement les petits agriculteurs, déplacés vers les villes tentent de trouver un nouvel emploi, non sans difficultés.

La concentration du secteur agricole et la tendance des petits agriculteurs à disparaître ont apporté à un manque actuel de main-d'œuvre qualifiée. Un élément supplémentaire qui semble exacerber la perte de connaissances agricoles est le système de soutien social actuel: le gouvernement accorde des contributions aux familles indigentes, en assurant des logements et les services de base. Selon plusieurs interrogées, ce système inciterait les pauvres à ne pas chercher un emploi, préférant maintenir le droit d'accès aux aides publiques.

Suite à la réorganisation du secteur rural et à la migration intense de la campagne, la structure des établissements humains a changé radicalement.

Les communautés rurales analysés ont montré une bonne capacité d'adaptation aux changements et à se réorganiser d'une façon efficace, mais ils ont perdu leur structure d'origine.

L'agriculture de subsistance a complètement disparu dans la région de la Pampa, alors que dans une certaine mesure, il est toujours présent dans la zone nord du pays. En se référant spécifiquement à la production du soja, les grands agriculteurs représentent la majorité des producteurs même dans la région nord. Comme dans la région pampéenne, les grandes entreprises jouent le rôle le plus important en termes de production. Quelques petits agriculteurs – qui cultivent généralement d'autres cultures, comme la

canne à sucre - sont situés dans les provinces du nord (Chaco et Tucumán), où les problèmes sociaux liés aux conflits fonciers restent encore fréquents.

4.5 L'EXPANSION DE LA PRODUCTION DU SOJA DE L'AMÉRIQUE LATINE EN AFRIQUE AUSTRALE: RÉSULTATS DE L'ANALYSE DOCUMENTAIRE

Compte tenu de la pertinence des relations entre les pays latino-américains et africains dans l'expansion de la culture du soja, une brève analyse de la littérature a été effectuée afin de mettre en évidence les principaux sujets liés au phénomène et à ouvrir une discussion à approfondir par des recherches supplémentaires.

4.5.1 Potentiels et tendances

L'expansion du soja a été un puissant moteur de la déforestation et de la perte de biodiversité en Amérique du Sud, ce qui expose le système à une critique croissante et à la pression de l'opinion de la société civile nationale et internationale et de nombreux groupes écologistes.

Avec d'autres aspects techniques et économiques, une telle pression a encouragé les pays de l'Amérique latine (principalement Brésil et Argentine) à chercher accroître la production de soja aux pays africains, grâce à des similitudes dans les conditions environnementales, institutionnelles et sociales.

La coopération entre l'Amérique latine et les pays de l'Afrique australe liée à l'expansion du soja se caractérise par le transfert des connaissances, coopération et investissements directs.

L'Afrique australe est une région déléguée à l'expansion du soja, grâce à la disponibilité de ses grandes surfaces similaires aux zones de culture du soja de l'Amérique du Sud.

La culture du soja en Afrique du Sud a augmenté de façon exponentielle, de 20.000 ha (début des années 1970) à 150.000 ha (début des années 1990), et 750.000 ha en 2013. La production correspondante a augmenté de 13 000 t (début des années 1970) à 260.000 t en 1990 et 1.248.000 t en 2013 (FAO 2014). Bien que les superficies et les productions soient encore faibles par rapport à l'Amérique latine, l'expansion du soja en l'Afrique australe après 2000 a eu lieu à des taux nettement plus élevés qu'en l'Amérique latine. Du point de vue environnemental, il est important de souligner que les savanes africaines et les forêts représentent des bassins de biodiversité uniques. Seulement environ 18,5% des terres utilisables pour le soja sont protégés. Par conséquent, l'expansion de l'agriculture industrielle à grande échelle peut conduire à une perte drastique de l'habitat et nuire à la biodiversité (Gasparri et al. 2015).

4.5.3 La production de soja en Amérique latine et en Afrique australe: similitudes, différences et interconnexions

Au-delà des similitudes environnementales entre les deux régions, un grand nombre des facteurs qui ont conditionné l'expansion du soja en Amérique latine sont présents en Afrique aujourd'hui, comme par

exemple la libéralisation économique et la déréglementation du marché, ainsi que les investissements dans la modernisation agricole, et la diffusion de technologies.

Toutefois, certaines différences entre l'Amérique latine et l'Afrique australe représentent des contraintes à l'expansion du soja en Afrique australe: conditions agronomiques, y compris les organismes nuisibles (par exemple, la rouille) et la qualité du sol (par exemple, l'acidité) jouent encore un rôle important dans la limitation de l'expansion du soja. Actuellement, le rendement du soja moyenne est d'environ 1,5 t / ha, comparativement à environ 3 t / ha au Brésil et en Argentine (FAO 2014).

La coopération LA-SAFR est très actif dans le transfert de technologie pour la production de soja et de variétés de soja adaptées aux conditions de l'Afrique subsaharienne sont à l'étude.

Les conditions socio-économiques et les priorités de développement aussi constituent une différence entre l'Amérique Latine et l'Afrique australe, où la production de soja est encouragée non seulement pour le marché mondial, mais aussi pour améliorer la sécurité alimentaire et les moyens de subsistance au niveau local, bien que la production de soja est actuellement dominé par les exploitations commerciales (Gasparri et al. 2015).

5. DISCUSSION

5.1 COMMUNAUTÉS RURALES ET SYSTÈME DU SOJA EN ARGENTINE

5.1.1 Changements radicaux dans la structure des communautés rurales et perte des connaissances agricoles traditionnelles

Depuis l'introduction du soja, les communautés rurales en Argentine ont été en mesure de s'organiser et de s'adapter à la nouvelle structure du secteur agricole, mais non sans conséquences radicales en termes de réorganisation sociale et économique de leur vie. Même si, à première vue, ils pourraient être interprétés comme des communautés très résilientes, les changements profonds dans leur structure d'origine a causé une subversion irréversible de leurs caractéristiques. D'où une analyse attentive fait observer que les communautés rurales ne sont pas suffisamment solides pour s'adapter à la nouvelle organisation du système tout en maintenant leurs caractéristiques internes.

En considérant le système du soja dans son ensemble, il apparaît extrêmement rigide, ce qui le rend très vulnérables. Dans un scénario où la demande de soja sur le marché international est susceptible de se réduire de manière significative, l'ensemble du système pourrait faire face à d'énormes conséquences négatives.

La plupart des éléments des systèmes de culture traditionnels ont disparu en évoluant vers une hyperspécialisation du secteur qui emploie des machines coûteuses, seulement amortissables sur une production à grande échelle.

Certains producteurs craignent que la monoculture de soja se terminera par un effondrement économique comme il est arrivé dans le passé pour d'autres cultures (café et tabac), sauf que la politique publique intervient.

5.1.2 Migration et changement radical dans la structure de la population agricole

Comme déjà mentionné, l'expansion du soja a amené une migration massive de la population rurale vers les villes, avec conséquences sociologiques et démographiques importantes.

La réorganisation du secteur rural et la répartition inégale des revenus ont conduit à une intense migration de la campagne.

Les communautés rurales dans leur ensemble ont montré une bonne capacité d'adaptation aux changements mais leur réorganisation a causé une fragmentation profonde et a dénaturé radicalement leur forme originale. Dans ce sens, nous pouvons affirmer que les communautés rurales ont montré n'être pas assez résilientes.

5.1.3 Occupation des terres et déplacements des activités et de la population

Dans les conditions actuelles, où le secteur des petites et moyennes exploitations familiales se réduit rapidement, les petits agriculteurs (les agriculteurs familiaux ont presque disparu) ne sont pas en mesure de faire face aux dynamiques imposées par le système du soja - orientée vers l'exportation - car individuellement ils ne sont pas en mesure de produire les quantités requises par le marché. Il devient alors essentiel d'appartenir à des associations d'agriculteurs. Dans les associations d'agriculteurs et au sein des coopératives, les agriculteurs ont un fort échange de *know-how*.

Pour les petits agriculteurs qui adhèrent aux associations, il serait difficile de changer individuellement vers différentes méthodes de production, puisque les associations généralement donnent la ligne à suivre et fournissent à la fois des moyens techniques de production (par exemple les semences) et du *know-how*.

Ces associations sont particulièrement efficaces dans la zone centrale de production du soja, tandis que dans les provinces du Nord les associations des producteurs et les populations indigènes sont occupés principalement à essayer jouer un rôle actif dans l'opposition à l'occupation des terres par les grands producteurs provenant de la zone centrale.

Dans le Nord, le manque d'une définition claire des droits de propriété des terres est toujours à l'origine de problèmes et de conflits entre les populations autochtones (pueblos indígenas) et les grands producteurs.

La déforestation génère des conflits avec les populations locales qui s'y opposent fermement à cette pratique, étant donné que la forêt représente leur habitat naturel.

En général les décisions et les mesures gouvernementales ne tiennent pas compte des populations autochtones aussi à cause de l'absence de droits de propriété foncière. Si les droits fonciers étaient réglementés la puissance contractuelle des populations autochtones serait probablement plus forte et le gouvernement aurait probablement intérêt à les inclure dans les politiques.

Les peuples autochtones ne sont pas les seuls déplacés par le soja. Les éleveurs aussi ont été déplacés et marginalisés dans les régions du Nord pour exploiter la terre (la région de la Pampa en particulier) pour le soja. Aujourd'hui le secteur de la viande n'est plus rentable, et les producteurs sont donc presque obligés de cultiver du soja. L'un des facteurs principaux qui influent sur le marché de la viande bovine concerne le choix du gouvernement d'interdire les exportations de boeuf, officiellement pour protéger le marché intérieur et garantir la consommation de viande bovine aux Argentins.

Les effets qui en découlent sont la réduction du nombre total d'animaux - et par conséquent de la quantité de boeuf disponible - et un changement dans le système d'élevage, passant de pâturage aux parcs d'engraissement. En conséquence, le prix interne de la viande bovine a augmenté, ce qui la rend inabordable pour la partie la plus pauvre de la population et, plus en général, la qualité de la viande bovine a diminué. Cela représente un problème majeur pour la société argentine, puisque le boeuf a toujours été un aliment de base dans le régime alimentaire argentin.

5.1.4 Nouvelle configuration du secteur agricole

Il est intéressant de signaler un aspect culturel considérable: alors que les petits agriculteurs traditionnels ont toujours été attachés à leurs terres, les producteurs à grande échelle - qui souvent ne sont pas les propriétaires de la terre - ne sont pas intéressés à préserver la fertilité et la qualité des sols, parce que leur intérêt unique est de les exploiter dans la mesure où ils sont productive, et ensuite de passer à d'autres terres. Il devient alors évident qu'il est très difficile pour les grands groupes de penser d'une manière axée sur la durabilité et de les convaincre à adopter des pratiques de production plus durables, sauf qu'elles ne soient compensées par un prix de marché plus élevé.

Au contraire, les petits agriculteurs traditionnels sont naturellement orientés vers la durabilité - même quand ils ne sont pas complètement conscients du sens et des principes de durabilité - mais le système actuel les oblige à des pratiques moins durables pour éviter d'être coupé du secteur agricole.

5.1.5 Rigidité du système du soja et dépendance aux exportations - Conséquences possibles sur la sécurité alimentaire argentine

Comme indiqué dans les paragraphes précédents, le modèle agricole actuel montre de la rigidité dans l'utilisation des terres, dans la taille des exploitations agricoles - ayant les petites fermes presque disparu - et dans l'utilisation de machines coûteuses qui ne seraient pas adaptés aux petites exploitations.

Nos résultats montrent que le substrat socio-culturel des communautés rurales traditionnelles est presque perdu et conduisent à penser que les actuels travailleurs agricoles - si spécialisés et si différents du modèle de l'agriculteur traditionnel - ne seraient pas en mesure de revenir à la gestion d'un processus de production complet.

Nous pouvons donc affirmer que la nouvelle configuration sociale, économique et technique des communautés rurales, à la suite de l'expansion de la culture du soja, est devenue beaucoup moins résiliente que dans le passé.

La forte croissance de la production de soja a extrêmement réduit la diversification au sein de la production agricole, en limitant la disponibilité de terres pour d'autres cultures et productions animales, qui, contrairement au soja, font partie du régime alimentaire argentin. Une conséquence évidente est la réduction de la consommation interne et l'augmentation du prix de la viande bovine.

Les questions suivantes se posent:

1) Est-ce la culture de soja menace la sécurité alimentaire pour la population de l'Argentine?

À l'heure actuelle la nourriture est suffisante - en termes quantitatifs - pour toute la population argentine, mais les problèmes de distribution alimentaire demeurent, en particulier dans les provinces du nord Chaco et Salta. En effet, 5% de la population (environ 2 millions de personnes) est sous-alimentée (Banque mondiale, 2013). La substitution d'autres cultures traditionnellement incluses dans le régime alimentaire argentin avec le soja - qui ne fait pas partie du régime alimentaire du tout - contribue déséquilibrant la

consommation alimentaire globale du pays. En fait, consacrer tant de terres à un produit agricole destiné à l'exportation a réduit la quantité de terres utilisées pour l'élevage et pour les cultures traditionnelles qui nourrissent les communautés agricoles locales.

2) Compte tenu de la forte dépendance aux marchés étrangers, qu'est-ce qui pourrait arriver si le système du soja orienté vers l'exportation échouait?

On peut supposer qu'à cause de la perte progressive du *Know-how* technique pour la production d'autres cultures, il serait difficile de rebondir à cultiver à nouveau ces cultures. Compte tenu du nombre réduit de travailleurs agricoles et la disparition des agriculteurs sur le terrain, il pourrait être difficile de rebondir aux travaux sur le terrain. En outre, les engins coûteux utilisés dans la culture du soja ne seraient pas pleinement exploités.

5.1.6 Les impacts environnementaux

Comme indiqué dans les résultats de l'évaluation de la résilience, les impacts suivants affectent fortement l'écosystème naturel:

- déforestation.
- dégradation des sols, principalement liés à la monoculture du soja.
- perte de biodiversité, principalement liée à la déforestation et à la monoculture.

Alors que l'élevage du bétail en général affecte les pâturages traditionnels, le soja progresse sur bois principalement, et la pression de la société civile sur la question est élevée. En réaction à la déforestation, les mouvements des Campesinon sont fréquents dans le Nord. Ces aspects montrent comment les dimensions environnementales et sociales sont interreliées et suggèrent l'importance d'inclure la pensée écologique dans la définition et la mise en œuvre des politiques.

5.1.7 Perspective selon la théorie de l'Engrenage de la Production

Pour une lecture plus complète de l'affaire argentine, nous avons emprunté les suggestions provenant de la théorie de l'Engrenage de la production, qui identifie trois principaux acteurs du système économique - le capital, la main-d'œuvre et de l'Etat.

Cette discussion nous permet de résumer qu'une intervention publique forte serait nécessaire en Argentine, à partir d'une application efficace des fonds de compensation des impacts environnementaux pour la production. Une autre possible intervention pertinente serait le soutien à la préservation de vastes systèmes d'élevage et la promotion des méthodes de production innovantes et durables telles que l'agriculture intégrée et biologique; la présente étude montre clairement que l'Argentine se déplace exactement dans la direction opposée.

L'interprétation des résultats à la lumière du cadre théorique de l'économie écologique, basée sur les notions de durabilité forte et de capital naturel critique, rend les considérations suivantes applicables. La

culture du soja a été principalement réalisée sur des sols fertiles précédemment destinés à d'autres cultures. Après avoir exploité toutes les terres agricoles, le soja a également étendu sur des sols moins fertiles et, surtout, sur les forêts. La déforestation a fortement perturbé les zones traditionnellement nécessaires pour la subsistance des populations autochtones, et a également affecté la société tout entière, en la privant des zones naturelles essentielles à la fois du point de vue social et environnemental. Avec cette approche, le remplacement des zones naturelles d'origine avec le soja semble négatif. Mais si l'on regarde d'un autre point de vue, nous pouvons observer que le phénomène de l'expansion du soja a deux principaux résultats positifs: d'abord, elle contribue fortement à l'économie argentine et, deuxièmement, au niveau mondial, elle contribue à la fourniture de denrées alimentaires. Dans cette perspective, ses effets positifs sont évidents. Il est cependant indéniable que son impact écologique négatif est presque irréversible, sauf en cas de mesures coûteuses et de très long terme visant à la restauration du capital naturel d'origine.

De nombreux auteurs, parmi lesquels C. Deverre et C. de Sainte Marie et B.K. Obach, analysent le processus de l'intégration croissante des objectifs environnementaux dans les politiques agricoles (nommé «écologisation»), comparant souvent les deux cadres conceptuels des théories de l'Engrange de la production et de la Modernisation écologique.

Comme résulte de l'analyse de la production de soja en Argentine, l'utilisation de produits agrochimiques est centrale dans la culture du soja GM, et constitue l'une des principales questions soulevées par les opposants aux OGM et par la critique de la société civile. D'un point de vue de la production, l'adoption de l'ensemble de la technologie pour la culture du soja a été une source importante de gains de productivité et d'efficacité pour les producteurs qui ont pu rester dans le secteur agricole. La même technologie, d'autre part, rend les agriculteurs dépendants des semences OGM et des produits chimiques. De nouvelles avancées technologiques sont nécessaires afin de maintenir les gains de productivité. Il serait intéressant d'évaluer l'alternative du soja biologique en Argentine. Nous pouvons nous attendre que le soja biologique pourrait être une option plus durable et pourrait aider à récupérer une partie des connaissances techniques et des aspects sociaux et environnementaux positifs liés aux pratiques culturelles traditionnelles, mais il pourrait également présenter différents problèmes.

Sur la base des résultats de l'évaluation de la résilience, nous pouvons déduire que la prise de conscience vers la durabilité seule ne serait pas suffisante pour entraîner une telle transition, étant le rôle du marché - et le système de prix *in primis* - souvent indiquée comme l'incitation qui pourrait vraiment soutenir un changement dans le processus de production du soja.

Dans le contexte décrit, suivant les considérations qui viennent de l'interprétation de l'Engrange de la production, il ne paraît guère pensable de réorienter la production vers des alternatives au soja OGM d'une manière qui pourrait vraiment permettre la durabilité écologique.

Dans l'expansion hypothétique du marché argentin du soja biologique une limite serait sûrement représentée par l'impossibilité de vente directe aux consommateurs - généralement un système de distribution fondamentale et écologiquement bénéfique pour une production biologique à ses premiers pas.

En outre, dans le cas d'une expansion substantielle de la production de soja biologique, un certain degré de mécanisation deviendrait probablement nécessaire. Comme la taille des fermes biologiques augmente, le travail manuel effectué par les producteurs biologiques à petite échelle est susceptible d'être mécanisé.

Un autre point important est que les opérateurs auraient besoin de quantités de produits biologiques supérieures à celles que les petits producteurs locaux peuvent fournir, ce qui nécessiterait d'une production de monocultures à grande échelle. Ainsi, dans une certaine mesure, l'agriculture biologique et la production de soja GM partageraient probablement des limites et des impacts socio-environnementaux négatifs communes.

5.1.8 La résilience des communautés rurales et la vulnérabilité du système Soja: une lecture globale

Résumant la discussion les observations suivantes viennent de l'évaluation de résilience effectuée:

- Le secteur agricole dans son ensemble a montré une bonne capacité d'adaptation et une réorganisation créative; ce qui a entraîné le secteur étant économiquement efficace, mais non sans coûts sociaux et environnementaux graves, qui consiste en la rupture de la structure originale des communautés rurales et de l'écosystème naturel d'origine.
- La base de la structure traditionnelle des communautés rurales est presque irrémédiablement compromise, ce qui pose de sérieuses limites à la capacité de rebondir à des pratiques agricoles plus traditionnelles et durables.
- L'épuisement des sols - principalement en raison de la monoculture - a besoin d'interventions rapides pour en restaurer la fertilité.
- Les impacts environnementaux et sociaux du système de production du soja sont de plus en plus critiqués et donnent lieu à des mouvements dont le poids dans le processus de prise de décision du gouvernement ira probablement augmenter.
- La hyper spécialisation du secteur du soja et sa rigidité due à l'adaptation à la demande internationale, le rendent très vulnérable dans le scénario de l'évolution de la demande internationale et de la concurrence, une tendance que déjà menace la persistance de la durabilité économique et la rentabilité du système du soja argentin.

5.2 EXPORTER LE MODÈLE D'EXPANSION DU SOJA DE L'AMÉRIQUE LATINE AUX PAYS D'AFRIQUE AUSTRALE: POTENTIELS ET RISQUES

Comme il ressort de l'analyse documentaire sur l'expansion du soja de l'Amérique Latine à l'Afrique du Sud, plusieurs similitudes et le vif intérêt des gouvernements latino-américains et africains vers les accords bilatéraux et les projets de coopération Sud-Sud pourraient conduire à l'hypothèse que le modèle du soja de l'Amérique latine puisse être exportée vers l'Afrique.

Néanmoins, des différences agronomiques et des différentes conditions socio-économiques, ainsi que des priorités différentes de développement, pourraient constituer un obstacle ou même être à l'origine de graves erreurs.

En Amérique latine, les principaux acteurs impliqués dans la production du soja sont des entreprises agro-industrielles qui produisent pour le marché mondial, avec très peu de participation des petits producteurs, tandis qu'en Afrique australe la production de soja est promu non seulement pour le marché mondial, mais aussi afin d'améliorer la sécurité alimentaire et les moyens de subsistance au niveau local. A cet égard, étant donné l'expérience en Amérique latine, il est important de réfléchir sur la faisabilité effective d'un tel objectif, considérant également que la production de soja africaine est actuellement dominée par les exploitations commerciales.

En outre, une forte contrainte pour l'expansion de l'agro-industrie en Afrique australe est principalement liée au contexte politique (Chamberlin et al. 2014, Deininger et al. 2014). L'expérience de l'Amérique latine montre que l'intensification agricole sans une politique environnementale solide peut favoriser la déforestation rapide.

En apparaît alors nécessaire de prendre en considération l'environnement et les impacts sociaux et d'identifier des alternatives de production durables, en aidant la préservation et l'amélioration de la résilience des communautés rurales dans les pays africains.

6. CONCLUSIONS

L'approche de la résilience permis de mettre en évidence les impacts sociaux et environnementaux de la culture du soja en Argentine, en fournissant une interprétation des nombreuses interconnexions entre les dimensions sociales, économiques et environnementale de la durabilité et de mettre en évidence les vulnérabilités du système de production du soja.

Le secteur agricole dans son ensemble a montré une bonne capacité d'adaptation et une réorganisation créative qui a démontré être économiquement performant, mais la réorganisation radicale des zones rurales et du système agricole a amené à un changement radical dans l'organisation sociale rurale consistant en la perturbation profonde de la structure d'origine des communautés rurales et de l'écosystème naturel d'origine.

Le système du soja, d'autre part, apparaît extrêmement rigide - en raison de la hyper spécialisation et de la dépendance marquée à l'exportation - donc très vulnérable aux changements de la demande internationale de soja.

Néanmoins, le modèle agricole argentin actuel ne correspond pas à la transition vers des pratiques agricoles durables. Bien qu'un segment des acteurs bénéficie du système actuel, la réorganisation radicale du secteur agricole limite sa capacité d'adaptation aux changements vers des pratiques plus durables. L'adoption de méthodes de productions alternatives (par exemple l'agriculture biologique) est actuellement limitée à la fois par des contraintes techniques et des inconvénients économiques, dont le dépassement nécessiterait l'intervention du gouvernement argentin et un dialogue entre l'Argentine et ses principaux marchés, l'Europe et la Chine.

Le système actuel est également fortement critiqué par la société civile argentine, qui l'accuse d'être la cause de problèmes environnementaux et de risques pour la santé.

Afin de réduire la vulnérabilité et renforcer la résilience du système vers un développement durable du secteur de la production du soja et, plus en général, de la production agricole en Argentine, à la fois les institutions publiques et le secteur privé (incluant également les agriculteurs et les organisations de la société civile) devraient contribuer à l'identification de stratégies efficaces et durables.

Parmi les interventions possibles, les éléments suivants apparaissent nécessaires:

- la diversification de la production agricole en Argentine;
- une révision de la pression fiscale et des politiques des prix en Argentine;
- l'intensification du dialogue entre l'Europe et l'Argentine et l'identification claire des demandes des consommateurs;
- l'amélioration de l'efficacité de la recherche académique et privée et une meilleure communication pour sensibiliser les producteurs et les consommateurs en Europe et en Amérique latine.

Malgré les difficultés à mesurer et exprimer la résilience selon une catégorisation normalisée, l'approche s'est démontrée très efficace pour capturer les interconnexions multiples et complexes entre les aspects techniques, économiques, sociaux et environnementaux du système de production du soja en Argentine.

Afin d'améliorer la résilience des communautés, il est nécessaire de planifier et de développer des stratégies qui réduisent les vulnérabilités, d'améliorer la communication, de supporter les partenariats entre gouvernement et secteur privé et de développer des stratégies qui permettent de diversifier le risque. La notion de résilience du système communautaire est très pertinente pour le concept de développement et de production alimentaire durable.

La comparaison de l'expansion du soja en Amérique latine et en Afrique australe a révélé la nécessité de tenir compte des impacts environnementaux et sociaux et d'identifier des alternatives de production durables, en aidant la préservation et l'amélioration de la résilience des communautés rurales dans les pays africains.

D'autres recherches devraient étudier plus profondément d'autres alternatives de production durable pour soutenir la diversification agricole et renforcer la résilience et la durabilité du secteur.

Ce serait intéressant d'évaluer les effets qui aurait le développement du soja biologique en Argentine (que se passerait-il s'il était promu et institutionnalisé). Ensuite, l'alternative du soja biologique pourrait être étudié à la fois par l'approche de l'Engrange de la production et de la théorie de la Modernisation écologique, ce qui demanderait des méthodes et des données spécifiques.