SOCIAL SUSTAINABILITY AND SOCIAL RESILIENCE OF
RURAL COMMUNITIES IN DRYLANDS:
THE CASE OF JÁCHAL (ARGENTINA) IN THE 19th AND 20th
CENTURIES

Preliminary version, please do not quote without permit

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Abstract
This paper explores aspects of social sustainability and social resilience—defined as the capacity of maintaining certain population with certain living conditions for a long time, and as the ability to endure stress due to external changes (political, economic and environmental), respectively—in irrigated areas of the department Jáchal, Argentina. Three key dimensions of social sustainability—structure, performance and dependence—are evaluated using demographic, economic, cultural and environmental indicators.

Introduction
Many rural communities in Argentina and other developing countries face today the risk of depopulation (Pérez 2001). This represents a serious threat to community survival because there is a certain critical population mass below which a number of social services and infrastructure are not provided: schools are closed, health centers are moved, etc.¹

Because population plays such a critical role, social sustainability—the capacity of maintaining certain population with certain living conditions for a long time—in rural areas is frequently associated or measured through the structure and dynamics of the population. However, in analyzing social sustainability, these features should necessarily be linked to the rest of the socio-economic, political, cultural, institutional and environmental features that characterized these communities and their multidimensional contexts.

However, it is worth to note that not all the rural communities are in the path of depopulation today, and in that sense some rural communities seem to be more resilient (or less vulnerable) that others, showing a greater ability of enduring stress due to external political, economic and environmental changes (Adger 2000).

My adviser, Bryan Roberts, commented some time ago that the question about rural areas should not be why people leave, but why people remain. With this in mind, this paper explores the interconnectedness (if any) between social sustainability and social resilience in rural communities, addressing the role of three dimensions—structure, performance and dependence—across four attributes, namely population and demography, economic activity, community/culture and institutions, and environment. This preliminary exploration will be illustrated with the case of the department of Jáchal (San Juan, Argentina).

Sustainable development and sustainability
The Bruntland Commission formally defined sustainable development as following: “Sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future” (WCED 1987). During the 1990s, the term became the politically correct way to address development problems, being vague or opaque enough to cover a broad range of perspectives and

¹ For example, in addition to very low rural population density (below 1 hab/km²), ongoing processes of depopulation and the gradual disappearance of small centers of rural population, these areas are characterized by demographic unbalances (for example in sex ratios), tendency to family disorganization, disappearance of essential services (for example education), increasing dependence, very low level of social interaction, and difficulties in regional integration (Bustos Cara 1990)
conceptual approaches, which made it perfectly suited for international politics (Sachs 1998; Goodland 1995; Lélé 1991).

The apparent simplicity of the concept, however, hides contradictions, unanswered questions, and competing conceptual approaches (Redclift & Woodgate 1998; Turner 1997; Farrell & Hart 1998). The lack of definition is evident, for example, in the disagreement on what and whose needs should be pursued, at what temporal and time scales, and through what mechanisms (Sachs 1998; Sneddon 2000; Thomas and Adams 1997). Sustainable development is becoming a normative concept difficult to articulate and put into practice. Its standards and recommendations seem to assume an a-priori knowledge of what the limits of the ecosystems are under certain types of management, or what the human necessities would be in the future\(^2\). In addition to this, these limits and needs have been generally expressed following a western or northern vision, living behind indigenous or local understandings of environment management. This may express as a bias toward technical knowledge (Foladori 2002), and this aspect adds to the rather a-historical character of the concept.

Sustainable development is not the same that sustainability. Sustainability has been applied to a number of issues, including development (Sneddon 2000). Within this last field, the use of “sustainability” suggests a more balanced view between social, economic and ecological goals and the aim of meeting a broad range of human needs and aspirations from material needs to health, literacy and political freedom (Farrell and Hart 1998:6).

This possibility of a more sociological view and the aforementioned caveats has led some authors (Sneddon 2000; Scott et al. 2000) to propose that **sustainability** may be a more adequate term that **sustainable development** in social sciences analysis. They based their proposal in a number of considerations. First, sustainability is context-specific and its use requires referencing it against specific geographic, temporal and socio-ecological contexts, which are crucial for the questions of what is to be sustained, at what scale, by whom and through what mechanisms (Sneddon 2000:525). Arizpe and Paz (1992:339) went further in affirming the need for context in analyzing sustainability when they stated that “…[sustainability] represents an ideal socio-political behavior, and consequently it is impossible to measure its effects until it became part of the everyday practices of the different societies…”

**Social sustainability**

From an analytical point of view, the concept of sustainability has been divided into three related but distinct components or dimensions: environmental, economic and social sustainability (Barbier 1987; Goodland 1995; Arizpe and Paz 1992). This distinction is important because each dimension prioritizes different aspects of the final goal of development or improvement of human well-being, but also because research on each of these dimensions may be included into different study fields. Goodland and Daly (1996:1002) affirm: “…the challenge to social scientists is to produce their own definition of social sustainability, rather than load social desiderata on to the definition of environmental sustainability…” Although the authors recognized overlaps and linkages

\(^2\) I am indebted with Claudio Barud for calling my attention to this implication of the concept.
between the three “types of sustainability” (they do not call them dimensions), Goodland and Daly also suggest that they are clearest when they are kept separate.

The focus here is on social sustainability, which may be approached from different points of view. On of them simply makes reference to the social conditions that influence the ecological sustainability of society-environment interactions (Lélé 1991:609). Instead of focusing merely on the social aspects of ecological sustainability, an alternative approach emphasizes the social connotations of sustainability. From this point of view, social sustainability addresses social structures and living conditions of human populations, considering them as central issues in achieving the goal of sustainable development and acknowledging the fundamental role that social actors and capital, organization and institutions play in that process. In doing this, the concept has the capacity of addressing not only the relationships between the physical environment and societies, but, more important, the cultural values, perceptions and interests of various social groups (differentiated along lines of socioeconomic status, ethnicity and gender) about the environment (Arizpe and Paz 1992; Scott et al. 2000).

The study of social sustainability implies to consider a society in its space-time matrix and to address the mechanisms through which that society remains in place in the long-term. This necessarily includes the relationship with its environment, although this aspect is not always explicit. This approach also requires an historical perspective, in order to have a long-term view of institutions and policies through the analysis of the interaction of socio-economic and environmental processes in the past (Berg & Straaten 1994:10).

Finally, without resigning issues of economic development and production, social sustainability seems to have more room for anthropological approaches with an integral vision (Crumley 2000). Characterized in this way, social sustainability may overcome the aforementioned problems of the concept of sustainable development.

**Social Resilience**

First in physics and then in ecology, resilience was used to mean the stability of a system. Later, the concept began to be used to refer to the ability of a system of conserving its internal structure when facing perturbations, and of incorporating changes without changing qualitatively, it means, keeping the properties that characterize it (van der Leeuw and Aschan-Leygonie 2000:9). Of interest here are the two aspects of resilience that these authors highlight: the behavior of the system due to the structure of its attributes and their interactions between them, and the perception of perturbations and change.

However, van der Leeuw and Aschan-Leygonie do not talk of “social resilience” but of resilience of socio-natural systems. Taken a step further, Adger (2000:347-48)

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3 For example, Allmark (1998), in his review of the relationships between environment and society in Latin America, emphasizes the endurance of the patterns of economic exploitation of natural resources that were established during the colonial period, their continuation through the current industrialized economy and the widespread depletion of natural resources. The author also examines the role of migration flows (internal and international) in the demographic dynamic of the region and in shaping the distribution of the population in the territory.

4 The authors privilege a “socio-natural” perspective working within the Complex System approach.
defines social resilience as the ability of groups or communities to cope or withstand external stresses, shocks and disturbances to their social infrastructure, as a result of social, political and environmental change. This definition is based on the second use of the concept as adaptation to change. Compared with social sustainability, social resilience seems to be more involved with issues of function or performance, and with identifying what are the key elements that are the core of the system. This may be the reason of Adger’s insistence on institutions, their historical evolution and capacity to change. However, although he suggests that social resilience should be defined at the community level due to the importance of the institutional context, its observation and analysis may require different levels of analysis and an interdisciplinary approach to take into account its economic, spatial and social dimensions.

Because it increases the capacity to cope, social resilience may be loosely opposed to vulnerability, which is defined as the exposure to stress due to the impact of environmental change and related to disruption of livelihoods and loss of security. Within the field of vulnerability, crisis and disasters studies, however, resilience has been considered as one of the components of vulnerability (Longhurst 1994:20).

The relation between social and ecological resilience is hypothetically more apparent in the cases of communities or social groups whose livelihood strategies are closely tied or depend on a single natural resource or ecosystem (Adger 2000: 350): the higher the dependence of a community on a narrow scope of natural resources, the higher the vulnerability of its livelihood systems. These communities are subject to both environmental variability and socio-economic and political stresses. For example, market variability is a key issue on natural resource dependence, although sometimes it is buffered by the persistence of subsistence activities. At this respect, the diversification of livelihood strategies (Ellis 1998) reduces risks and increases resilience.

Social resilience may be a useful approach to address the mechanisms that guarantee social sustainability with the advantage that this approach assumes a relationship between social and ecological resilience, making clear the necessity to address environment in considering social sustainability, particularly of rural communities. It could be considered a bridge concept.

**Matrix of socioeconomic sustainability**

One of the key problems in addressing social sustainability and resilience is to decide what to look at, the selection of proxies, variables or indicators. A related problem is how to make use of the sometimes abundant but disperse and heterogeneous information that is needed to address these issues. Attempting to solve this puzzle, the paper combines the methodological suggestions of two studies, adapting them to the information available for the study area for the period of interest, from the middle 19th century on. An additional challenge is to match historical and statistical sources along this period.

The paper attempts to compare two moments of Jáchal history, broadly defined as before and after the 1930s, using the concepts of social sustainability and social resilience.

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5 Adger (2000:348) defines institutions “…in the broadest sense to include habitual behavior and rules and norms that govern society, as well as the more usual notion of formal institutions with membership, constituencies and stakeholders…”
as the heuristic tools. Following Copus and Crabtree (1996:44), the exploration of these
two moments in Jáchal population-environment history will be done through their
definitional matrix of socioeconomic sustainability model, establishing first the structure
and performance of the four attributes and afterward considering dependence across all
the attributes. The variables selected to characterize the matrix, however, take in account
not only Copus and Crabtree recommendation but also Adger’s (2000) suggestions
regarding indicators of social resilience.

Copus and Crabtree (1996:41-42) decompose the concept of socioeconomic
sustainability in three attributes -- population, economic activity and community/culture
(Adger’s institutions may be included here), each of them characterized through three
dimensions --structure, performance and dependence. The authors explore these
dimensions and attributes using classical demographic, economic, cultural and
environmental variables.

Social sustainability from the point of view of economic activity refers the
capacity of maintain an adequate quality of life for the population on long term basis,
without transfer from more prosperous regions. Economic activity is approached through
activity and unemployment rates, the economic sector structure and its changes
(including the relative importance of expanding and declining industries), and levels of
entrepreneurial activity. As the study area is a rural and agricultural setting, it may be
adequate interesting to include here other livelihoods strategies that do not represent
income sources, as subsistence agriculture and no paid family work, but that could be
important to explain the production and reproduction of the community. Characteristics
and changes in agriculture structure (land distribution, crop pattern, ownership, etc.), to
the extend that regulate the access to resources, should also be included.

The community/culture attribute makes reference to intergenerational equity and
cultural capital, and I think that social institutions, formal and informal, should also be
included here. The community/culture attribute, where I am including also institutions, is
more difficult to grasp. Copus and Crabtree suggest looking at the influence of
immigration, measured by the proportion of people born out of the department for
example, at spoken languages, and at socio-cultural capital.

Finally, population refers to the ability of the population to reproduce itself and to
maintain a balanced structure. Among the demographic variables are population density,
population change, migration, and age structure. Regarding population density, Copus
and Crabtree (1996:44) consider that it is one of the most useful demographic indicators
in terms of social sustainability. Low population density is linked to constraints to social
and economic development, to reduction of social interaction, and to the increase of the
cost of services provision, industrial inputs, marketing, etc.

However, as was said before, in dealing with social resilience it is essential the
explicit consideration of a forth dimension, environment. The environment attribute
includes the environmental framework, to the extent that it determines or influence
natural resources availability and living conditions, and to the management of the natural
resources. In this sense, it would be adequate to extend the original Copus and Crabtree’s
conceptual matrix to include the dimensions of this attribute as well. Environment and
resource management, including land use/land change, may be approached using
variables related to the physical environment (climate, drainage system, soils and natural vegetation cover).

Finally, the elusive dependence dimension is addressed through variables as government and non-government transfers for services and infrastructure, subsidies, public and financial assistance, including assistance for the survival of minority languages and culture. Copus and Crabtree pool this dimension for all the attributes, not separately.

Adger (2000) proposes social resilience to be observed through proxy variables as institutional change, economic structure and demographic change. Because of the close relation between social sustainability and social resilience, indicators are very similar, but the rationale for their selection is slightly different. In effect, in the building of indicators of social resilience it is necessary to take in account the ones that better represent the links between ecosystems and social resilience.

For example, regarding population, Adger privileges population distribution. He considers that the distribution of population across a territory, which is the outcome of the settlement patterns, is closely related to the distribution of natural resources and infrastructure, determining site and situation (absolute and relative advantages of a location). In arid lands, where water is the critical natural resource, the location of the water sources (natural and artificial) will determine and constrain the distribution of the population. About demographic change, mobility and migration may be used as indicators of resilience assuming that population mobility may indicate stability or instability, depending on the type of migration. Population displacement, for example, frequently denotes a deterioration of living conditions in the origin area, and may indicate instability. It is also necessary to consider the role of migration within the rest of household livelihood strategies, particularly in a context of resource dependence (Adger 2000). Finally, economic aspects of social resilience include the nature of economic growth, the distribution and stability of income, the influence of environmental variability on crop productivity, and the stability of income sources and as a result of livelihoods.

The study area

The Department of Jáchal is a non-metropolitan and agricultural site the in arid lands, with limited influence from larger urban centers, an important proportion of rural population and a long history of settlement. The department is located in the north of the Province of San Juan, in the west of Argentina (maps 1and 2).

Maps 1 and 2 about here: Localization of the department of Jáchal in Argentina

The department of Jáchal is included in the drylands of Argentina⁶. Drylands, especially in developing countries, present particular challenges to human settlement because of the constraints that their biophysical characteristics, particularly water scarcity, pose over economic activities (notably agriculture), everyday life and

⁶ The term “drylands” refers to arid, semiarid and dry sub-humid ecosystems characterized by low and irregular rainfall and high evapotranspiration, and that are subject to cyclical droughts and to the consequent deficiency of moisture (UNSO 2000)
livelihoods in general. However, this did not discourage societies, which have been settling in drylands since the beginnings of the civilizations, adapting themselves to the environmental hardships but also modifying the environment to suit their needs.

Although there is an almost intuitive comprehension of the term “rural”, its exact definition is difficult to grasp. The identity between “rural” and agriculture or farm is erasing, given the increasing economic diversification but also the profound changes within agriculture, including new actors like farm workers living in cities (Hart 1995; Giarraca 2001). In Argentina, the censuses of population have routinely differentiated rural and urban localities following a numerical criterion: those localities with 2,000 or more inhabitants are considered urban and those below the limit are considered rural. However, differences between a city of 5,000 inhabitants and another of 500,000 are very likely larger than those between the city of 5,000 and a rural village of 1,500. Vapñarsky and Gorojosky (1991) proposed a different approach, creating a category from rural to up to 50,000 inhabitants and including in the same stratum the countryside and the small cities that provide services for the rural population. Because of this, the selected department is considered as rural-not metro although it includes a small city of 10,000 inhabitants.

The department of Jáchal underwent a major shock in 1931. That year was passed the law that forbidden livestock trade to Chile, except by the mountain pass of Las Cuevas, far south of the department. Following this, there as a change in the productive pattern, reflected in the decadence of extensive crops like alfalfa and wheat, and the increasing acreage of horticulture, especially onions. Two questions arise: a) how did the community adapt to or cope with these changes?, b) Regarding social sustainability, did living conditions and livelihoods remain, improve or worsen?

Environment: structure and performance

The two key characteristics in terms of the environment structure and performance are aridity and variability. Overall, aridity represents at the same time the main characteristic, the main environmental constraint and the main hazard of the department of Jáchal. Aridity means that water shortages in general as well as seasonal and inter-annual variations in water availability are the norm. The department of Jáchal is included among the most arid regions of Argentina. Climatic events as droughts, floods and hailstorms add to the hazard pose by the characteristics of the arid climate. The water deficit is constant and this fact makes agriculture in the department impossible without irrigation, but the small amount of local precipitation is important for the dynamics of the native vegetation, which is a basic resource for small goat farms for example.

Aridity imposes constrains on the drainage system, composed by multitude of occasional and temporary courses and just two permanent rivers, the Jáchá and the

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7The available records show an average total annual precipitation between 100 and 200 mm for the 1941-1990 series, while evapotranspiration averaged more than 1000 mm for the same period. Precipitation is not uniformly distributed along the year but concentrated during the summer months, and it may vary from year to year. There are also spatial variations in the amount of precipitation: the east of the department presents higher averages that the central section. Hot summers, temperate winters and wide daily amplitudes also characterize the climate of Jáchal. As with precipitation, there is a small ascending gradient of temperatures from west to east following the variations in elevation (Cornejo 1997).
Huaco, which have structured population settlement\(^8\). Water availability in the department is tied to these surface watercourses since the use of underground water is minimal and the amount of precipitation is small. A particular problem related to the Jáchal River is the high content of salts (borates and chlorines) in its waters (Allub and Guzmán 2000). This natural salinity became one of the main ecological constraints for agriculture and particularly for crop diversification. Following climate patterns, rivers show quite strong seasonal and inter-annual variations in discharge.

Soil quality is not optimal. A substantial amount of the department area is categorized as rock and is consequently not suitable for agriculture purposes. In the rest of the department, the soils are incomplete, with scarce organic material in its composition and absence of distinct pedogenic horizons or soil strata. They are the result of the physical characteristics of the environment, mainly its topography and particular erosion processes, the aridity of its climate, and the scarce organic matter available. The different types of soils in Jáchal exhibit variations in their capacity to sustain agricultural activities, but performance is generally low. The main constraints are low and moderate-high salinity levels, and moderate slope erosion caused by streams and the run-off from rains (INTA/Aeroterra 1995).

The natural vegetation cover of the department corresponds to the Monte, which included originally three strata of vegetation --grass, shrub and trees- in a combination of sparse open woods and shrub steppes identified respectively by two species, algarrobo (Prospòsî) and jarilla (Larrea). The species of the Monte are xerophytes very well adapted to aridity and to live in particular niches within the general arid environment: rocks, sand, clay, salt and marshes (Morello 1958; Cabrera 1958). Natural vegetation cover is open with wide patches of bare soil, and presents an irregular spatial pattern that follows micro-level changes in ecological conditions. This original vegetation cover has been extensively modified by human activities in and around the settlement areas. It has been used for grazing and firewood and replaced by crops and other foreign species like poplars and eucalyptus following the irrigation ditches.

As time in nature has a different scale than in human history, most of these characteristics of the physical environment where there a century ago. For the 19\(^{th}\) century, Igarzábal (1875) depicted the scarcity of precipitations, their violence, and their seasonal and inter-annual variations. He also described the seasonal characteristics of the drainage system and its importance for irrigation, particularly the Jáchal River. The exploitation of the natural vegetation, especially for domestic firewood but also as forage, has been in place for as long the population has settled in the department.

However, aridity is not alone, and its effects are complicated by natural resources management issues as well as by other social problems related to agriculture and

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\(^8\) The largest of these permanent courses is the Jáchal. The mean monthly discharge (8 cubic meters per second or cms) is quite low considering this is the most reliable water source of the department. The summer months are the peak discharge season while the winter months represent the low discharge period. This pattern derives from the source of the river, the snowmelt in the Arid Andes. The Jáchal also presents strong inter-annual variations in discharge, with series of humid and dry years. Other two watercourses used for irrigation are the Huaco and the Agua Negra, both with small discharges that do not exceed 1 cms (Adamo 1991). Their characteristics in terms of seasonal and inter-annual variations are similar to those of the Jáchal River.
settlement in arid lands. In Jáchal, the main natural resources are water, land and to less extent the natural vegetation cover, and irrigated farming and ranching have profoundly modified the natural landscape. Management issues are mostly related to irrigation, whose institutional derivations will be addressed in the section about the culture/community attribute.

In Jáchal there are areas affected for aeolian and hydrological erosion. Erosion in the piedmonts was classified as severe-grave, while in the rest of the areas it was classified as moderate-grave. Except for the Bermejo Valley (on the east of the department), where exploitation was considered to be minimal, degradation had negative economic effects for the department (PROSA 1988:147).

The major and probably older modification of the natural environment in Jáchal is the implementation of irrigated farming. The forms of management in Jáchal has led to a number of environmental problems, among them salinization, waterlogging, deforestation and soil infestation, but the seriousness of these problems cannot be wholly addressed, and in addition the incidence of the problems present marked spatial variations. However, the management of water for irrigation with traditional methods resulted in low efficiency and high water waste is high (Allub and Guzmán 2000). In fact, the recuperation of soils affected by salinization, waterlogging and depletion has been mentioned as a concern of the local authorities (Davire and Malberti 1999).

**Economic activity: structure and performance**

Díaz and Luna (1991:121) divided the development of economic activities in Jáchal in before and after 1947, using as criterion changes in land use from the dominance of extensive crops to intensive crops. Jáchal’s economic activity before 1947, particularly during the 19th century, was composed by two separate but interconnected sectors: international trade and local subsistence. Both of them were based in irrigated farming, particularly alfalfa, which was an important element in the livestock-agriculture-irrigation pattern that characterized the west Argentina economy in the last half of the 19th century. Key factor for the emergency of this pattern was the increasing labor force population of the north of Chile (Tarapacá and Antofagasta) due to the mining activity (nitrates). This population formed a regional market for cheap food, and part of the demand was covered with livestock imported from Mendoza and San Juan in Argentina, which in turn got the livestock form the valleys in the Sierras Pampeanas.

Within this regional model, since around the 1820s Jáchal’s began to specialize in livestock feedlots and livestock commerce with the north of Chile, and the main consequence in terms of land use was the large expansion of the alfalfa fields (Davire and Malberti 1999). Around the same period, an incipient flour industry and commerce also appeared, with the expansion of wheat fields and the installation of mills. In addition to this, since 1860 there had been a gradual process of pacification in the Argentina’s interior with the end of the civil wars. This peace process allowed the secure transportation of livestock from the Sierras Pampeanas to the grazing fields in the Andes, and from there,

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9 Díaz and Luna (1991) indicate 1947 as the year of extinction of the old economy. However, 1931 may be a relevant date also. That year, an Argentine law mandated that all livestock crossing to Chile should go through the Las Cuevas Pass, in Mendoza. This law effectively eliminated the relevance and advantages of Jáchal’ natural resources and location.
to the North of Chile (Denis 1987). With the increase in the livestock trade, alfalfa began to replace cereals and wheat as main crop.

Jáchal had a privileged situation in the region (Pannocchia 1979). It was located in the road from the Llanos (La Rioja) to the Chilean ports over the Pacific (Coquimbo and Huasco) (Moussy 1864). The department had good irrigated pastures, which were more reliable than natural pastures, and the Villa de San José de Jáchal had urban services like post office, banks and other government offices. There was also financial capital, derived from commercial exchange with Bolivia and Chile, which was used for livestock and rent of fields.

By mid 19th century, Jáchal’s economic activity was based in irrigated agriculture, and the most important crops were cereals (mainly wheat) and alfalfa. The total crop acreage in 1850 was 9807.5 hectares (24,234.8 acres). There is not information in the 1850 census about crop pattern, although the number of mills may be an indication of the importance of cereals, particularly wheat. The flour was traded in the provinces of San Luis, La Pampa, Catamarca, Tucumán and La Rioja (CFI/San Juan 1978), and Jachal’s mills represented 29% of all the mills in the province. Of course, the profitability of wheat operation and the formation of a regional wheat market were only possible due to the area’s geographic isolation from Buenos Aires.

In 1895, the census of agriculture counted 1217 farmers in Jáchal, with a proportion of owners of 84%. Cereals, mainly wheat and corn, occupied 4824 hectares, while alfalfa expanded over 11,973 hectares. Ranching was also an important activity: cattle, horses, sheep, and goats. Cattle were the most important assets because of the commerce with the north of Chile. Sheep and goats were also important, but mainly for local economy, as wheat and corn in agriculture.

<table>
<thead>
<tr>
<th>Census Year</th>
<th>Number of farms</th>
<th>Acreage (hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>N/a</td>
<td>9,807.5</td>
</tr>
<tr>
<td>1895</td>
<td>1217</td>
<td>21,264.0</td>
</tr>
<tr>
<td>1937</td>
<td>724</td>
<td>10,029.0</td>
</tr>
<tr>
<td>1969</td>
<td>1059</td>
<td>5,839.2</td>
</tr>
<tr>
<td>1988</td>
<td>1174</td>
<td>4,883.5</td>
</tr>
</tbody>
</table>

Source: Censuses of Agriculture

This economic activity shaped a particularly dynamic society of ranchers, farmers, ranch and farm foremen and laborers, officers, dealers and retailers, where the agricultural sector was an important source of permanent and temporal jobs. People in farm and ranch related occupations represented 14% (2075) of the total population in 1909 (although 50% of them were temporary workers). From them, 40% were farmers.

However, since 1880 things had already began to change, although the main characteristics maintained to some extent until the 1930s, when the alfalfa/ livestock/ wheat period ended (Davire and Malberti 1999). The decadence was triggered by the closing of the Chilean saltpeter mines closed after WWI, and by the 1931 law. After that, Jáchal was effectively marginalized from the main commercial routes, and economic stagnation set in the department.
Since then, the department of Jáchal underwent a period of deep change. From an economy based in wheat, irrigated pastures, livestock feedlots and exportation to Chile, the department shifted to an economy heavily dependent on horticulture, notably onion, tomato and garlic, marked with serious commercialization problems and competition with other productive regions. Around the 1940s, the shift to intensive crops was evident. In the 1937 census of agriculture, alfalfa acreage amounted to 3727 hectares, 69% less than in 1895, while the number of farms diminished to 724. Acreage decline responded to the lost of dynamism in agriculture, the new advance of ranching and the transition from extensive to intensive crops, and to less extend to the increase in soil deterioration due to salinization. The problems related to commercialization of onion were evident even back then (Allub and Guzmán 2000). Instead, wheat acreage in 1937 showed a slight decrease with respect to the one in 1895 (4090 hectares).

During the 1950s and 1960s, alfalfa continued to decline in acreage, while horticulture increased. In 1979, Pannocchia characterized Jáchal as an onion area. Out of 23700 hectares with irrigation rights, there were only 6100 actually under cultivation. Products included vegetables, forages, cereals, alfalfa, onions, tomato, olive, quince, and wheat and corn in the subsistence part (chacra). There was even a cooperative, Cooperative Clan-Cay, today closed, for tomato processing. The proportion of small and very small farms with low profitability was high, although it was a market oriented agriculture. However, subsistence agriculture persisted to complemented households livelihoods. Natural hazard made agriculture highly risky: from 8000 hectares in 1965-1966, the department fell to 3000 in 1967-1971, due to drought.

Regardless the decadence of the sector and the increasing monoculture problem, agriculture was still significant in terms of employment, if not in terms of profit, although it declined over time. Around 20% (3675 people) of the 1970 total population worked in a farm. One third of them were farmers and another third were unpaid family workers. In 1988, when the last agricultural census was fielded, only 12% (2465) of the total population worked in a farm or ranch: 43% of them were farmers, and another 45% were family workers, similar to 1909.

Today, Jáchal is characterized as an area economically depressed. The primary sector is dominant, basically irrigated agriculture and mining, under a structural crisis of onion monoculture. Crop costs are very high, which limit profitability since price formation is not local. Credit is absent, closely related to the problems with farm ownership. Commercialization assumes the subordination of small farmers to larger farmers and to other commercialization agents. A new issue is the competence with other production areas, like Buenos Aires and Santiago del Estero (Allub and Guzmán 2000; Casas 2001).

Regarding the economically active population, for July 2000 the overall unemployment rate for the department was 24% -- 18% in urban areas and 24% in rural areas-- while underemployment reached 39%. People expressed concern about unemployment (35% of the responses) (Casas 2001). Dependency is higher in rural areas, where not economically active population is 38% against 30% in urban settings. In addition to agriculture, other employment sectors were government (at the municipal, provincial and national levels), and commerce, particularly retail. There was a heavy reliance in public employment.
Overall, structural poverty, as measured by NBI, in the department for 1991 reached 20% of the population. The groups at risk in Jáchal include household with female heads, the elderly, the unemployed youth, large households with male heads with low educational level. In terms of human capital, 26% of HH heads had no education or incomplete primary school at the time. About 53% of the population lived in inadequate dwellings, and 43% does not have toilet inside the house (latrines). These indicators were higher for rural areas.

In sum, poverty and unemployment are chronic problems in the department, and they are acute in rural areas, characterized by indigence conditions, while urban areas were still qualified as poor. Rural poverty is less visible. However, livelihood strategies in rural areas were found to be more diversified, including subsistence crops, temporary jobs, bartering (trueque), craftsmanship (artesanías), retirement, and remittances from migrant household members. But the lack of drinking water and access to other services is common (Casas 2001).

**Population: Structure and Performance**

According to the evolution of economic activity just depicted, Jáchal seems to have undergone an acute decadence process. This may be further evaluated looking at the evolution of the population (Pannocchia 1979).

The sex and age structure of Jáchal’s population have changed in the last century, as can be seen in the table below. The proportion of children under age 10 has decreased strikingly, from 34% in 1895 to 23% in 1991, while the proportion of people age 60 and older has increased without reached the levels of aging yet. The sex gap in age groups 10-19 and 20-39, probably associated to male out-migration, very clear in 1895, closed noticeably, and it is almost inexistent in 1991. Changes seem to have been quicker in the last 30 years.

**Table 2: Sex and age structure of the department of Jáchal: 1895, 1970 and 1991**

<table>
<thead>
<tr>
<th>Census Year</th>
<th>&lt;10</th>
<th>10-19</th>
<th>20-39</th>
<th>40-59</th>
<th>&gt;60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>1895</td>
<td>17.19</td>
<td>16.56</td>
<td>10.41</td>
<td>12.45</td>
<td>12.03</td>
</tr>
<tr>
<td>1970</td>
<td>14.15</td>
<td>14.02</td>
<td>12.05</td>
<td>11.53</td>
<td>13.11</td>
</tr>
</tbody>
</table>


Population distribution also changes, displaying a trend toward urbanization, although half of the population is still rural. In 1895, proportion of population considered urban was 8%, while in 1970 it was 37%, and by 2001 this proportion reached 52%. For the first time, the department may be barely considered urban, taking in account that the proportion of urban population for Argentina was 10% in 2001. This urban population lives in the only “real” city (urban center) of the department, San José de Jáchal. The rest of the population is distributed in villages and towns in the irrigated area, near or on the rivers courses, and a very small proportion of the population lives disperse in the countryside (in the “puestos” up in the mountains) (map). Since the Spanish Conquest, the pattern of distribution has privileged the occupation of irrigated valleys following the
drainage system, showing the capital importance of water availability (Allub and Guzmán 2000; Casas 2001).

A first look at performance may be found in the evolution of population growth rates in the department displayed in table below, jointly with the rates for the province and the country for comparison purposes. As can be seen, population growth rates have been consistently lower than in San Juan and in the country since the 1895 census. Other two features are the general depopulation of the 1960s, as well as the rural depopulation and the urban growth of the 1970s.


<table>
<thead>
<tr>
<th>Census Year</th>
<th>Total</th>
<th>Urban</th>
<th>Rural</th>
<th>Inter Census Annual Growth Rate (%/0)</th>
<th>Jáchal</th>
<th>San Juan</th>
<th>Argentina</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Urban</td>
<td>Rural</td>
<td>T</td>
<td>U</td>
<td>R</td>
<td>T</td>
</tr>
<tr>
<td>1895</td>
<td>12591</td>
<td>960</td>
<td>11631</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1914</td>
<td>13097</td>
<td>1122</td>
<td>11975</td>
<td>2.1</td>
<td>8.2</td>
<td>1.5</td>
<td>18.5</td>
</tr>
<tr>
<td>1947</td>
<td>17129</td>
<td>N/a</td>
<td>N/a</td>
<td>8.2</td>
<td></td>
<td></td>
<td>24.0</td>
</tr>
<tr>
<td>1960</td>
<td>19254</td>
<td>6886</td>
<td>12368</td>
<td>9.0</td>
<td></td>
<td></td>
<td>23.3</td>
</tr>
<tr>
<td>1970</td>
<td>18500</td>
<td>6815</td>
<td>11685</td>
<td>-4.0</td>
<td>-1.0</td>
<td>-5.7</td>
<td>8.7</td>
</tr>
<tr>
<td>1980</td>
<td>18863</td>
<td>8873</td>
<td>9990</td>
<td>1.9</td>
<td>26.4</td>
<td>-15.7</td>
<td>19.3</td>
</tr>
<tr>
<td>1991</td>
<td>19955</td>
<td>9726</td>
<td>10229</td>
<td>5.3</td>
<td>8.3</td>
<td>2.1</td>
<td>12.0</td>
</tr>
<tr>
<td>2001</td>
<td>20898</td>
<td>10901</td>
<td>9997</td>
<td>4.6</td>
<td>11.4</td>
<td>-2.3</td>
<td>16.3</td>
</tr>
</tbody>
</table>


Population growth in Jáchal has not been homogenous. When urban and rural populations are considered separately they show different developments. The urban population, concentrated in the small city of San José de Jáchal, has been growing almost continuously, although rates have varied over time since 1895. Instead, the rural population displays a declining although discontinuous trend, with small increases at the beginning of the 20th century and during the 1980s. Both the highest increase in urban population and deepest decline in rural population correspond to the 1970s. This pattern agrees with the general trend toward urbanization, population concentration and rural depopulation of the rest of the country.

The small population growth may be explained for a constant out-migration flow. For example, the annual growth rate for the 1960s was negative in Jáchal, and this decade also shows the lowest population growth rate for the province of San Juan. The out-migration flow was particularly strong during this decade, when rural-urban and inter-province migration flows were highest in Argentina (Vitoria de Holubica 1988; Lattes 1981; Mazzeo 1996; INDEC/IEE 1998). After this turning point, rates were positive again, but without reaching the already meager levels of previous decades.

Characterized as an area of expulsion since the beginning of the 20th century, out-migration and other forms of spatial mobility have been regarded as key demographic processes to understand Jáchal’s population structure and dynamics (Retamar 2001; Davire and Malberti 1999; Casas and Tejada 2001). The evolution of the net migration

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10 The annual growth rate was calculated as exponential growth (Hinde 1998:154-56).
rates in Jáchal, displayed in table 6.2 below, may be matched to the population growth rates shown in table 6.1. As could be expected from a traditional sending area, net migration rates have been consistently negatives at least from the beginning of the 20th century, but not to the extreme of causing depopulation at the department level, since the population growth rate was negative only in the 1960s. Net migration rates in the department continued to be negative during the 1970s and 1980s. Taking into account net migration rates at the department level in the rest of the country, Jáchal rates in these two decades were quite high, particularly during the 1970s.

Table 4: Net migration rates, Jáchal

<table>
<thead>
<tr>
<th>Inter-census Period</th>
<th>Net Migration Rate (per thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1895-1914 (1)</td>
<td>[-28; -8]</td>
</tr>
<tr>
<td>1914-1947 (1)</td>
<td>[-20; -9]</td>
</tr>
<tr>
<td>1947-1960 (1)</td>
<td>[-23; -12]</td>
</tr>
<tr>
<td>1960-1970</td>
<td>No data</td>
</tr>
<tr>
<td>1970-1980 (2)</td>
<td>-19.65</td>
</tr>
<tr>
<td>1980-1991 (2)</td>
<td>-10.79</td>
</tr>
</tbody>
</table>

Sources: (1) Rechini de Lattes and Lattes (1969); (2) Caminos (1991).

Casas (2000) recognizes three patterns of population mobility in the department, which he organizes in a stage-migration fashion. The first of these patterns includes the movements from isolates zones, like puestos and very small villas to larger rural villages. The second pattern consists of the movements from these villages to the city of San José de Jáchal or other destinations in the province of San Juan. Finally, the third pattern contains movements from San José de Jáchal to San Juan or other provinces like Buenos Aires. In addition to these movements within the department and toward permanent migration, people in the department have traditionally engaged in temporal migration (seasonal and non-seasonal). Lately, the trends seems to have been rural-urban displacement and less rural-urban out migration (Casas 2001).

Population stagnation has been repeatedly mentioned as characteristic of economically depressed areas like Jáchal (Allub and Guzmán 2000; Casas 2001). However, there have been notable changes in terms of structure and rural-urban distribution.

Community/Culture/Institutions/Services: structure and performance

This attribute is more difficult to address, given the imprecision of the elements involve. I have chosen to include here issues related to social structure and to formal and informal institutions and practices or uses, as well as those related to characteristics of the community in terms of services and infrastructure. Following Adger (2000), agrarian structure is also included among social institution.

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11 The information for the 1991-2001 period is not available yet.
12 Stage migration is characterized by a succession of intermediate movements following the urban hierarchy of a particular country, it means, people move from the farm to the rural village, from there to a small city, and so on, until they reach the great city (Roberts 1995: 107)
During its golden era, Jáchal also enjoyed administrative relevance within the province of San Juan. There were a branch of the Customs Office, and the Villa de San José de Jáchal had urban services like post office, banks and other government offices. The bank managed the financial capital, derived from commercial exchange with Bolivia and Chile, which was used for livestock and rent of fields.

The decisive change from extensive pasture to intensive gardens during the 1940s was contemporary with other series of events in the department of Jáchal, among them the extension of public and social services and infrastructure, which was also reflected in the increase of public employment on provincial and national offices. In 1947 a branch of the Banco de San Juan opened in Jáchal. The expansion of educational and health services during the 1940s and the 1950s included board schools in rural areas for the sparse population and sanitary posts (Davire and Malberti 1999). Currently, education levels are within normal levels and in fact, Jáchal has a good education system and infrastructure. The main problems are high primary school dropout and low secondary school continuation, which act as constraints of the system (Casas 2001).

Regarding the state as a social actor, it is qualified as absent, and a number of people express a feeling of abandonment and unequal treatment. An example could be the distribution of temporary jobs in the public sector (pasantías). This could be related to the increasing importance of public employment as employment source (Allub and Guzmán 2000).

The social structure is and has been linked to the agrarian structure. A substantial proportion of small household farms, which main resource is their own labor force and which technological level is low, characterizes the agrarian structure (Allub and Guzmán 2000). Land subdivision is higher in the irrigated areas (Pannocchia 1979). Ownership is complicated because an important number of farmers do not own the land, legally speaking. Rent and sharecropping are common.

Regarding this, small onion farmers in rural settings have been highly vulnerable due to their place in the onion productive process, particularly but not only in the commercialization. This created a clear division with larger farmers and ranchers, who are often also dealers and retailers in the local commerce scene. As small farmers use to work in the larger farms, there is the perception of social distance between small farmers and large farmers who are the employers (patrones) (Allub and Guzmán 2000). Small farmers are similar to farm laborers in terms of poverty (sometimes they have the two roles) (Casas 2001).

Tradition and local culture are important in Jáchal (Davire and Malberti 1999). Among these traditions may be mentioned labor interchange or “vuelta de mano”, which is work reciprocity among households, although other products or goods could be traded instead of work. Sometimes this old tradition is only practiced among relatives, other times among neighbors, but in any cases physical distance is important. This used to be one of the most important social strategies.

Wheat and “vuelta de mano” are closely related though the traditional collective tasks associated with the crop, like la “trilla” y el “venteo”. In fact, the wheat has remained as a symbol of the “good old times” in Jáchal. In this sense, onion and wheat represent two different periods and sectors of Jáchal’s economic activity, but also of the social relationships within the community.
Furthermore, Díaz and Luna (1991:166) suggest “…1947 marca la fecha de rompimiento de la estructura social de tipo pastoril […] El paso de una sociedad pastoral a una sociedad cuyas economía se basa en la actividad agrícola comercial impactó en los valores sociales predominantes, así, de valores solidarios pasamos al predominio del individualismo, la desconfianza y la especulación…”

Finally, a note about irrigation institutions. Since 1858, when the first Irrigation Law was passed in San Juan, irrigation institutions have been key influences in Jáchal. These institutions are the Juntas de Irrigation (local) and the powerful Dirección Nacional de Hidráulica (provincial). This last not only controlled water capture, transportation and distribution, but also provides an important number of jobs related with the management of water (tomeros, llaveros, etc.). Irrigation institutions have been at odds with the municipal government and other governmental offices since their foundation (Davire and Malberti 1999).

The dependence dimension across the four attributes

How to evaluate this dimension across the attributes for these two periods?
Overall, the diagnosis may be that to some extent, Jáchal has lost the relative independence the department it enjoyed, product of its particular geographical position and history.

Jáchal showed an early integration to the world economy. This integration was beneficial and positive before the 1940s since the department had a liaison position. However, after the 1940s it turned to have a terminal and very weak position. It is possible to talk of different types of commercial dependence. During the 19th century, it was dependent upon the regional, national and international commercial circuits and trends, from a position of relative strengths based in the advantages of its location within the prevalent commercial circuits. In the second, the advantages of the position were gone, and Jáchal was now embedded in a different commercial circuit where it occupied a marginal position.

A different type of dependence has probably increased in the last period, as education, health and other services expanded. Schools, hospitals and other infrastructure services as the Dirección de Hidráulica depend on the national and provincial government, they are not local in terms of political or administrative decisions. Also, social programs for small farmers and other relief programs are organized by the national government. On the other hand, local organizations seem to weaken over time (André 1999).

As a correlate, the expansion of services and infrastructure has also deepened the dependence of the department in terms of finances, since a growing percentage of the labor force works in the public sector. On the positive side, this may also have improved the living standards of the population, at least of those living in or near the urban centers and the villages dispensing services.

Final remarks: some very preliminary conclusions

The department of Jáchal underwent profound transformations since mid 19th century. They appear more dramatically in the economic activity, but they are also evident in the rest of the attributes.
In terms of social sustainability, as it was defined at the beginning of the paper, the department has shown the capacity of maintain its population almost stable in numerical terms, thanks to a persistent out-migration process. In this sense, population mobility makes part of such ability in its characters of one of several possible and not mutually exclusive responses to stress.

However, the maintenance of the standards of living for a long period of time appears more problematic to evaluate due to the lack of specific information, as well as contradictory development in the different attributes. Environmental deterioration is probably higher today that it was a century ago, and this could eventually jeopardize agriculture and affect livelihoods and living conditions. Although the current situation in terms of poverty, indigence and unemployment is worrying, it was probably similar before the 1940s, including inequalities. However, social services did improve during the last decades.

In terms of social resilience, Jáchal has endured a number of changes along its history. Regarding institutions, broadly defined, changes in the formal institutions were not as marked as changes social relations, and in any case these changes did not altered management of resources. As its economy became more diversifed, with a twist toward services, commerce and public employment, Jáchal as a whole appears to be less dependent of natural resources, consequent less vulnerable to their inherent variability and more resilient, but this may be not the case of specific groups within the community, for example small farmers.
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