*American Journal of Rural Development, 2016, Vol. 4, No. 2, 49-58*
Available online at http://pubs.sciepub.com/ajrd/4/2/3
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DOI:10.12691/ajrd-4-2-3

# Territorial Management, Environmental Degradation and Resilience in Rural Areas of the Argentinian Temperate Arid Diagonal

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**Abstract** Rural areas located in the South of Buenos Aires province represent a clear example of an extra marginal Pampean area with evidence of environmental degradation. The area is located in the Argentinean Temperate Arid Diagonal and presents a semi-arid to arid climate with high variability, mostly regarding precipitation regimes. Throughout the twentieth century and up to the present, these lands were incorporated into the new logics of globalized agricultural production leading to the deforestation of the native forest and the development of unsustainable agriculture with methods and techniques which are highly aggressive towards the environment. In addition to these practices, the absence of public policies aiming at territorial planning even enforced the environmental degradation of the area. Degradation in these areas involves three aspects of the same reality: Firstly, the natural aspect, which refers to changes in soil characteristics causing desertification and loss of biodiversity. Then, the economical aspect with an increasing indebtedness of the farmers and consequently rural impoverishment. Finally, the social aspect that manifests itself in the degradation associated with land abandonment, rural exodus and the loss of cultural values and traditions. The goal of this article is to develop a concept, based upon three models, constituting the framework for a stepwise development towards sustainability and resilience: (1) a conceptual model explaining different land management processes in which shaped these rural areas, (2) a process model covering the relationship between (land use/management) processes and environmental degradation and (3) a future model, proposing alternatives for rural land management, related to the concept of rural resilience.

***Keywords:*** *rural areas, temperate arid diagonal, environmental degradation, territorial management, rural resilience*

**Cite This Article:** Julia Inés Gabella, and Friedrich M. Zimmermann, "Territorial Management, Environmental Degradation and Resilience in Rural Areas of the Argentinian Temperate Arid Diagonal." *American Journal of Rural Development*, vol. 4, no. 2 (2016): 49-58. doi: 10.12691/ajrd-4-2-3.

## 1. Introduction

The growing complexity that rural areas present at a world level is – at least partly – due to the context of globalization and (social and economic) fragmentation that they are part of. The changes and reorganization observed in rural areas throughout the last decades have stimulated the development of numerous research works aiming to understand and explain the processes and phenomena that are taking place. The changes in the world as well as in the national socio-economic context throughout the last decades have had numerous effects on the territorial configuration of rural areas [1]. These changes give rise to conflicts and problems causing severe effects on the natural environment. One of the reasons for the environmental instability is, in part, the lack of planning and management resulting in inappropriate use of natural resources, which have been subject to conditions of extreme degradation [2].

At an international level, there is a reorganizing process geared towards more sustainable models and there are progressively more research and projects organized by foundations, institutes and research centers looking for new approaches capable of incorporating issues of territorial development as the central element. In some European countries, the active participation of the local population, of companies and public organizations in processes of local initiatives has been encouraged to favour economic development e.g. through programs like the "Local Agenda 21" [3].

However, despite of these tendencies regarding conservation and recovery of land, economic policies and investments, development initiatives and programs, many rural areas of Latin America and, Argentina specifically, are going through a decay process. The industrial intensification of agriculture is credited with sparing substantial natural habitat from conversion to cropland. Consequently, spillover effects from the energy-, machinery-, petrochemical-, water- and monoculture-intensive practices of industrial agriculture have led to large negative environmental externalities, including soil erosion and degradation, biodiversity loss, and water and air pollution on different scales [4,5]. Social externalities

of industrial agriculture have been equally profound. In many cases, agricultural inputs have supplanted previous cultural practices that were based on the farmers' knowledge of the local agroecosystem [6].

Argentinean modern farming, based on the industrial paradigm, has important and mostly unfortunate social and ecological consequences [7]. Degradation in rural areas of the South of Buenos Aires province involves three aspects of the same reality. First, the natural aspect, which refers to changes in soil characteristics causing desertification and loss of biodiversity. Then, the economical aspect considering the of the farmers leading to rural impoverishment. Finally, the social aspect that is leading to degradation associated with land abandonment, rural exodus and the loss of cultural values and traditions [8].

Following these premises, the goal of this article is to develop three models, constituting the framework for a stepwise (re)development towards sustainability and resilience: (1) a conceptual model explaining different land management processes applied in these rural areas explaining the current situation, (2) a process model covering the relationship between these processes and environmental/social degradation and (3) a future model, designed to propose alternatives for rural land management, strongly related to the concept of rural resilience.

## 2. Methodology

The research strategy is based on the case study method, which allows to investigate the significant characteristics of real life situations (and trends) in a more holistic way. It allows us to learn about processes and procedures in depth and thus advance in the search by analysing general patterns for similar cases [9]. The chosen district is Patagones, located in the South of Buenos Aires province and, within it, the analysis focused on rural areas of dry land, comprising an extension of 13,597 km² (1,402,639 has.) and approximately 650 farmers.

Quantitative and qualitative approaches were combined throughout the research process. Quantitative methods support the identification of structural aspects that determine the behaviour of actors and stakeholders referring to a macro social framework. At the same time, the qualitative methodological approach details and underpins the social phenomena from the perspective of the actors (the civil society), representing the meaning or sense that the local population is giving to reality. Hence, the proposed research work permitted the merger of both approaches through "triangulation", which makes it easier to understand the phenomena and their different stages [10]. Because of the given complexity and relationships we decided to develop models to abstract structures and make dynamism and processes as well as the system transparent. By iterations of deduction and induction the exploratory results were generalized and transferred into three (qualitative) models to interpret and understand structures and dynamics and to use those as a basis for scenarios and solution oriented proposals especially targeting politicians, planners and relevant stakeholders [11,12].

With regard to data collection, primary sources include fieldwork, direct and indirect observation, interviews and surveys. During field trips or fieldwork, a work pattern/flow [13] was carried out collecting information and focusing on qualitative data. Interactive observation was carried out by semi-structured interviews with different kinds of social actors: farmers, (agricultural and environmental) experts, extension agents and managers (working and retired) from the INTA (National Institute of Agricultural Technology), state and local officials, agents and professionals of the private sector as well as professors and researchers from the National University of the South.

Secondary sources of information include national and international research papers and results, community information and statistical data, and general and thematic maps and visualizations of the area (from the Office of Agricultural Affairs of Buenos Aires province, the Municipality of Patagones district, the National Institute of Statistics and Census (INDEC). The results of the 1988 and 2002 National Agricultural Census were analysed, as well as those from the 2001 and 2010 National Population Census.

### 2.1. Case Study: Patagones District

The district of Patagones represents a transition area between the well-known Humid Pampas and the Dry Pampas. Its location makes it a social, historical and economic articulation area between the Pampas and Patagonia regions (Figure 1). It is the southernmost district, located between parallels 39º and 41º South latitude and meridians 62º and 64º west longitude and the largest district in Buenos Aires province, Argentina, with an area of 13,597 km².

The study area represents a climatic transition zone from an arid to semi-arid environment reflected in its native vegetation which constitutes an ecotone between the phytogeographic provinces of shrub land and thorn scrubland with xerophilous vegetable individuals that adapt to arid environmental conditions. Due to the climatic border nature between these two environments and the variability and alternation of wet and dry periods, this area is considered to be in the middle of the so-called Argentinean Temperate Arid Diagonal. The Arid Diagonal in Argentina covers a large latitudinal area and thus, has various types of climate. In order to delimit its location, the "temperate" condition was taken into account since it is found within the study area of the planetary zone of temperate climate.

Some authors [14] assessed the changes in this region in its shift and location through geomorphologic and paleontological studies which provided evidence of its existence since the mid-Holocene. This area was defined as a vast and, at the same time, narrow strip of successive arid environments with scarce precipitations that interrupt the continuity of wet areas [15]. It crosses the continent in a sloped way, from the north of Peru to the Patagonian coastline, with a Northeast-Southeast orientation. It can be considered a huge physiographic unit, an area with its own features, derived from its common aridity although it also represents a linear and real climate boundary, where the areas in the north and northeast are under the domain of wetter climates whereas, towards the South and Southeast, they are under the domain of arid climates.

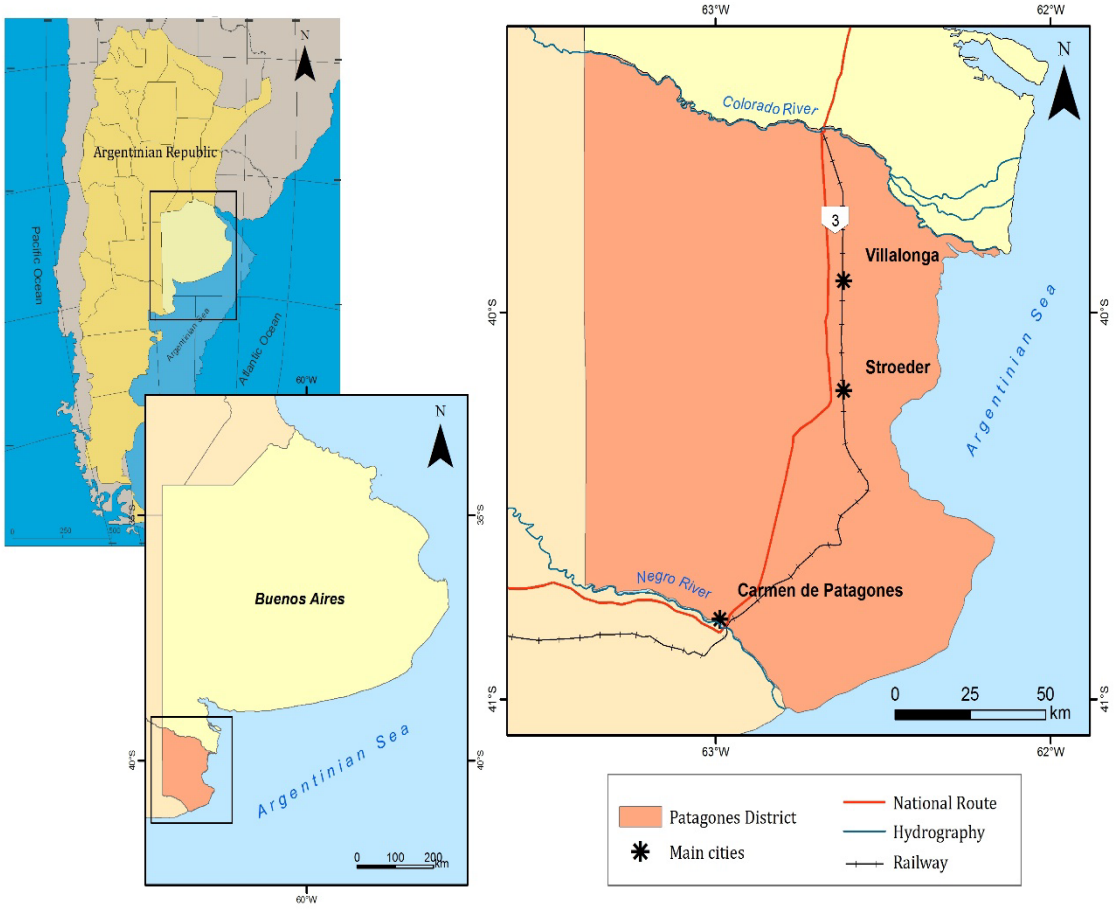


**Figure 1.** Study area

Nowadays, the productive dynamics is based on farming and livestock activities and there is a huge difference between the East and West districts. The 63º meridian divides the district into two, in the same way, as does the Nº 3 National Road. Towards the East, the land with greater sea influence tends to be more suitable for agricultural purposes. Towards the West, going deeply into the continent, features of greater aridity are present and reveal themselves in the soil and vegetation characteristics and are therefore, less suitable areas for agriculture. Thus, areas with well-differentiated characteristics as regards land use and distribution are identified in the district. The northern area surrounding the Colorado River matches the irrigation area devoted to horticultural-livestock production and is the district's most dynamic area. In dry land, towards the west, we distinguish the area of native shrub land devoted mainly to extensive stockbreeding, raising and fattening. Here, the exploitation areas are larger than 2,000 ha and towards the east, there is an area of approximately 510,000 ha with no bushes, devoted to wheat production. In this sector and near the towns, smaller exploitation areas are observed (less than 1,000 ha), devoted to either agricultural or agricultural-livestock activities. The remaining land takes up the Atlantic coastal strip.

Figure 2 is representing the relative location of the main productive areas of the district, according to data surveyed and collected in the Remote Sensing Laboratory as well as in the GIS of the Agricultural Experiment Station Hilario Ascasubi (INTA).

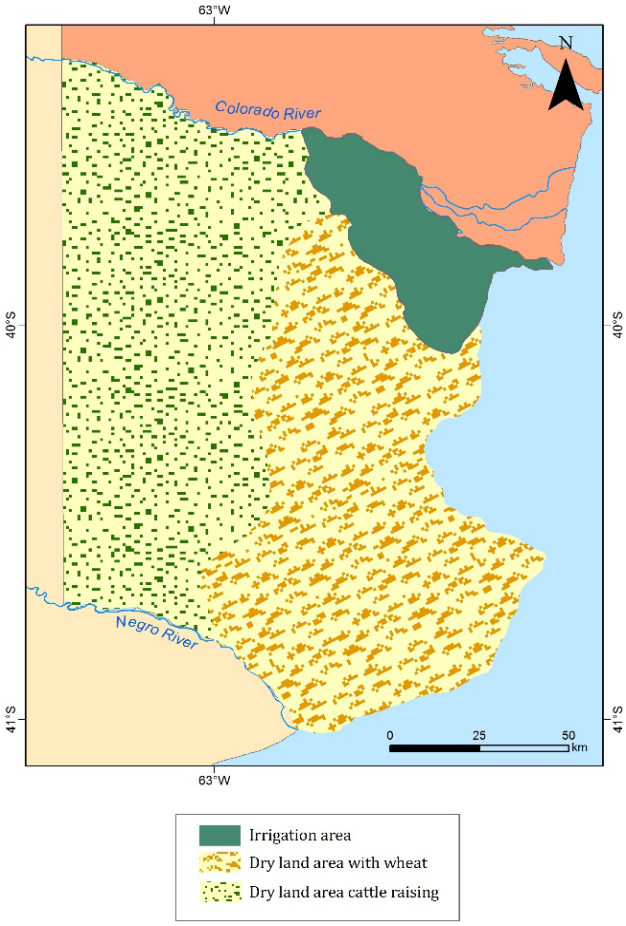


**Figure 2**. Productive areas of Patagones district

Agricultural and livestock activities constitute the productive dynamics and structure of the primary sector and represents the basis of the district's economy. In the dry land area, the productive diversification is scarce. The main crop is wheat, representing 90% of the harvested crops, with an approximate production of 120,000-140,000 t/ha. Oats and rye come in second place and are used for pasture making. In the area with no bushes, stockbreeding plays a secondary role where breeding, raising and fattening take place. Livestock activity is made up mainly of sheep and cattle and is situated on grassland, pasture and natural grass. Over the last 10 years, sheep production has recovered and there has been an emerging growth of olive farming and porcine and aromatic plants production.

Since the beginning of agricultural activity in the region and after the boom of the agro export model, the changes in land use have affected the environment. The natural balance has been altered as a result of the productive orientations used. The exploitation of native tree species in the study area was intense. Some sectors were extensively modified and most of the biome was altered due to the excessive hunting of its fauna and the destructive overgrazing of sheep and cattle [8].

The advance of the agricultural border over native bush land has been evident. Agricultural dry land represented 25.7 % of the total area in 1975. In 2009, this percentage rose up to 49.1 %. By 2009, native vegetation had been reduced to 30% of the total area of the district [16] and that by 2011, this percentage was reduced to 20%, with a 153,263 ha of deforestation in just two years (Table 1 and Figure 3).

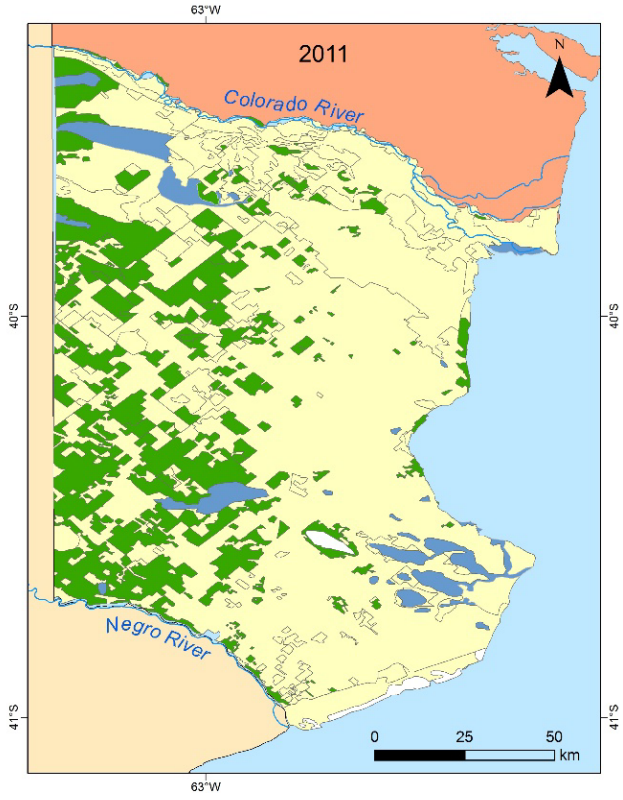


**Figure 3**. Native forest in Patagones district, 2011

The loss of native vegetation produces, in turn, the loss of biodiversity. The shrub land is the habitat of a great variety of wild flora and fauna and its destruction implies the danger of extinction of numerous species and causes ecological imbalance in the ecosystem. Natural vegetation plays an essential role in the struggle against land deterioration and evergreen vegetation ensures an effective and long-lasting protection. Deforestation increases land susceptibility to desertification [17].

**Table 1. Deforestation of the native forest in Patagones district 1975-2011**

| year | native vegetation area (ha) | % Native vegetation area (sup) |
|---|---|---|
| **1975** | 911.171 | 65 |
| **1987** | 682.367 | 49 |
| **1999** | 554.138 | 40 |
| **2002** | 524.629 | 37 |
| **2005** | 437.134 | 31 |
| **2009** | 432.280 | 30 |
| **2011** | 279.017 | 20 |

# 3. Three Models Supporting the Path from Analysis to an Integrative and Sustainable Future

## 3.1. Conceptual Model: Environmental Degradation, Territorial Management and Sustainable Development

Degradation in the research area is the result of historical processes of territorial management, associated with unsustainable production processes, caused by the lack of land use planning parallel to a dynamic industrialization of agriculture. But, land use planning not only the problem, it is an essential part of the solution to the challenges. Good (and participatory) management towards integrated harmonious and sustainable development is the (only) key to solve the local/regional problems.

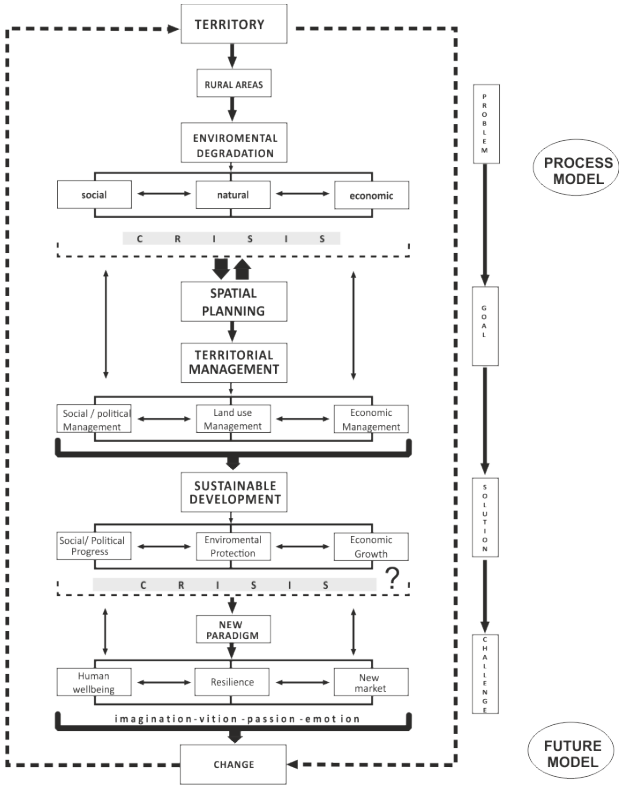


**Figure 4.** Conceptual model

However, the concept of sustainable development has caused confusion and those actions directed to it have not

achieved the expected changes yet. Consequently the paradigm which supported the idea of sustainable solution to territorial problems got in crisis. Therefore there is a need for updating terminology and concepts to define the notion that a new form of environmental (and social) development is necessary. This should lead to a new paradigm, based on the concept of resilience, which proposes new ways of thinking and challenging change to achieve new scenarios for the degraded spaces. That change should be promoted and brought up from the local population in the respected area supplemented by continuous feedback cycles and social learning processes, and - that is the challenge of this research - should contribute to the development of the future model (Figure 4).

#### 3.1.1. Resilience: an Alternative for Understanding the Rural Environmental Dynamics

In recent years the discussion on the concept of resilience as a new paradigm has started. This term is deriving from ecology and is indicating the capacity of communities and ecosystems to absorb shocks without significantly altering its structure and its functionality features, while at the same time being able to return it to its original state once the disturbance is over [18]. Thus resilience would be a precondition for sustainability. While sustainability is obtained through changes in the system, the ability to tolerate changes or reorganize a number of structures and procedures by which sustainability is achieved would be the resilience approach [19]. Resilience provides the capacity to absorb shocks while maintaining function. When change occurs, resilience provides the components for renewal and reorganisation [20]. Vulnerability is the flip side of resilience: when a social or ecological system loses resilience it becomes vulnerable to change that previously could be absorbed [21]. In a resilient system, change has the potential to create opportunity for development, novelty and innovation. In a vulnerable system even small changes may be devastating.

Rural resilience may be defined as the capacity of a rural region to adapt to changing external circumstances in such a way that a satisfactory standard of living is maintained. It can be described by how well a rural area can simultaneously balance the ecosystem as well as its economic and cultural functions. As such, the rural resilience perspective refers to a rural area's ability to cope with its inherent economic, ecological and cultural vulnerability. This perspective is based on, and consistent with the idea that ecological, economic and cultural systems become increasingly entangled, and interactions between these systems increase in intensity and scale. Consequently, it makes less sense to think of them as separate, and more sensible to regard them as overlapping components. It is not surprising that rural resilience builds on the interface of other types of resilience, in particular economic resilience, ecological resilience, and cultural resilience. It is obvious that these forms of resilience are mutually related and interconnected [22,23].

### 3.2. Process Model: Land Management in Rural Areas of the South Pampean Region

The specific regional development in Argentina throughout its history brought up different processes of space occupation and organization and determined the productive management of agricultural, rural areas. Rural areas devoted and directed to activities of primary production for foreign markets developed to the key constituents in the national agricultural organization.

The Pampean region with its favourable weather conditions for agriculture and stockbreeding, turned into a suitable area for developing the agro export model and "sustaining" it over different historical periods. This vast region was altered by the expansion of this model, regardless of the distinctions of the natural environment and the distinctive features of each zone.

From 1990's in Argentina, a period of neoliberal restructuring began. Institutional and legal changes are the expression of new forms of regulation that have been progressively imposed since then. Convertibility law, privatization, decentralization and removal of regulatory institutions are some of these new impact factors. This structural transformation reorganized territories and societies, especially rural areas and small urban communities [24]. The introduction of new technologies for competitive agriculture generated new sectors and created new geographical areas capable of successfully competing in the global marketplace, while other marginal areas were separated, isolated or even stayed outside the system [25].

Pampean and extra-Pampean agriculture suffered from a significant modernization that led to a growth of production and productivity, with a process of land concentration on few owners and social differentiation and disparities that created a brand-new scenario of increasing vulnerability for small and medium-sized farmers [26]. Consequently, a double process began: On the one hand land concentration processes as result of the agriculture modernization occurred, on the other hand many farmlands were abandoned and disappeared. The Pampean region lost 29 % of their holdings between 1988 and 2002, whereby units of less than 500 ha were the most affected. The disappearance of farms generated a decreasing population, which resulted in the further loss of services and infrastructure in the respected rural areas [27,28].

The district of Patagones, located at the southernmost point of Buenos Aires province is another example of this dynamism. Agricultural production systems were introduced in this area throughout the 20$^{th}$ century and are still valid today. The advance of the farming frontier in these spaces, not only implied a change in agricultural production but also caused changes in social networks and territorial configurations. It was possible to incorporate big land areas of this district to cereal production with the consequence of native bush land deforestation. Over the past few decades highly aggressive agricultural methods and technologies have been implemented in this region, resulting in unsustainable agricultural practices and consequently leading to excessive environmental impacts.

Besides these types of management practices, the lack of public policies aiming at land use planning only favored (1) the global economy and (2) supported the environmental degradation of the area. The equation of environmental degradation in rural areas of the district of Patagones is complex, variable and dynamic. The processes of territorial management applied in the district and the impact on the environmental degradation of the area are composed and interpreted in the process model (Figure 5). The social and cultural characteristics of the

local farmers in this area added to the lack or scarcity of public policies targeting territorial planning. These characteristics are the backbone and are essential for explain the degree of degradation in this district.

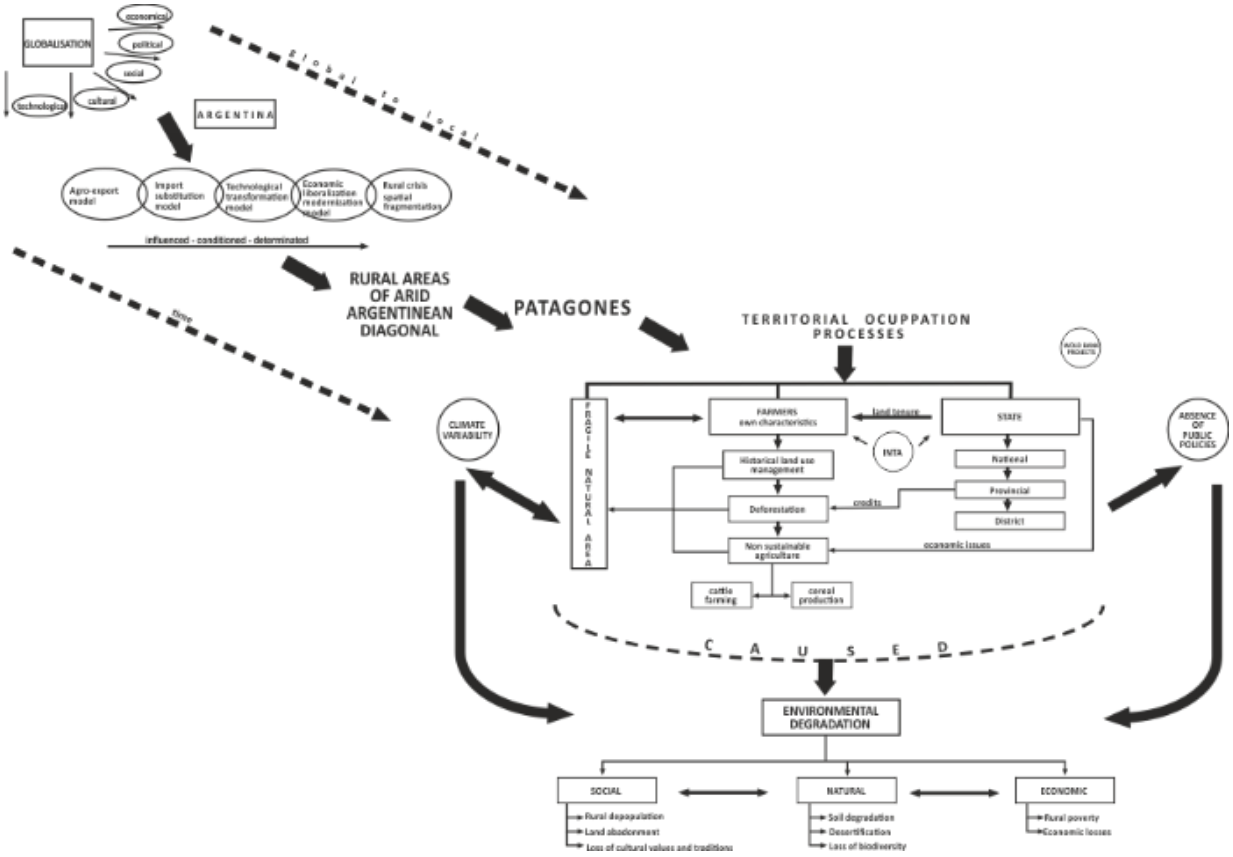


**Figure 5.** Process model

### 3.2.1. Persistence of Unfeasible Production Models: Farmers' Resistance to Change

The connections between climate variability and the productive management model adopted by the colonizing culture in the district of Patagones are essential when trying to understand the processes and dynamics of this territory. The original settlers had a farming culture, deeply rooted in wheat crops and the use of traditional tools such as the plowshare and the moldboard, but they found a dense forest area, which needed clearing in order to cultivate the land. Farmers in Argentina had grown up in Europe or are descendents of migrants from Europe, and were used to tenant or small holder farming [29].

Since the occupation of this rural space, there has been no connection between the natural environment and the exploitation systems. The lack of adaptation to unpredictable weather characteristics, caused serious socio-economic consequences. Precipitation variability, the ignorance of the farmers, and productive mismanagement where recurrent factors. Throughout history these recurrent factors caused increasing problems in the region. Today, in spite of new technologies, the small and medium-sized farmers are still facing the same vulnerability issues due to the conflict between climate conditions and production logics not being compatible with the natural environment. Farmers usually face every radical innovation with skepticism, doubt, prejudice and concern. In arid and semi-arid agro ecosystems in particular, the decision-making process of small farmers is carried out under conditions of uncertainty when it is not possible to assess the likelihood of occurrence of certain events. The attachment to "traditional techniques" is not an irrational attitude but a proven way of minimizing uncertainty in order to avoid total loss and disintegration of productive units [30]. The perception of farmers when faced with extreme climate events, particularly droughts, should additionally be noted. Their occurrence and regularity are usually recurrent however farmers tend to ignore this fact when making decisions about the future of farming. Farmers tend to think that they were circumstantial or that they will not repeat with the same magnitude. In some cases, they even forget these events and wait for better years to come [31].

Debates and discussions on the environmental issue suggest two points of view of the same problem. On the one hand, the anthropic action causes degradation and, on the other hand, humans feel they are victims of the environment. While scientists and local experts state that the drop in land productivity in the district of Patagones is due to soil degradation as a result of the use of bad farming practices, farmers insist that it is the lack of precipitation that causes their problems. Some of the expressions recorded in interviews carried out during field trips reflect this view:

*"The problem is that the farmer has a production logic which is usually wrong. The severe drought was a catalyst, which speeded up the degradation process. It speeded up a process which had already been developing"1.*

*"I do not know what we need, it is the weather that kills us. I do not know what we can implement, I do not know*

1 Interview with an Agronomist of the INTA, Hilario Ascasubi, in August 2012.

*what can be done. The weather has treated us brutally. Let's have faith and think that this is temporary and that the rain will come soon"2.*

*"The district's problem is climatic. If it rained, I would be fine. Irrigation would be a quick solution. If irrigation was brought, we would have a solution. I do not want to have all my land irrigated, I would produce to feed my cows"3.*

*"There has not been enough rainfall for a long time. The rainfall millimeters of the last years make it really difficult for us to produce. The last drought was extremely long and severe and it was not in our calculations or predictions"4.*

*"Here, the most serious problem is of climatic nature. They say wheat cannot be produced but it is a fast alternative; you sow it and within a few months and with few hectares you can reorganize yourself again. You need more hectares for cattle"5.*

*"I hate bush land, either in my own land or in rented land, I weed it and leave nothing…you cannot work, it sucks the soil dry"6.*

*"A lot of people gave their opinion even if they did not have any knowledge. People from the city, a lot of experts and engineers who came from other places think that this is a simple situation to solve…It is easy to give your opinion and then do nothing under those circumstances"7*

In the area of Patagones, a widespread lack of the sense of responsibility can be seen in its inhabitants and farmers in relation to the sustainable use of natural resources. The low level of awareness and understanding of the land resource degradation problem is annoying. The logics of short-term economic strategies and actions have priority over the long-term sustainable viewpoints and approaches, causing a lack of sensitivity when faced with the degradation problem and even rejecting the damage already caused.

## 3.3. Future Model: A Change of Scenario for Rural Areas of the Arid Temperate Diagonal

The situation involving environmental degradation in the rural territories of the Arid Temperate Diagonal in Argentina and in particular, the district of Patagones currently forces us to look at the reorientation of public policies as well as the management and administration strategies and instruments of the rural territory.

Based on the analysis developed and aiming to suggest solutions to the problems shown in these spaces, it is essential and imperative to carry out planning for the study area with future oriented and specific measures directing the necessary actions to solve the expounded problems. The suggested proposal, the selected approach, the intervention methodology and the main key topics on which the work plan should be based in order to achieve a change of scenario in degraded rural areas are composed in the future model -which can be seen as a communication and demonstration tool to increase the awareness of politicians and planners as well as stakeholders from the civil society- in order to change towards sustainability and resilience (Figure 6).

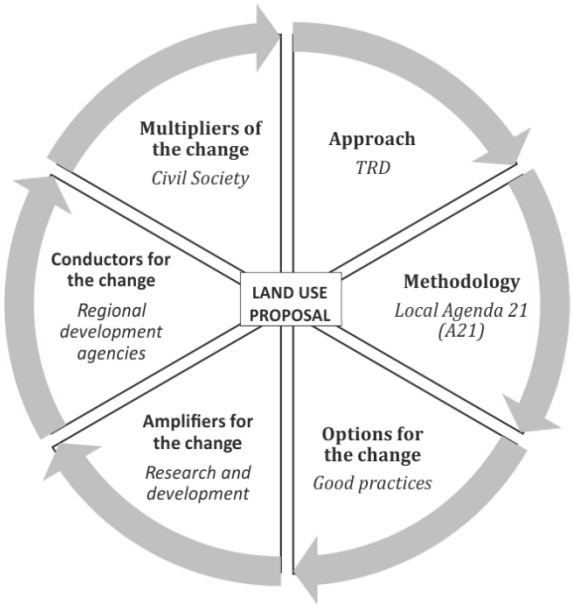


**Figure 6.** Future model

### 3.3.1. Land Use Proposal

Firstly, the devising of an agreed, comprehensive and participatory land use planning/development proposal/draft, focused on the development of the territory, is suggested. The design of a model with a vision and a desired long-term image is proposed, as well as the definition of appropriate strategies and measures for implementation. This proposal needs to be directed towards creating higher rural resilience in the area. The suggested land use planning/development needs to be reflected in a Land Use Plan. The selected approach for the devising of a Land Use Plan is the Rural Territory Development (RTD). This is a comprehensive systemic approach based on the concept of territory.

According to this approach, the territory gains relevance and prominence and is the object and engine for development. The territory is not seen as a physical space but as a social construction, as a set of social relations that generates and, at the same time, expresses an identity and sense of place shared by numerous private and public agents [32]. This approach stems from a holistic inclusive view in which multidimensionality transdisciplinary are the key elements. This involves considering all the dimensions and components that make up a territorial system: the economic, social, natural, political, scientific and institutional dimensions [33,34].

The guidelines and tools proposed in the Local Agenda 21 (A21) are suggested as the intervention methodology for the specific plan and the key constituent of land use planning in the study area. It is based on a creative and open process where each municipality (by including its local civil society) sets up its own strategies, actions and planning spaces. Even though there is not a unique standardized model for the design and management of this

2 Interview with a farmer of Patagones district in his agricultural establishment, in March 2013.
3 Interview with a farmer of Patagones district, at the Rural Society of Stroeder, in August 2011.
4 Interview with a son of a farmer in Patagones district, in his workplace, in March 2013.
5 Interview with a farmer of Patagones district in his agricultural establishment in November 2012.
6 Interview with a farmer of Patagones district, at the Rural Society of Stroeder, in April 2014.
7 Interview with a farmer in Patagones district, at his home in Patagones, in December 2013.

agenda, a series of standardized steps are identified: (1) environmental commitment (2) diagnosis devising (3) identification of environmental problems (4) definition of action guidelines and designing of a plan. Agenda 21 is a process of involvement of social actors that will express a shared view of the social and environmental sustainability of the community for which they are and feel responsible – in a scheduled short, medium and long-term (work) plan [3,35].

#### 3.3.2. Options for the Change

By introducing and modeling practice cases land use planning and management will get innovative change options [11]: To avoid degrading processes and decrease problems as well as new methods for land and environmental management in arid and semi-arid areas is necessary using the experiences of other areas with similar environmental and social characteristics.

Various authors [36-54] have worked on this subject in different rural areas of the world suggesting primarily to focus on activities directed to strengthening productivity, e.g.:

a. A forest plan for the area, devised on the basis of local, provincial and regional consensus allowing the harmonization of the uses of forest resources with a comprehensive view on native forests, not only dealing with production but also with conservation aspects.
b. Greater production diversification guided to extensive livestock farming in shrubland, sheep and pig farming and beekeeping.
c. Comprehensive management plans with crop rotation, pasture management, mixed systems and in general the implementation of more sustainable production practices.
d. Forest windbreaks in order to reduce wind erosion.
e. Alternative productive activities, more appropriate for the weather characteristics in the area (growing of aromatic plants, olive trees, almond trees, capers, etc.).

#### 3.3.3. Amplifiers for the Change: Research and Development

In the research area, there is collected and systematized information by different institutions available but the reliability of the database needs to be improved. E.g. regarding precipitation records, there are no organizations or bodies that provide a full database. This information would be useful for future projects and would be the necessary basis for research. More specific and transdisciplinary research providing in-depth information for the prevention of land erosion and degradation due to the impact of climate variability is necessary - the implementation of projection models is an inevitable basis for future sustainable developments.

Moreover an environmental monitoring and early-warning system would be the basis for permanent feedback loops and the process based improvement of the development. Hence, it will be necessary to expand the quantity and quality of the network of agro-meteorological stations, to constantly processing satellite data and images and drawing up and updating specific and thematic cartographic visualizations for the area.

#### 3.3.4. Conductors for the Change: Regional Development Agencies

The creation of an office for rural development is suggested. It should coordinate the different actors involved (institutions, associations, farmers, civil society etc.) and the different public policies applied. It should also be a place to manage and channel information on plans, programs, projects, measures and also the financial aid for the area. This office will promote agreements with relevant institutions, find additional financing sources and carry out activities focused on creating closer connections and networks based upon public-private-people – partnerships (PPPP) resulting in inter- and intra-institutional strengthening processes and in more participation of the civil society.

#### 3.3.5. Multipliers of the Change: Civil Society

The involvement and commitment of the regional and local actors is essential to support transition and achieve change. It is necessary and essential to have stakeholders who are responsible and visionary, who are able to establish connections, links and networks, bringing together as many actors in the territory as possible. Sustainable and resilient rural settlement patterns should be encouraged, avoiding the exploitation of the area by only focusing on industrial agricultural production.

It is important to make a program strongly focusing on social issues and aiming at the appreciation of local cultures and creating opportunities by promoting new economic options and projects supporting the local level. Social and cultural activities need to be strengthened in order to guarantee access to basic services and information based on an inclusive approach.

## 4. Conclusion

Rural areas belonging to the district of Patagones, within the Argentinean Temperate Arid Diagonal are facing strong environmental degradation. The degradation is directly related to and is the result of different management processes in the territory, which were and still are conditioned by external economic, political and socio-cultural factors. They are, in turn, internally determined by multiple and diverse social actors, each one with specific interests and individual roles. The occupation, construction and appropriation of the area is the result of a process that was evident in the whole region. Despite being within this region, designed by natural pasture and a benign climate for agricultural production, the study area is characterized by natural fragility. This fragility is typical for a transition area between a semi-arid to an arid environment with alternation of wet and dry recurrent and variable cycles. In turn, there are distinctions throughout the district which are manifested in the precipitation patterns, the temperature and the land development. Native vegetation presents a forest formation with developed vegetable species that adapt themselves to environmental conditions and present ecosystem functions and services that are essential for keeping the biome, habitat of numerous species.

Patagones' rural life is associated with a traditional world, more or less at a standstill, far away from the image of the modern, technological, highly productive and

connected rural areas in the Pampas. Here, there is a local cultural heritage from past times which can still be seen in many farms, and which is reinforced with traditional farming logics. The socio-territorial and environmental effects of the paradigms and development models introduced in rural areas of the Argentinean Pampas region can be easily observed in traditional farming practices; from the outdated machinery, the exploitation and degradation of the land, to the isolated and nowadays uninhabited towns.

There is a need for a new approach for land-use planning and management which will contribute to a new thinking about a long-term policy aiming at the sustainable development of the territory. If it is accepted by politics and administration, a comprehensive, participatory development, using methodologies such as the Local Agenda 21, will create greater commitment and will increase the involvement and participation of social actors. Using an approach which is not only based on the production oriented development of the territory will contribute to a holistic conceptualization and an integrative planning approach, supplementing the globalization based and production-driven farmland model. Through modeling examples introduced in other arid and semi-arid areas in the world, the degrading processes of the agro- ecosystems be reverted and negative future challenges could be prevented. If transdisciplinary research, based on the discussed models, with an emphasis on climate variability, would be promoted, valued and shared by politics, institutions and stakeholders in the area, it would contribute to transition and change the current views of the environmental and climatic reality in the area.

A government influence and direction is necessary, should encourage reward by granting tax benefits for farmers who carry out traditional land use and conservation practices – it should be a remarkable benefit for the farmers. This process needs to be supplemented by strategies, advices and technological know-how provided by the institutions, which in turn, will have to solve the internal problems of lack of connection between the research and politics/institutions as well as the extension areas to overcome the unawareness of the territorial government and the lack of knowledge and consciousness of the people living in it.

It will be a decision and obligation of the governments to improve infrastructure and services in order to make these areas habitable and produce a greater identity for and anchoring in the territory. However, the boost and promotion of the expected changes will also depend on social commitment and participation

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