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RAINER WEHRHAHN**

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Agriculture and Cattle Frontier Advance and Variation of Poverty in the North of the “Gran Chaco Argentino” during the 1990s

Pablo Paolasso, Julieta Krapovickas and Fernando Longhi
(San Miguel de Tucumán)

It is forgotten that cities have not radiated their progress towards the countryside, and that somewhat it has rather been the countryside which has entered them. It has entered with the people who dis-integrate from their economic and social constellation without integrating properly in the constellation of the cities. Rather, the precarious existence of the countryside is carried to the cities in the huge “tugurios”
of the marginal populations.

Raúl Prebisch (1970, 9.3, author’s translation)

Abstract

The “Gran Chaco Argentino” (GCA) is the major extension of forest and the major biomass reserve of the country and the extra tropical south hemisphere. During the 1990s this region underwent an intense process of change of land use. In parallel, a fast growth in deforestation rate was produced, an unprecedented advance of the agriculture and cattle frontier and a substitution of traditional crops (cotton, sugar cane, beans) by oleaginous (mainly soy beans) and forage crops. The increase of the soy bean and wheat crops and the intensive cattle raising in the GCA changed the physiognomy of the territory to transform it from being a marginal productive area to being an area of increasing importance within the national economy. However, the new economic activities which were introduced into the territory, and which generated great richness and important territorial transformations, do not seem to have led to genuine regional growth. Despite the important economic dynamism that the agricultural activity produced, and produces at the present time, the regional poverty rates cannot be changed. Instead, highly-profitable economic activities began to exist in the same territory as situations of extreme poverty. In this paper we therefore ask if relations between the agriculture and cattle frontier advance and the poverty conditions of the population exist. That is to say, we wonder in which way the increase of the soy bean-sown area and the increase of cattle in El Chaco are related with the advance, stagnation or decline of the poverty level. Our starting hypothesis is that the dynamism of the agriculture and cattle sector largely characteristic of El Chaco during the 1990s did not mean an improvement in the living conditions and

that, parallel to the increase of profitable activities, poverty level increases were also observed. For the analysis of the agriculture and cattle frontier advance, data from the National Agriculture and Cattle Surveys of 1988 and 2002 were used; these refer to sown surface area by crop and cattle, and distinguish between departments. The sown surface was grouped according to large extensions of crops, distinguishing the soy bean-sown surface area individually. To evaluate the poverty evolution the Index of Life Resources Privation (IPMV) drawing on data from the National Population, Families and Houses Surveys of 1991 and 2001 was used. The results show that together with a growth in the sown area (mainly with soy beans) and cattle, there was a generalized increase in poverty conditions among the GCA population. Precisely those departments that most increased their poverty in the 1990s were the ones that showed most changes in relation to the expansion of the sown area, increase in number and average size of agriculture and cattle enterprises (EAPs), and increase in oleaginous crops and cattle. These results permit us to affirm that the economic activities which developed in these departments were not effective enough to reduce poverty. On the contrary, apparently, the scanty redistribution of the profits obtained by means of these new economic activities, led to an increase in poverty level. The reasons for this non-redistributive behavior would have to be related to the presence of foreign businessmen and the weak reinvestment of the profits in the region.

1 Introduction

In the last forty years an extraordinary increase in soy bean production (a six-fold increase) and global commerce (a five-fold increase) has occurred worldwide. This is explained mainly by the continuous increase of consumption in Middle and Far East countries like Iran, China, India, Pakistan and Bangladesh, which in terms of consumption overtook European countries and Japan, nations which up to the 1970s were the main consumers and supplied by the United States (PIERRI 2006, p. 54). Since the mid-1990s Argentina has become one of the main producers and exporters of soy beans. In 2001 Argentina was the third largest soy bean exporter (12.9% of the global market), the largest soy bean oil exporter (39.8%) and the largest soy bean pellets exporter (34.0%). In 2003 29% of Argentinean exports was related to soy beans and derivatives (MARTÍNEZ MAINO 2003).

The soy bean crops were developed especially in three areas: (1) the region of La Pampa; (2) the centre of “El Chaco Oriental” (Northern Santa Fe; Southwestern El Chaco and Eastern Santiago del Estero) and (3) the threshold to El Chaco (Eastern Tucumán, Eastern Salta and Western Santiago del Estero) (Figure 1). However, while the region of La Pampa showed, at the beginning of the 21st century, the best life quality level of the country, the “Gran Chaco Argentino” (GCA) appeared as the poorest area, a situation which is historical (VELÁZQUEZ 2008; BOLSI and PAOLASSO 2009a; Figure 2).

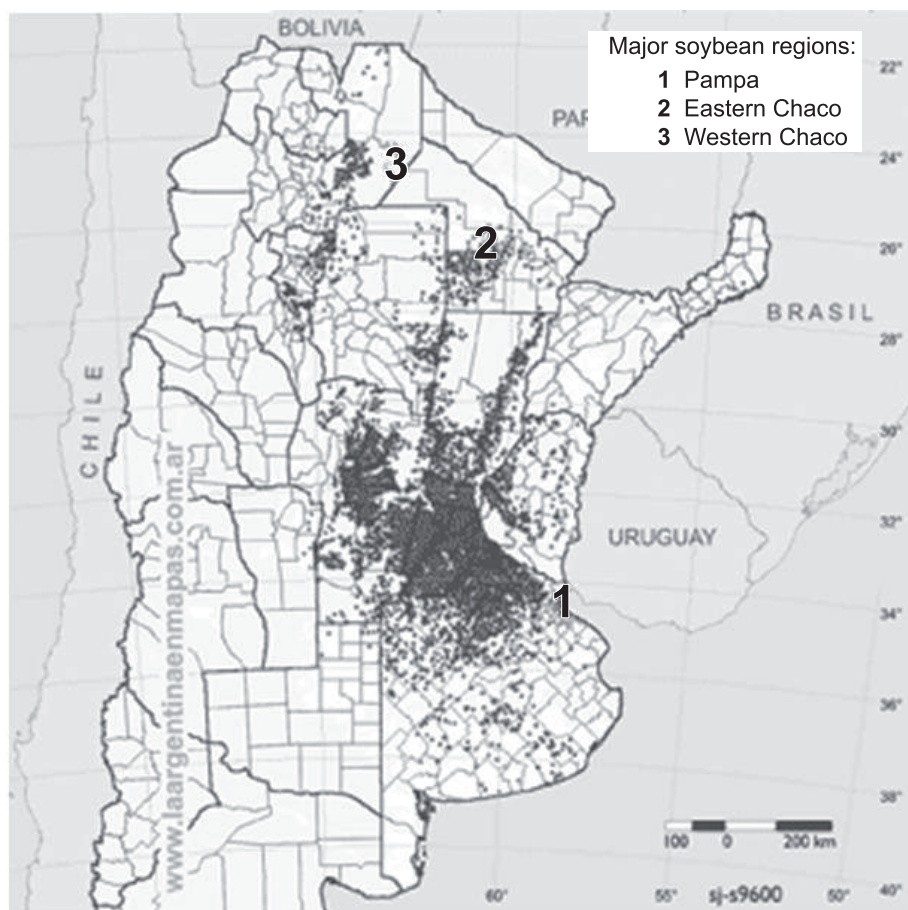


Figure 1: Spatial distribution of soy bean in Argentina (2001)

Source: *La Argentina en mapas*. CONICET. Buenos Aires, 2011. URL: <http://www.laargentinaenmapas.com.ar>. Accessed: 7 Apr 2011

In addition to arguments concerning the growth of soy beans in relation to environmental consequences, or the positive effects that such growth had for the Argentinean macro economy, some authors say that this transformation in the agriculture and cattle sector and economy, far from improving the situation for the population, coincided with an increase of hunger and poverty in the country (TEUBAL 2003; PENGUE 2000; LATTUADA and NEIMAN 2005; GRAS and HERNÁNDEZ 2008). In the case of the GCA, the soy bean expanded in the areas with the worst poverty, indigence, malnutrition and child death rate levels of the country (ADÁMOLI et al. 2008, p. 18).

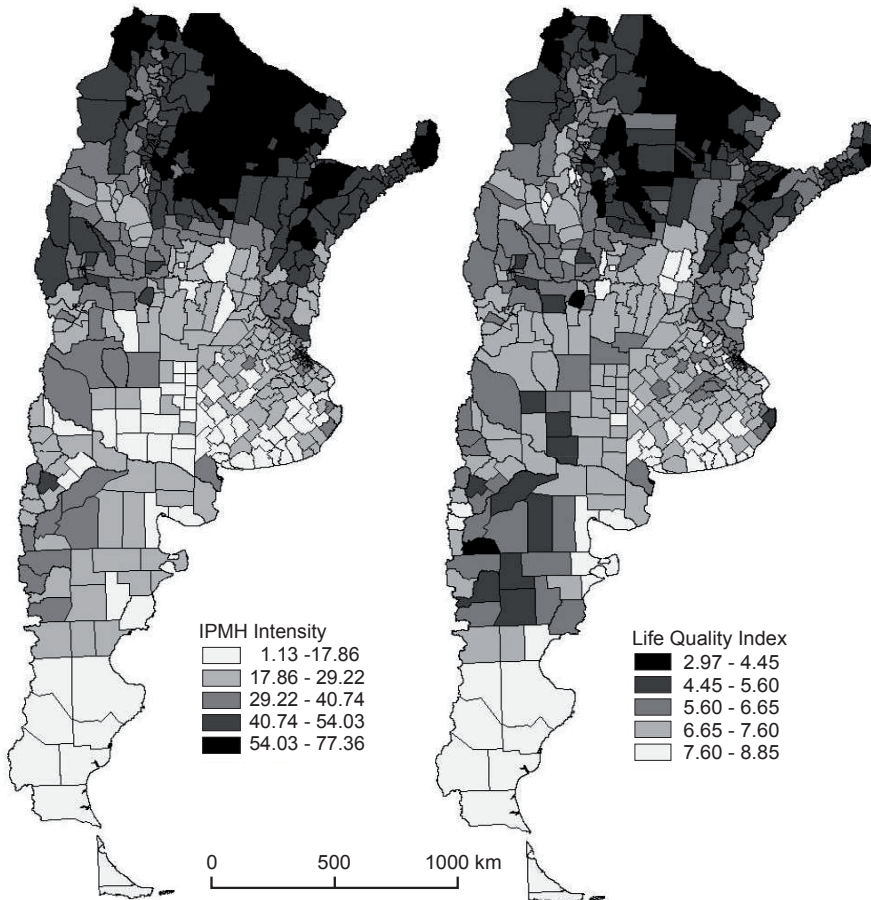


Figure 2: Poverty and quality of life in Argentina, by departments (2001)

Source: Laboratory of Digital Cartography, ISES, CONICET - UNT based on data of Censo Nacional de Población, Hogares y Viviendas 2001

Such aspects showed by the literature review and initial observations mentioned in this paper lead us to wonder about the relation between the agriculture and cattle frontier advance and poverty in the north of the GCA. Particularly, we are interested in analyzing whether the soy bean growth expansion permitted the improvement of the historical conditions of poverty of the population in the north of the GCA during the 1990s. To answer this question, firstly, the concept of poverty and its measurement were considered; then the context of productive change in Argentina and in El Chaco was observed; and, finally, the relationship between poverty variations of the population and the main productive transformation in the north of the GCA was analyzed.

2 Poverty and its measurement

To identify and measure poverty, studies habitually focus on the severe privations of properties and services which a variable part of the population suffers owing to their low income (FERULLO 2009). However, SEN states (1997) that to trust exclusively in poverty in terms of income may hide important aspects of privation. SEN focuses on the people potentialities and the conditions which restrain the freedom to have what oneself considers rationally is worth while being and having. So a person's poverty condition is related to some level of privation which impedes him/her in the full development of his/her abilities, and even his/her freedom (FERULLO 2009)¹. SEN's focus on human abilities contributes in a significant way "to understand[ing] better the nature and cause of poverty and privation, transferring the main attention of means (e.g. the rent) to the targets that individuals have and so to the necessary freedom to satisfy these targets" (SEN 2000, p. 117). SEN's contribution has been important to understand poverty as a multidimensional phenomenon in which non-monetary dimensions must necessarily be considered. According to SEN's focus, the means (income or outcome) is not what needs to be taken into account but rather the results in terms of well-being and living conditions (death rate, illiteracy, life hope, and so on) (HERRERA 2002). SEN defines poverty as: the privation of abilities, understood as "abilities" to reach certain living conditions. Because of this, the connection with income insufficiency is only instrumental.

Conceptual frames that explain the poverty problem satisfactorily do not exist (ALTIMIR 1979). The lack of the theoretical precision of the concept of "poverty" impedes consideration of the poor as a strict social group, and the descriptive nature of the concept only permits, essentially, it to be considered as a classifying social category which works as a statistic aggregate (MORENO 1995). However, in our work we consider poverty as a situation in which certain families are. This situation is not the sum of dimensions or partial aspects but the situational and structural context in which such families are, as a result of their particular insertion in the social and productive structure. This last factor is what determines the possibility of not accessing or accessing, in one way or another, determinate properties and services (MORENO 1995). Poverty is showed by means of some general characteristics of the families such as their low educational level, nutritional insufficiency and minor participation in labor activity. The latter aspect is defined at the same time by the exercise of low-production occupations, which produce scanty income and impede satisfying integrally their most essential material and non-material needs.

¹ In the same way, CÓRDOBA ORDÓÑEZ and GARCÍA ALVARADO (1991) state that poverty defines an in-need situation in a vital context of human existence and it would probably be simplistic to reduce this to its economic component, but it is indubitable that in a system like ours, of utilitarian philosophy and consuming practice, each in-need situation in the vital context must be associated with a deficient material availability which must consequently form the basis of any definition of "poverty".

The material aspects of poverty continue to have their protagonists in studies about this topic. However, the non-material aspects of the poverty concept have attracted particular interest in recent years. In this context GONZÁLEZ (1997, p. 285) defines poverty as a multidimensional phenomenon, which refers to the “means of life privation and lineage loss”. However, the sources of information to study the non-material aspects of poverty, such as lineage loss, are scanty and only limited to surveys of relatively small populations. The economic aspect of the measurement of poverty thus continues to govern the focus of studies currently.

A widely-used indicator of poverty and valid in recent years is the “Index of Material Privation of Families” (IPMH), which was elaborated by the INDEC (Instituto Nacional de Estadística y Censos) and in its formulation gathers current and structural importance variables². However, the characteristics of its formulation only permit it to be applied in 2001. This limitation of IPMH when analyzing indicator evolution was the main argument which led us to choose the “Index of Life Resources Privation” (IPMV) to carry out our study in the 1990s. The relation this indicator maintains with the IPMH is high, reaching a coefficient of Pearson correlation equal to 0.94.

The IPMV was elaborated and presented by MEICHTRY and FANTÍN (2004). It integrates two indicators: the Index of Subsistence Ability (ICS) and Lodging Condition (CH). The former tries to approach the current poverty dimension while the latter one examines the structural origin of it. Both indicators use the family as a unit of analysis and the “National Population, Families and Houses Survey” from 1991 and 2001 as a source of information, permitting the analysis of the temporal evolution of poverty. The ICS relates the income providers with the maximum educational level reached; meanwhile the CH expresses the result of the relation between the “type of house” and “stacking” variables. The value of the IPMV oscillates between 0 and 8 points, representing numerous possible situations (which could be considered as a weakness of the indicator in the intensity of the phenomenon measurement) (MEICHTRY and FANTÍN 2004).

2 The IPMH is a variable which identifies families according to their situation with respect to material privation in relation to two dimensions: current and patrimonial resources. The patrimonial dimension is measured through the Lodging Condition indicator, which establishes that families who live in a house with a floor or roof made with insufficient materials or without basin with water drainage, present patrimonial privation. The dimension of current resources is measured through the Economic Capacity indicator which establishes that families with insufficient economic capacity to acquire the basic properties and services for subsistence present current resources privation. The combination of these dimensions defines four groups of families: without any kind of privation, with current resources privation only, with patrimonial privation only and with convergent privation (when both privations are presented simultaneously) (INDEC 2004). The IPMH intensity is derived by dividing the families with convergent privation by the total of families with some kind of privation (Figure 2).

The IPMV formulation is expressed as follows:

$$IPMV = \left(\frac{\sum_{i=1}^n P_i * NE_i}{n} \right) * CH$$

Where the *ICS (Index of Subsistence Ability)* is compounded by:

- n : number of family members.
- P_i : income provider with the following variables: 0: if he/she does not provide income; 1: if the one is a male provider; 0.75: in the case of a female provider; 0.50: for a retired person.
- NE_i : Maximum educational level reached (1: did not attend or complete primary school; 2: completed primary school or EGB (Educación General Básica); 3: completed secondary school or; 4: completed tertiary or university education).

The *CH* indicator (*Condición Habitacional*), has the following values: 2.0 house-apartment type A without stacking; 1.5 house-apartment type A with stacking; 1.0 remaining types without stacking; 0.5 remaining types with stacking. It is considered that the value of *ICS* very well expresses the capacity of a standard family, made up of four members (father, mother and two children), to obtain the necessary resources for ensuring their existence and reproduction, so that this indicator is used to establish the poverty thresholds of the IPMV. The levels refer to the following situations:

- Family with a male provider who has not finished his/her primary education:
 $1 * 1 / 4 = 0.25$
- Family with a male provider with a complete educational primary level or EGB:
 $1 * 2 / 4 = 0.50$
- Family with a male provider with complete primary level or complete EGB and a female provider with incomplete primary education:
 $(1*2) + (0.75*1) / 4 = 0.69$
- Family with a male and a female provider both with complete tertiary or university level education: $(1*4) + (0.75*4) / 4 = 1.75$.

These “thresholds” would indicate for the two first cases a very low and a low capacity to obtain the necessary income for the support of the family. At the other extreme, we consider that the fourth threshold would set the lower limit of the best conditions for the support of the family and reproduction. In this way, five levels in the IPMV formulation

are established, considering a poor family as one with low and very low levels (threshold line in IPMV = 0.49):

- Very High: 1.75 and more
- High: 0.70 to 1.74
- Medium: 0.50 to 0.69
- Low: 0.25 to 0.49
- Very Low: 0.00 to 0.24.

3 Poverty in the north of the “Gran Chaco Argentino”

The population of the northern GCA grew during the 1990s at a higher rate than in the rest of the country. In 2001 the regional population again increased slightly more to three million inhabitants. Although important transformations occurred in the agriculture and cattle sector and in the economy in general, in 2001 the proportion of those in poverty increased by 5.7 percent, affecting more than half the population. Figure 3 shows the spatial distribution of poverty in 1991 and 2001, according to the IPMV. It can be observed that the poorest sectors of the El Chaco are in the north and the southeast extreme. The marked persistence of precarious living conditions in those departments in the 1990s should be noted. It can also be seen that most departments increased their IPMV level; there were very few cases where the index reduced. Comparisons of poverty distribution between the two dates permit us to classify – as the natural fracture of variations – the departments at four levels (Figure 4) (see Annex 1):

- Level 1: departments which decreased their poverty. This includes four jurisdictions, with variations from -3.2 to -0.2.
- Level 2: departments which experienced a minimal increase in impoverishment. This includes 25 jurisdictions, and the values oscillate from 0.3 as a minimum to 4.6 as a maximum.
- Level 3: departments which experienced a medium increase in impoverishment. This involves 30 jurisdictions, with values of variation from 4.9 as a minimum to 8.4 as a maximum.
- Level 4: departments which experienced a substantial increase in impoverishment. This contains 15 jurisdictions, and the variations range from 9.2 to 16.1.

Level 1 includes all those departments in which poverty decreased, while the remaining three, in an increasing order of intensity, include those in which poverty increased. Level 4 thus does not represent the poorest departments, but those that have undergone the greatest impoverishment, independent of the initial level on which they started. In the same way, level 1 does not represent better living conditions, but includes those departments in which, during the 1990s, the percentage of families with IPMV decreased. This classification permits us to analyze the evolution of poverty over the decade, independently of its grade of intensity, and to compare productive changes in the departments to their level of poverty variation.

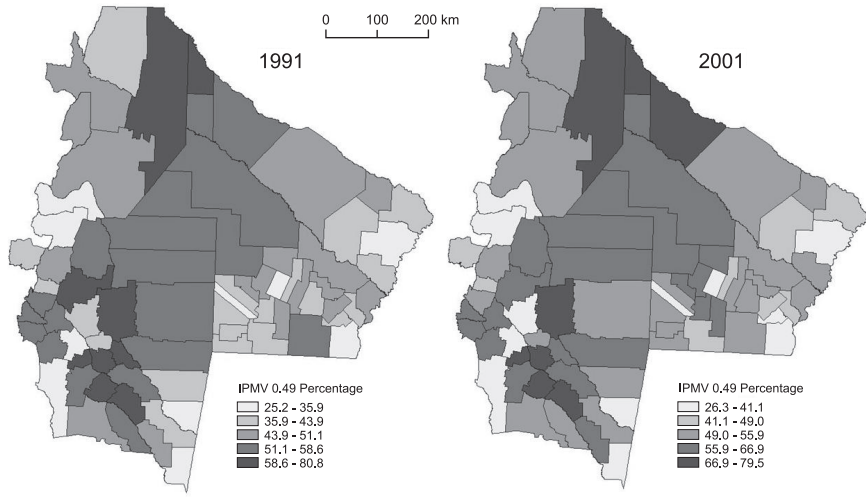


Figure 3: Classification of the Chaco departments, by the percentage of households with less than 0.49 IPMV, for 1991 and 2001

Source: Laboratory of Digital Cartography, ISES, CONICET - UNT based on data of National Population Census 1991 and 2001

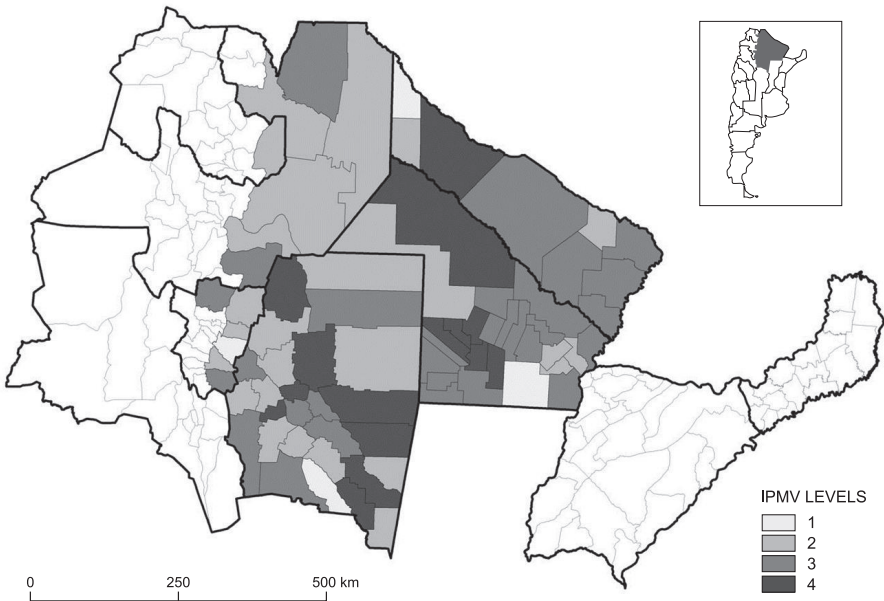


Figure 4: Variation levels of IPMV during the decade of 1990 for the study area

Source: Laboratory of Digital Cartography, ISES, CONICET - UNT based on data of National Population Census 1991 and 2001

Table 1: Total population, population percentage over the GCA total population, and percentage of poor homes, for each level of poverty variation. Values for 1991, 2001, and variation of poverty (according IPMV)

| Levels of poverty variation | 1991 | | | 2001 | | | Variation of IPMV |
|-----------------------------|------------|--------------|--------|------------|--------------|--------|-------------------|
| | Population | % pop. Total | % IPMV | Population | % pop. Total | % IPMV | |
| Level 1 | 67041 | 2,7 | 60.3 | 77537 | 2,6 | 58.4 | -1.9 |
| Level 2 | 886180 | 35,2 | 49.4 | 1073895 | 35,7 | 52.2 | 2.8 |
| Level 3 | 1298656 | 51,6 | 44.6 | 1539732 | 51,2 | 51.1 | 6.5 |
| Level 4 | 264144 | 10,5 | 50.0 | 313610 | 10,4 | 61.1 | 11.1 |
| TOTAL | 2516021 | 100 | 48,3 | 3004774 | 100,0 | 54,0 | 5,7 |

Source: National Population Census 1991 and 2001

The generalized increase of poverty acquires dimensions that are even more significant if the initial values of poverty in 1991 and the population volumes which the phenomenon affects in each of the levels are analyzed, as can be observed in Table 1.

So we observe that level 1 – which would represent the best situation as there poverty decreased through the decade by around 2% – not only contains the lowest proportion of the total regional population, but also started at the highest value of poverty. On the other hand, in 2001 levels 2 and 3 represented jointly 869% of the total population. In level 3, in which poverty increased by 6.5% in the medium term, had in 1991 the lowest average value of poverty. Level 2 only increased by 2.8%, but its initial level of poverty was not so low.

Level 4 includes those departments in which poverty advanced in such a way that in 2001 nearly two-thirds of the 3,130,000 people who lived there were poor. There the IPMV increase was 11.1 % (nearly twice the regional average).

Analysis of the evolution of poverty in El Chaco during the 1990s, then, permits us to affirm that there was a generalized process of impoverishment. The few departments in which we find a decrease in the percentage of poor families are precisely in the most disadvantaged zones and such a decrease places 58.4% of the local population in poverty conditions. Somehow, what is observed in El Chaco is a homogenization in the IPMV values, in which the poorest departments reduce their poverty and the least poor increase it. In this way, even though causal relations cannot be established, we wonder if some bond or parallelism exists between agriculture and cattle transformations and the increase of poverty in the departments of the GCA. We thus now turn to analysis of the change process affecting the Argentinean agrarian structure and how it was carried out in the GCA.

4 Agriculture and cattle production in Argentina and its transformations in the late 20th century

Since the last third of the 20th century, Argentina has been characterized as an agrarian exporter country. Agricultural and cattle production for exportation has been centered in the moderate and plain area of the country: the La Pampa region. At the beginning of the 20th century the sown surface in that region reached its maximum using practically every area of land available and producing principally maize, wheat and sunflowers, plus cattle production (breeding of bovine cattle to obtain meat and milk) (REBORATTI 2010, p. 65). As time progressed, owing to subdivision through split inheritance and the sale of fields, the average size of agricultural and cattle enterprises decreased. Since the 1960s, some of the advances in relation to the “green revolution” began to be applied in Argentina: mechanized sowing and harvesting, crop rotation, electric wire fencing and mills for cattle. However, the use of crop fertilizers and forage supplements for cattle were not generalized at this time, cattle still mostly grazed in natural fields. The delay in introducing these improvements meant that the yields and volumes of production grew slowly and, consequently, markets for primary production were lost (REBORATTI 2010, pp. 64-65).

From the agriculture and cattle nucleus in the La Pampa region diverse centers of agriculture and cattle production were developed through the country, known as “regional economies” and related to agrarian industry: cotton in El Chaco; sugar in Tucumán, Salta and Jujuy; viticulture in Mendoza, yerba mate in Misiones and fruit culture in El Alto Valle del Río Negro. But, while the production in La Pampa was exported, the regional economies supplied the domestic market. This factor would be determining for the territorial development of the different productive areas and its underlying evolution.

Not before the middle of the 1970s, and more particularly in the 1980s, the “green revolution” was finally fully implemented in Argentina. New varieties of cereal were introduced which enabled the adoption of bi-annual harvests. The soy bean, in combination with other crops, started to become one of the dominant species of Argentinean agriculture. The use of Mexican short season wheat, in combination with the use of agrochemicals, facilitated the cultivation of soy beans in the summer and wheat in the winter (REBORATTI 2010, p. 65). The double wheat-soybean crop expanded first in the La Pampa region and rapidly displaced cattle raising (bovine and ovine) and sunflowers³. During the 1990s it expanded to part of the El Chaco region, owing to the increase in land prices and rents in the central region of Argentina. The advance of the soy bean occurred mainly through the deforestation of the “chaqueño” forest where the main activities were extensive cattle raising and the gathering of forest products, although some traditional crops were also cultivated (such as peas in southern Salta or cotton in El Chaco) (TEUBAL 2003, 2009; REBORATTI 2010).

3 Between 1988 and 2002 1.8 million head of bovine cattle and 3.1 million head of ovine cattle were produced in the Buenos Aires and Córdoba provinces, two of the main cattle provinces.

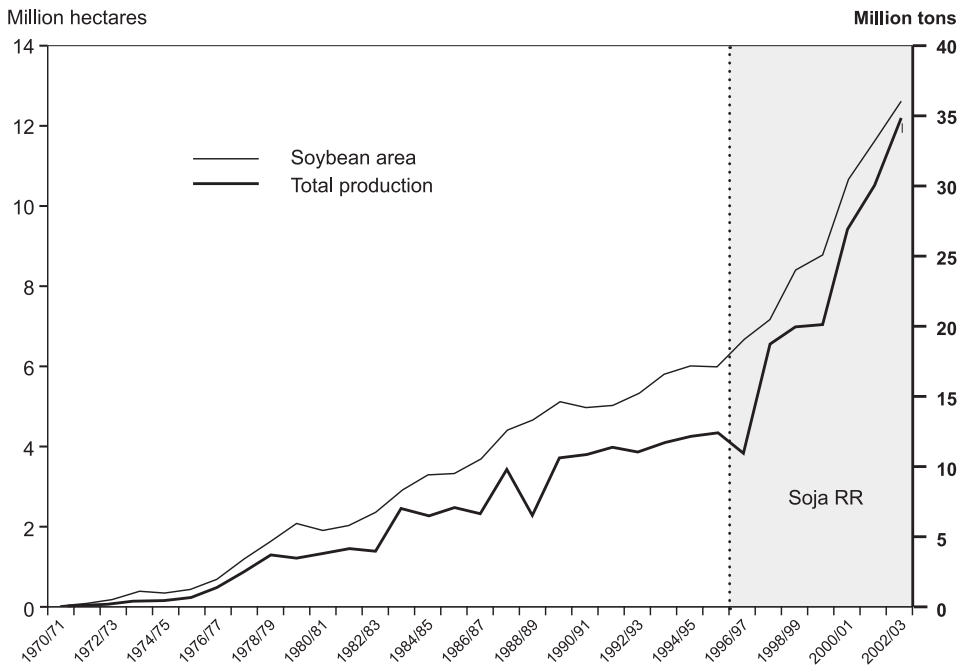


Figure 5: Evolution of the area planted and total production of soybeans in Argentina from 1970 to 2003

Source: Ministerio de Agricultura, ganadería y pesca de la Nación, Sistema integrado de información agropecuaria. URL:<http://www.siiia.gov.ar/>. Accessed: 7 Apr 2011)

During the last decades of the 20th century the production of the soy bean became one of the most dynamic activities of the Argentinean economy, with production aimed mainly at exportation (BISANG and SZTULWARK 2007, pp. 181-182). From 37 thousand sown hectares in the work period 1970/71, the area under soy bean cultivation grew to more than 12.6 million hectares in the work period 2002/03, increasing total production from 59 thousand tons to 34.8 million tons (Figure 5).

The advance of the soy bean was possible due to a series of factors:

- an increase in soy bean demand in the foreign market (especially in China);
- good relative prices for its production;
- the rapid and widespread diffusion of a new agronomic “package” (adoption of the direct crop, use of agrochemicals and, by the middle of the 1990s, the use of transgenic seeds⁴);

⁴ The expansion of the transgenic soy bean occurred at a speed never seen before and permitted a series of competitive advantages to apply, facilitating the pre-eminence of Argentina in the worldwide market. The rapid development of the industrial sector and logistics and transport facilities were also relevant (BISANG and SZTULWARK 2007:182).

- the consolidation of a new organization of production, in which the primary activity, industry and services are closely interrelated;
- an increase in the size of the agricultural and cattle raising enterprises and the generalization of renting as a method of land occupation (REBORATTI 2010, p. 69; BISANG and SZTULWARK 2007, p. 190).

Added to these factors, in the GCA, was the occurrence of a cycle of increased humidity from the 1950s, intensified from the 1970s, which contributed first to the advance of the pea crop and then to that of the soy bean (PAOLASSO et al. 2010).

In the La Pampa region, the soy bean used the pre-existing territorial structure, favoring the growth of small and medium locations which became service-providing centers for soy bean production (REBORATTI 2010, p. 67). Although the agrarian activity that characterizes the “pampeano” territory continues, the changes were significant as the alternating pattern of cultivation/cattle raising that had been characteristic tended to disappear, making way for a landscape where agriculture put its seal throughout the year. Here the soy bean has generated prosperity – in the mid-term – for regional society, together with an undeniable process of capital concentration and the disappearance of small and medium producers. It is enough to compare any social and economic indicator with that of other regions of the country to see that La Pampa is among the most relatively well-off areas in the Argentinean context (VELÁZQUEZ 2008; BOLSI et al. 2009; BOLSI and PAOLASSO 2009a and 2009b). Evidently, this was not due to the adoption of the soy bean model, as the La Pampa region was traditionally the most prosperous region of Argentina, but at least the soy bean permitted that such conditions continued.

5 Agriculture and cattle frontier expansion in the north of the “Gran Chaco Argentino”

The GCA is the major extension of forest and biomass reserve of the country and extra tropical south hemisphere (GASPARRI et al. 2008). Our study covers the northern sector of the GCA, corresponding to 74 departments of six Argentinean provinces: El Chaco, Formosa, Salta, Santiago del Estero, Tucumán and Jujuy (Figure 6).

AS MORELLO and SARAVIA TOLEDO state (1959a and 1959b), the original vegetation of the El Chaco consisted of areas of pirophitic pastures, areas of savannas and dense forests. This original vegetation, however, was altered with the inclusion of cattle which propitiated the transformation into areas of pasture with short forest and bushes. Today the dominating vegetation is forest, but there are also large sectors with bushes, especially in places with salt soils.

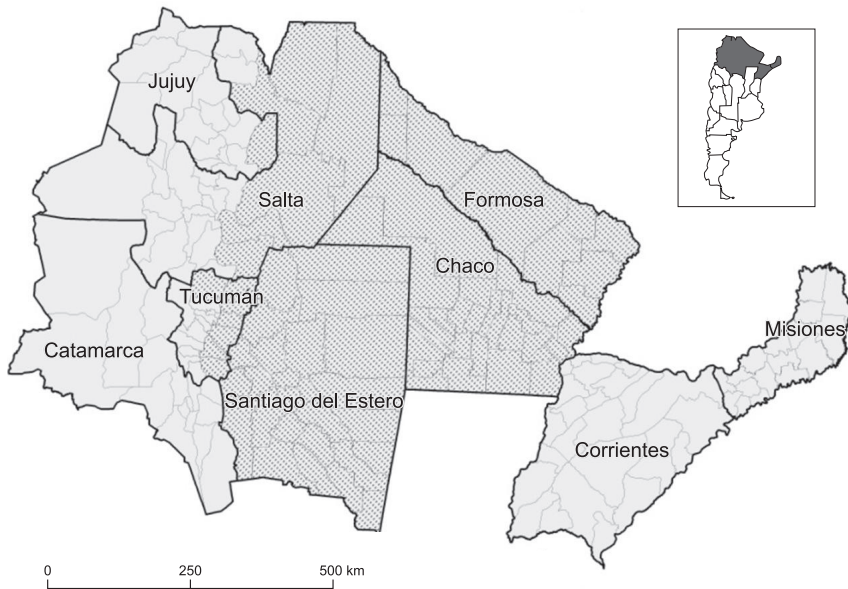


Figure 6: Location of the Northern Argentine Big Chaco, under study
 Source: *Laboratory of Digital Cartography*

With more than 400,000 km² of surface area, the region of the GCA contained a population of more than three million people in 2001, representing a rather low population density, about 7.5 people per km². 50% of the population live in the province capitals which are included in the study zone and the total urban population represents about 70% of the total population. During the 1990s the rural population of the El Chaco showed an important decrease although the percentage of dispersed countryside population remains considerable, at 11.5% of the total population and 42% of the total rural population.

In this context the territory witnessed during the 1990s large transformations in its productive structure. As mentioned above, in as much as soy bean expansion reached a certain limit in the La Pampa region and the price of fields began to increase significantly, the crop started to be propagated to the north, thus causing a process of major expansion of the agriculture and cattle frontier in recent decades (ADÁMOLI et al. 2008, p. 1; REBORATTI 2008, pp. 15-16).

The advance of the soy bean was made by means of the replacement of industrial crops (cotton, sugar cane), cereals (mainly peas) and extensive cattle raising (which extended throughout the GCA). However, the most important advance was carried out mainly by

resorting to the deforestation of the “chaqueño” native forest. It is calculated that during the 1990s an average of 175,000ha were deforested yearly in the GCA (GASPARRI 2010), a surface area which was added to the million of hectares calculated to have been deforested up to the late 1980s (REBORATTI 2008 and 2009), and thus making the GCA the most active deforestation region in the whole country (ADÁMOLI et al. 2008, p. 6). The soy bean expansion and the decline of the industrial crops (cotton and sugar cane) were the most important transformations in the “chaqueño” countryside, but there was also an increase in the surface sown with cereal and forage and an important increase in the number of head of cattle (Tables 2 and 3).

Between 1988 and 2002 the sown surface in the north of the GCA was increased by 79.9%, which meant that a little more than 1.5 million hectares of agricultural production was added to the 1.9 million of sown hectares recorded in 1988. 66% of this increase was soy beans, which expanded over 1 million hectares, tripling the area occupied at the beginning of the decade. At the end of the period the oleaginous crops (of which 85% is soy bean) occupied 45% of the regional sown surface. It is also interesting to observe that

Table 2: Area planted by crops in the north of GCA (hectares). Values for 1988 and 2002, relative and absolute change, and percentage of the increase over the total regional.

| Crops | 1988 | 2002 | Increase | Rate of Increase | % |
|-------------------------------|-----------|-----------|-----------|------------------|-------|
| Cereals | 332,576 | 739,465 | 406,889 | 122.3 | 26.7 |
| Oil crops | 502,811 | 1,539,193 | 1,036,382 | 206.1 | 68.1 |
| - Soybeans | 289,882 | 1,295,748 | 1,005,866 | 347 | 66.1 |
| Industrial crops | 532,916 | 347,108 | -185,808 | -34.9 | -12.2 |
| Vegetables and legumes | 193,698 | 139,900 | -53,798 | -27.8 | -3.5 |
| Fodder crops | 320,916 | 638,889 | 317,973 | 99.1 | 20.9 |
| Total | 1,903,967 | 3,404,555 | 1,521,638 | 79.9 | 100.0 |

Source: National Agricultural Census 1988 and 2002

Table 3: Livestock increased (cattle, sheep and goats) in the GCA, from 1998 to 2002

| Livestock | 1988 | 2002 | Increase | Increase Rate | % |
|---------------|-----------|-----------|-----------|---------------|-------|
| Cattle | 3,363,305 | 4,770,554 | 1,407,249 | 41.8 | 57.5 |
| Sheep | 191,643 | 383,514 | 191,871 | 100.1 | 7.8 |
| Goats | 316,897 | 1,163,159 | 846,262 | 267.0 | 34.6 |
| TOTAL | 3,871,845 | 6,317,227 | 2,445,382 | 63.2 | 100.0 |

Source: National Agricultural Census 1988 and 2002

at the beginning of the 1990s more hectares were sown with industrial crops than with oleaginous ones. By the end of the decade the industrial crops had moved from occupying the first position to fourth place, behind oleaginous, cereal and forage, representing a decrease of 35%.

This formidable transformation was possible as the “pampeano” soy bean model was used, characterized by two yearly harvests (soy beans in summer and wheat in winter, varying sometimes with soy bean/saffron or maize/wheat). Furthermore, the model is based on the use of genetically-modified seeds, mechanization of the sowing and harvesting process and the generalized use of agrochemicals, particularly glyphosate.

At the same time, in the GCA there was an important increase of the surface area sown with forage and the number of head of bovine cattle. The soy bean expansion of the La Pampa region, which was realized to the detriment of cattle production, promoted the displacement of the agricultural and cattle activity to the north. The GCA became a marginal cattle area characterized by the low quality of its cattle groups, a cattle area becoming more relevant in the national context. In addition, the introduction of more refined species and a change in the management of the cattle groups helped to increase the carrying capacity of the enterprises. The same phenomenon also explains the increase of the surface sown with forage.

The progressive use of the model generated an increase in the field price⁵ and the need of sophisticated machinery and adaptation to the new productive logic. This changed the producer profile, as it was necessary to have major capital and increased field lengths for profitable exploitation. These circumstances favored the influx of producers and foreign capital and a decrease in the demand for labor⁶ (VAN DAM 2003, p. 140). This reduction in the number of jobs was accompanied by a change in the labor profile, as the use of machinery demanded relatively qualified workers to drive the machines. They are hired temporarily and generally come from outside the region.

The field consolidation process has been evident. Between 1988 and 2002 the number of agriculture and cattle enterprises (EAPs) decreased by 27.6%, but the surface area exploited increased by nearly two million hectares. The EAPs average size increased from 357ha to 456ha between 1988 and 2002, sharpening the inequality in field distribution. Figure 7 shows clearly that the EAPs of less than 25ha have decreased both in number and in surface area, while the ones between 500ha and 5000ha have decreased in number but increased the surface area they occupy significantly.

5 At the beginning of the 1990s one hectare of field in the east of Salta province cost 150 dollars; in 2002 it cost between 1300 and 1500 dollars (VAN DAM 2003, p. 174).

6 In the east of Salta it is thought that the demand for labor decreased from 2.5 wages/ha to 0.5 wages/ha (VAN DAM 2003, p. 175).

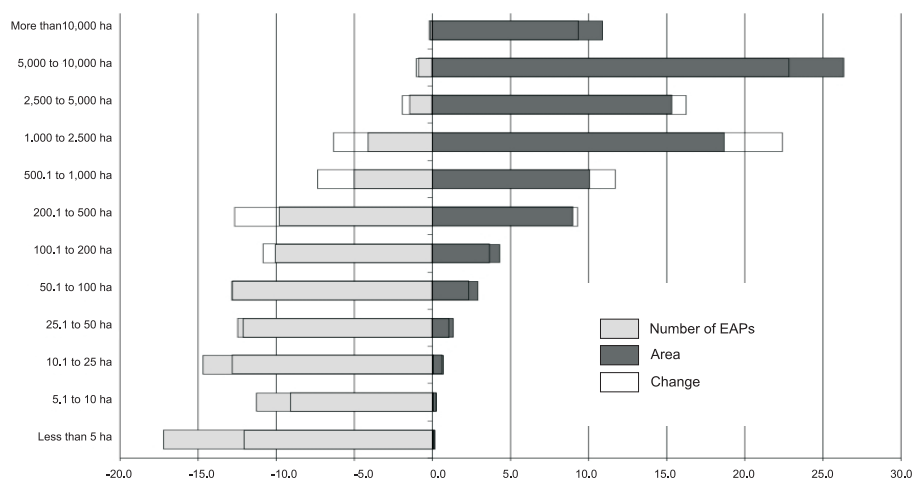


Figure 7: Number of farms and the area they occupied in the Argentine Big Chaco in 1988 and 2002

Source: National Agricultural Census 1988 and 2002

In the case of all these changes we can say that the entirety of production is commercialized out of the region, without any kind of process that brings added value to the area. The supplies and necessary seeds for production are provided by foreign companies; similarly the groups of workers that have taken over the labor are from outside the region. The profits obtained are not reinvested in the region, or if so, they are used to buy more fields or for the expansion of production, which does not have a dynamizing effect on the economy (VAN DAM 2003, p. 176).

In this way, the changes in land use, characterized by the replacement of crops and traditional cattle raising and the important increase of the surface area being exploited because of deforestation and the disappearance of a great number of small producers and the increase of medium and large enterprises, are the most evident and significant transformations that caused the agriculture and cattle frontier advance in the GCA during the 1990s.

6 Agriculture, cattle expansion and poverty

Now, having considered the process of productive change in Argentina and the GCA, and the extreme and persistent poverty conditions of the region, it is only left to analyze these two variables jointly. For that, firstly, we analyzed the relation between the levels of variation of poverty and the evolution of the large masses of crops during the 1990s (Table 4). While no tendency is clearly defined, it can be observed that the departments

Table 4: Percentage of cultivated area total increase, by group of crops and levels of poverty variation, in the north of GCA during the 1990's.

| Crops | Level 1 | Level 2 | Level 3 | Level 4 |
|------------------------|---------|---------|---------|---------|
| Cereals | 29.6 | 31.0 | 14.0 | 29.4 |
| Oil crops | 67.8 | 58.1 | 88.5 | 71.8 |
| - Soybeans | 67.8 | 55.2 | 88.5 | 67.4 |
| - Others | - | -2.9 | - | 4.4 |
| Industrial crops | -16.7 | -3.7 | -31.7 | -12.3 |
| Fruit crops | 0.0 | -0.5 | -0.3 | -0.1 |
| Vegetables and legumes | -5.5 | -5.9 | 0.4 | -2.1 |
| Forest crops | -1.2 | 0.1 | -0.2 | -0.1 |
| Fodder crops | 26.1 | 21.0 | 29.3 | 13.4 |
| Total | 100 | 100 | 100 | 100 |

Source: National Agricultural Census 1988 and 2002

with the major increase in poverty (levels 3 and 4) in the 1990s also underwent important agrarian transformations related mainly to the increase of oleaginous crops. In relation to the area sown with other crops a clear pattern is not observed, as cereals increased in every level and industrial crops also decreased in general in every one. Table 4 shows that it is in level 3 that the major agrarian transformations occurred (with a major increase in oleaginous and forage crops and a larger decrease in industrial ones).

On the other hand, an important increase in cattle raising in the study area is observed (Table 5). The head of cattle increase in every level. However, it is in level 4 - major impoverishment - where we find the maximum increase (nearly 200%). However, if we observe the absolute number of head of cattle, we note that the increase is similar in every

Table 5: Absolute and relative livestock increased, by IPMV levels. (1988 - 2002)

| | Level 1 | | | Level 2 | | | Level 3 | | | Level 4 | | |
|----------------------------|---------|------|------|---------|-----|------|---------|-----|------|-----------|-----|------|
| Increase | 112,587 | | | 991,514 | | | 948,035 | | | 1,095,423 | | |
| Increase Rate | 48.9% | | | 103.4% | | | 36.8% | | | 187.5% | | |
| Increase by species | Bov. | Ov. | Cap. | Bov. | Ov. | Cap. | Bov. | Ov. | Cap. | Bov. | Ov. | Cap. |
| | 32.2 | 19.5 | 56.2 | 45.8 | 6.7 | 36.6 | 53.4 | 2.6 | 17.7 | 37.5 | 7.2 | 23.0 |
| Proportion Increase of CGA | 3.6 | | | 31.5 | | | 30.1 | | | 34.8 | | |

Source: National Agricultural Census 1988 and 2002

level where there is impoverishment, versus a 100,000 increase in head of cattle in the departments of level 1 only. The departments of levels 2, 3 and 4 each saw an increase of nearly one million head of cattle in the 1990s. In this way, although cattle raising was extended throughout the region, it grew most in the departments where impoverishment also increased the most.

As observed in Table 6, in the 1990s in the GCA generally there was an increase in the average size of the agriculture and cattle enterprises, from 357.3ha to 455.9ha. The change is owing to a decrease in the total number of agriculture and cattle enterprises (by about 7000 units) parallel to an increase in the total surface area they occupy (about 1.9 million hectares). The increase represents a 27.6% variation rate.

If we then compare this regional tendency with what happens in the departments disadvantaged according to the IPMV variation levels, we observe that tendencies are not homogeneous in all of them. While in every level there was an important increase in the average size of EAP (up to 19%), the major increase is in level 4, up to 55%. However, this increase is not owing to a contraction in the total number of EAPs (which increase from 8,800 to 9,400 between the beginning and the end of the decade) but above all owing to an increase in the total surface area they occupy, which is about 1.5 million hectares. That is to say, this increase represents 80% of the increase of the total surface area incorporated to production in the GCA, which means that in these 15 departments, which are the ones that have increased their poverty level the most, the agriculture and cattle frontier advance has been the strongest. Although the surface area of EAPs increased in every level, in no other level do we find so important an increase.

The average size at the beginning of the study period is, in this case, excellent. The areas where poverty decreased started the decade with the EAPs of the least average size (214ha) and finished, despite a high percentage increase, still with the smallest average

Table 6: Variation in the average size of farms by variation levels of IPMV in the north of GCA (1988-2002)

| | EAPS 1988 | SUP 1988 | Tamaño Medio 1988 | EAPS 2002 | SUP 2002 | Tamaño Medio 2002 | Variación (%) |
|----------------|--------------|------------|-------------------------|--------------|------------|-------------------------|---------------|
| Level 1 | 3,174 | 680,092 | 214.3 | 2,281 | 702,275 | 307.9 | 43.7 |
| Level 2 | 13,688 | 5,849,584 | 427.4 | 11,968 | 6,475,577 | 541.1 | 26.6 |
| Level 3 | 24,703 | 9,189,163 | 372.0 | 20,015 | 8,908,027 | 445.1 | 19.6 |
| Level 4 | 8,880 | 2,306,977 | 259.8 | 9,438 | 3,836,614 | 406.5 | 56.5 |
| Chaco | 50,445 | 18,025,816 | 357.3 | 43,702 | 19,922,493 | 455.9 | 27.6 |

Source: National Agricultural Census 1988 and 2002

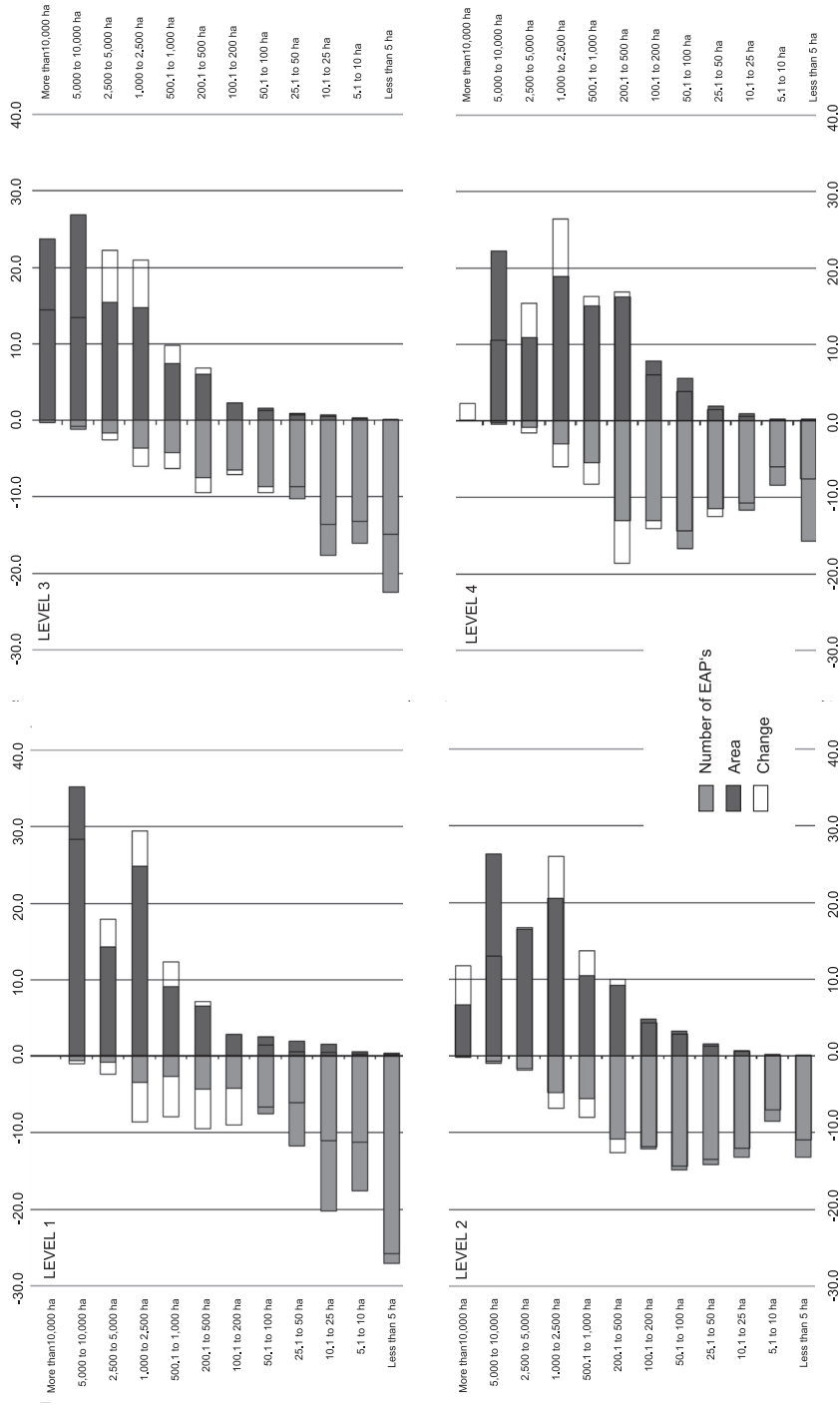


Figure 8: Agrarian structure by varying levels of poverty in the NGCA
 Source: National Agricultural Census 1988 and 2002

size (307ha). In contrast, the areas which impoverished went from an average size of more than 250ha and finished the decade with between 400ha and 540ha on average. However, in this case, the greatest average size of enterprises is found not in level 4 but in level 2, although, as mentioned above, level 4 presents the highest relative increase (56%).

Figure 8 compares the agrarian structure and the changes that occurred in it in 2002 with the levels of poverty variation. It can be observed that the major decrease of the smallest EAPs occurred in level 4. In contrast, the greatest growth of the number and surface area of the medium and large enterprises occurred in levels 1 and 2. This evidence is related to the variation in the average size of the exploitations analyzed above.

7 Conclusions

The analysis of poverty variations in relation to the agriculture and cattle frontier advance in the north of the GCA, although no strictly causal connections between one phenomenon and the other can be established, shows an unpromising panorama for regional development. Although the GCA has historically been one of the poorest areas of the whole country, this tendency was not reversed after significant productive transformations in the 1990s. On the contrary, it has been observed that the living conditions of the local population have in most cases worsened.

The simultaneous increase of regional poverty with severe productive transformations shows us that this model is still far from becoming an engine for local development. The productive activities which are carried out in the territory were always a marginal part of the national economy. Since the 1990s, the agriculture and cattle frontier advance caused the region's produce to enter the domestic and foreign markets strongly and the region to become a major protagonist in the country. The increase of the soy bean crop has been the central driver in this process, together with the "pecuarización" (related to cattle) and tree-clearing.

The analysis of interaction between impoverishment and production changes in the GCA in the 1990s shows that together with an increase in sown area, especially of soy beans, and the increase of cattle raising, there was a generalized increase in the poverty conditions of the population. Precisely in the departments where poverty most increased in the 1990s, most changes appeared in relation to the expansion of the sown area, increase in number and average size of the agriculture and cattle enterprises (EAPs) and increase in oleaginous crops and head of cattle. These results permit us to affirm that the economic activities which were developed in these departments were not effective enough to reduce poverty. On the contrary, apparently the scanty redistribution of the profits obtained by means of these new economic activities led to an increase in poverty levels. The reasons

for this non re-distributive behavior would seem to be related to the presence of foreign businessmen and the weak reinvestment of profits in the region.

Why then do these economic activities, which should bring prosperity for the local population, not succeed in doing so and why, on the contrary, are they related to poverty increase? The answer to this question is the absence of state policies and a development model adapted to the territory under consideration here. It is not the target of this work to analyze Argentina's and El Chaco's social and economic system failures, but it is evident that effective state intervention and adequate planning are needed to lead genuine regional development. The productive transformation is not enough to reverse El Chaco's historical poverty. Specific policies which guarantee the redistribution and local reinvestment of profits are needed in order that the great economic benefits generated from the productive activities are seen locally.

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ANNEX 1

| Province | Department | IPMV 1991 | IPMV 2001 | Variation | Level |
|---------------------|-------------|-----------|-----------|-----------|-------|
| Santiago del Estero | Quebrachos | 54.4 | 51.2 | -3.2 | 1 |
| Chaco | Tapenagá | 53.5 | 50.5 | -3.0 | 1 |
| Formosa | Ramón Lista | 80.8 | 79.5 | -1.3 | 1 |
| Tucumán | Leales | 52.5 | 52.3 | -0.2 | 1 |
| Santiago del Estero | Jiménez | 64.9 | 65.2 | 0.3 | 2 |
| Santiago del Estero | Rivadavia | 25.6 | 26.3 | 0.7 | 2 |
| Salta | Anta | 49.8 | 50.5 | 0.7 | 2 |

| | | | | | |
|---------------------|-----------------|------|------|-----|---|
| Santiago del Estero | Moreno | 55.0 | 55.9 | 0.9 | 2 |
| Santiago del Estero | Belgrano | 35.9 | 36.9 | 1.0 | 2 |
| Tucumán | Cruz Alta | 43.9 | 45.1 | 1.2 | 2 |
| Santiago del Estero | Salavina | 70.6 | 71.9 | 1.3 | 2 |
| Tucumán | Burruyacú | 50.3 | 52.8 | 2.5 | 2 |
| Chaco | General Donovan | 46.0 | 48.5 | 2.5 | 2 |
| Formosa | Matacos | 57.3 | 60.0 | 2.7 | 2 |
| Tucumán | Simoca | 57.1 | 60.1 | 3.0 | 2 |
| Santiago del Estero | Loreto | 56.7 | 59.8 | 3.1 | 2 |
| Chaco | Libertad | 37.1 | 40.2 | 3.1 | 2 |
| Santiago del Estero | Capital | 25.2 | 28.4 | 3.2 | 2 |
| Santiago del Estero | Guasayán | 55.4 | 58.7 | 3.3 | 2 |
| Chaco | Almirante Brown | 53.3 | 56.7 | 3.4 | 2 |
| Formosa | Pilagás | 50.4 | 53.9 | 3.5 | 2 |
| Salta | Metán | 35.1 | 38.8 | 3.7 | 2 |
| Santiago del Estero | Atamisqui | 72.9 | 76.7 | 3.8 | 2 |
| Salta | Orán | 46.5 | 50.4 | 3.9 | 2 |
| Chaco | 1 de Mayo | 41.3 | 45.5 | 4.2 | 2 |
| Salta | Rivadavia | 65.8 | 70.0 | 4.2 | 2 |
| Santiago del Estero | Banda | 36.7 | 41.1 | 4.4 | 2 |
| Santiago del Estero | Copo | 54.4 | 58.8 | 4.4 | 2 |
| Formosa | Santa Bárbara | 47.2 | 51.8 | 4.6 | 2 |
| Chaco | Sargento Cabral | 49.5 | 54.4 | 4.9 | 3 |
| Santiago del Estero | Sarmiento | 62.0 | 66.9 | 4.9 | 3 |
| Tucumán | Trancas | 40.0 | 45.2 | 5.2 | 3 |
| Formosa | Patiño | 47.8 | 53.1 | 5.3 | 3 |
| Formosa | Pirané | 42.8 | 48.2 | 5.4 | 3 |
| Chaco | 25 de Mayo | 47.8 | 53.2 | 5.4 | 3 |
| Chaco | Chacabuco | 35.4 | 41.1 | 5.7 | 3 |
| Chaco | Quitilipi | 43.3 | 49.0 | 5.7 | 3 |
| Santiago del Estero | Río Hondo | 52.9 | 58.6 | 5.7 | 3 |
| Santiago del Estero | Ojo de Agua | 45.1 | 51.3 | 6.2 | 3 |
| Chaco | San Fernando | 26.7 | 32.9 | 6.2 | 3 |
| Salta | San Martín | 43.4 | 49.8 | 6.4 | 3 |
| Chaco | Fontana | 38.8 | 45.3 | 6.5 | 3 |
| Santiago del Estero | Alberdi | 54.2 | 60.8 | 6.6 | 3 |
| Santiago del Estero | Choya | 31.6 | 38.3 | 6.7 | 3 |
| Chaco | San Martín | 47.6 | 54.3 | 6.7 | 3 |
| Santiago del Estero | Avellaneda | 58.6 | 65.3 | 6.7 | 3 |
| Tucumán | Graneros | 55.3 | 62.0 | 6.7 | 3 |
| Formosa | Formosa | 29.9 | 36.7 | 6.8 | 3 |

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|---------------------|------------------------|------|------|------|---|
| Salta | Rosario de la Frontera | 33.8 | 40.9 | 7.1 | 3 |
| Chaco | 12 de Octubre | 43.4 | 50.6 | 7.2 | 3 |
| Chaco | Fray J. Sta M. de Oro | 43.4 | 50.6 | 7.2 | 3 |
| Chaco | 2 de Abril | 43.4 | 50.6 | 7.2 | 3 |
| Chaco | Bermejo | 45.3 | 52.5 | 7.2 | 3 |
| Formosa | Pilcomayo | 39.3 | 46.7 | 7.4 | 3 |
| Chaco | Maipú | 49.3 | 56.8 | 7.5 | 3 |
| Chaco | Presidente de la Plaza | 43.4 | 51.3 | 7.9 | 3 |
| Santiago del Estero | San Martín | 66.1 | 74.0 | 7.9 | 3 |
| Chaco | Cmte. Fernández | 32.2 | 40.4 | 8.2 | 3 |
| Formosa | Laishi | 43.7 | 52.1 | 8.4 | 3 |
| Santiago del Estero | Pellegrini | 57.1 | 66.3 | 9.2 | 4 |
| Santiago del Estero | Gral. Taboada | 42.6 | 52.0 | 9.4 | 4 |
| Chaco | 9 de Julio | 41.4 | 50.9 | 9.5 | 4 |
| Formosa | Bermejo | 58.2 | 67.8 | 9.6 | 4 |
| Santiago del Estero | Robles | 40.8 | 50.4 | 9.6 | 4 |
| Santiago del Estero | Silípica | 62.7 | 73.2 | 10.5 | 4 |
| Chaco | Güemes | 53.3 | 63.9 | 10.6 | 4 |
| Santiago del Estero | Aguirre | 40.1 | 50.9 | 10.8 | 4 |
| Santiago del Estero | Mitre | 46.6 | 57.5 | 10.9 | 4 |
| Santiago del Estero | Ibarra | 53.6 | 64.6 | 11.0 | 4 |
| Chaco | San Lorenzo | 48.5 | 59.6 | 11.1 | 4 |
| Chaco | Belgrano | 49.1 | 60.2 | 11.1 | 4 |
| Chaco | Independencia | 51.1 | 63.9 | 12.8 | 4 |
| Chaco | O' Higgins | 42.6 | 57.4 | 14.8 | 4 |
| Santiago del Estero | Figueroa | 61.9 | 78.0 | 16.1 | 4 |