

# **Changes and resistance in family farming systems facing the agricultural intensification model in emerging countries. The example of Paraná State in Brazil**

Dimes Soares Júnior<sup>1</sup>, Philippe Pedelahore<sup>2</sup>, Nathalie Cialdella<sup>2</sup> and Ricardo Ralisch<sup>3</sup>

<sup>1</sup> IAPAR – Agronomic Institute of Paraná, Rodovia Celso Garcia Cid, km 375, Caixa Postal 381, CEP 86.047-902, Londrina – PR, Brazil

<sup>2</sup> CIRAD - Agricultural Research for Development - UMR Innovation, Bâtiment 15, 73 rue Jean-François Breton, Montpellier, 34398, Cedex 5, France

<sup>3</sup> UEL – State University of Londrina, Rodovia Celso Garcia Cid, km 380, CEP 86.055-900, Londrina – PR, Brazil

**Abstract:** During the period 1950-2000, the agricultural development model which is based on changes in technological improvement and commodities allowed a significant increase in global agricultural production. Beginning in the 70's, this model was consolidated in South American emerging countries as a result of the combination of government policies and strategies of large private groups. It has raised questions about the environmental and socio-economic consequences, particularly when adopted in family farming systems. The authors found changes and resistance in agrarian structures, farming systems and demographic aspects related to the dissemination of this model and their adoption by the farmers. The study was conducted in the state of Paraná - Brazil in two areas representing the history of rural diversity on the technical, socio-economic and human development dimensions. The work was based on the analysis of statistical data of the agricultural census (1970, 1975, 1980, 1985, 1996 and 2006), on the demographic census (1970, 1980, 1991, 2000 and 2010) and on the agricultural official database of the State of Paraná Agricultural Agency (1970-2012). The data were compared between the two areas and analyzed in alignment with the State of Paraná standards. The data exhibit a decrease in the numbers of farms and of the rural population, with a focus on the significant departure of young people and of women especially. The results also show a big reduction in the numbers of the middle-size farms, caused by land concentration and proliferation of extra-small farms in the suburbs of the cities. They also demonstrate the expansion of soybeans crops in both regions, however with differentiated modalities of insertion in the farming systems, and finally the recent survival of family farming systems despite the severe changes observed in the period.

**Keywords:** agrarian structure, rural demography, family farms, soybean

## **Introduction**

The occurring changes in the rural Paraná areas in the past 40 years have involved a group of agricultural, demographic, economic and social phenomena which impact and are impacted by the agricultural production structure changes observed during this period of time.

Although such transformations, which took place in the last 40 years, have the proposed changes in common in the scope of the "green revolution", the fact is that these changes resulted in different impacts on the different regions of the state of Paraná, and it became relevant to analyze these impacts at a regional level (Fritz Filho, 2009).

The present text has an introductory nature. It presents the work that has been conducted to the present moment and intends, to analyze the trajectory of family farming systems and the roles and limits of the innovations in the strategies observed in such families (Bar, 2011; Cialdella and Dedieub, 2011). Its goal is to demonstrate some preliminary elements that allow the discussion of the ongoing transformations of the regions that were chosen for the study, which are the North Pioneer and the West Paraná (Figure 1).

Figure 1: Location of the studied regions.



The so called Pioneer North corresponds to the pioneer colonization of northern Paraná whose occupation dates back to the early 1890. Nowadays it is constituted of 29 counties and 10,436 km<sup>2</sup> in area which is characterized by a depressed economic development when compared to that observed at a state level (IPARDES, 2007). Such situation made it to obtain the status of one of the "Territories of Citizenship" included in the Territorial Development Program created by the Ministry of Agrarian Development.

On the other hand, the West Paraná represents the last great agricultural border of the state. Occupied in the 50's, it presented rapid changes in its production systems, specially from the 70's, becoming an agroindustrial swine and poultry complex leader, leading the gross value of the state agricultural production. The West of Paraná is composed of 21 counties and of 8,768 km<sup>2</sup> in area representing, according to the definition of the Brazilian Institute of Geography and Statistics (IBGE), the homogeneous geographic microregion of Toledo.

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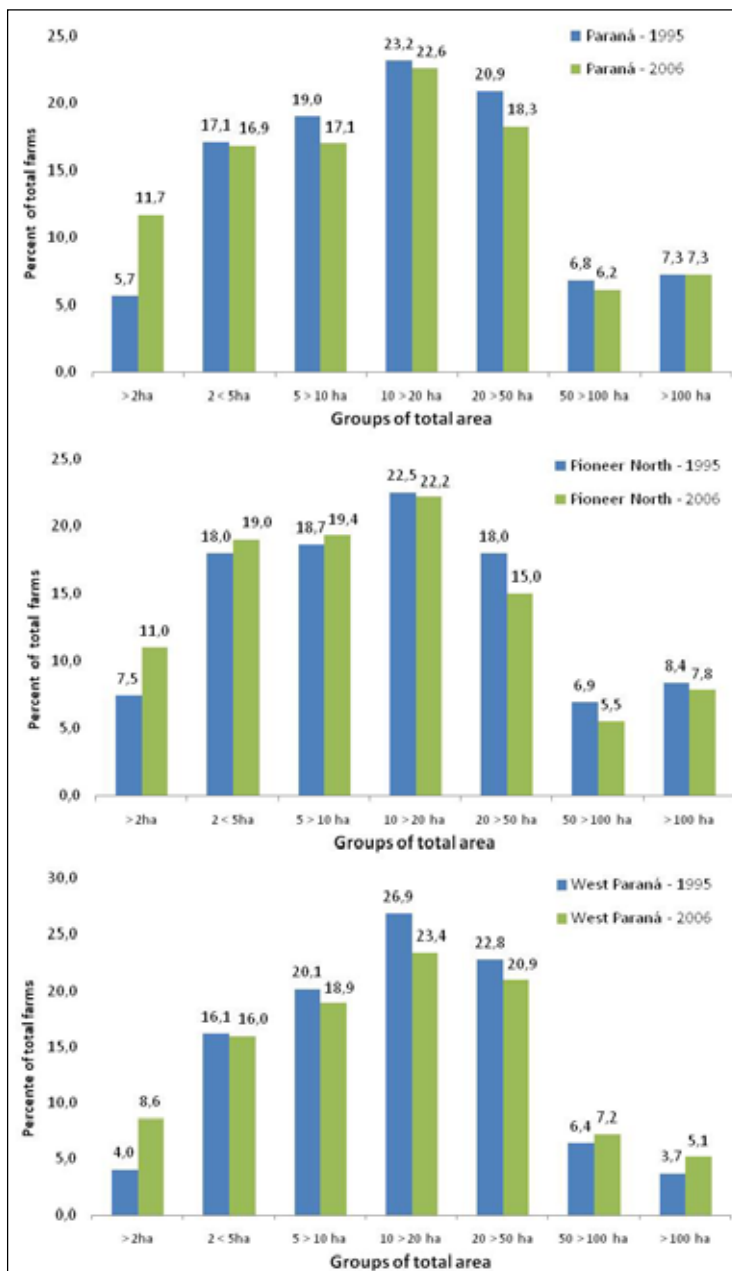
## Results and Discussion

### The Agrarian Structure

The first analyses indicate that these two regions broadly follow the main trends observed in the state which are marked by the following characteristics. At state level, to the increase of 14.2% of the total area occupied by farms from 1970 to 1985. This increase was followed by a reduction of 7.8% of such areas in the following two decades, a fact which is associated with continued reduction in the number of farms between 1970-1996, which resulted in the termination of about 33% of them, and their stabilization in 2006.

However, although stabilized the agricultural establishments constituted the scenario of major changes when taking into account the number of total area groups observed in the last two census periods (Figure 2).

Figure 2: Relative participation of the number of farms in total area groups. Paraná, Pioneer North and West Paraná. 1995 and 2006. (in %)



Indeed, the stratum with a total area smaller than 2 was the only one that increased its share in the studied state and regions, doubling its relative presence on the total of establishments in Paraná and its Western region. At state level, the number of farms was reduced in all of the area strata, especially in the strata between 20-50 and 5-10 ha.

In the Pioneer North there was growth the number of farms in the other two lower area strata, between 2-5 and 5-10 ha, being the reductions concentrated in farms from 50-100 ha and 20-50 ha. In contrast to that, the stratum that presented an increase in the total number of farms in the West Paraná was the one with areas with more than 100 ha, while the reduction of number of farms happened in the strata between 10-20 and 20-50 ha.

In general it appears that establishments between 20-50 ha, preferred stratum for agricultural exploitation in small and medium scale, decreased their participation. On the other hand, there was an increase in the number of the minimum strata area establishments, potentially embedded in a context of "new rurality" comprising the rural at the same time acting as space for living space and leisure.

This last observation has been reinforced as the evolution of households not occupied for occasional use has been taken into consideration, confirming their consistent growth in rural areas of both regions in even higher proportions at state level as observed in urban áreas.

In addition to that, the analysis of changes in the total of permanent farming households shows that those located in rural areas had their numbers reduced in more than half in the period of 1970-2010 in the West Paraná and Pioneer North region, as opposed to their rapid growth in urban areas, which were multiplied by about nine times in the West, five times in the state and three times in North Pioneer, as a result of the fast urbanization process.

The changes in the number of farms by total area groups did not cause significant changes in the concentration of land in the upper area strata. The main aspect to emphasize is that the state and regions studies demonstrated that the hegemony of the groups with areas >100 ha has been maintained, which reinforced their status as major stratum mainly throughout the West Paraná.

In Paraná, strata between 20-50 and 5-10 ha have shown losses of 15% and 12% in the occupied area while the North Pioneer losses are concentrated in the strata of 50-100 and 20-50 ha, having lost 19% and 17% occupied area respectively. In the West the greatest losses took place in the strata between 10-20 ha, reduced by 25%, and 20-50 and 5-10 ha, both with 20% in total area loss.

The land use has also changed during the same observed period, noting the growth of 62% in the areas of temporary crops in Paraná, especially between 1970-1975. A decrease in the areas of permanent crops and natural pastures between 1970-2006 is noticeable. There has also been an increase in cultivated pastures, indicating an intensification of the livestock production, natural, and mainly, in the planted forests.

Such movements associated with those observed in the number and total area of farms result in increased average of utilised agricultural area (UAA) that moves from 16.6 ha to 30.3 ha between 1970-2006.

### **The production**

The data about main agricultural products in the state regarding cultivated area explain such changes especially when we observe the growth since 1980 in the areas devoted to the cultivation of soybeans, which was almost constant in the period and strongly pronounced in the decade 1995-2005. The corn, despite some oscillations, are in the the second position. Crops of wheat (although declining) and beans complete the main group of temporary crops over the period. The

data also highlights the growth of areas dedicated to sugar cane and the decline of coffee, cotton and rice. The last one traditionally devoted to the own consumption.

Considering the common aspects of increase in the soybean cultivation areas, the two studied regions display distinct characteristics regarding the use of crop areas. In the Pioneer North that oilseed gained importance from the 2000's having disputed its importance with the corn and wheat cultivation for about half of that decade. In this region the changes in the production system are demonstrated by the reduction of beans and coffee plantations, typical activities in the 80's, and by the increase of sugar cane crops, that has been observed during the same decade (Figure 3). In the West Paranaense areas cultivated with temporary crops are based on the keys crops of the productions systems of grains: soybean, corn and wheat (Figure 4).

Figure 3: Area evolution of the main products. Pioneer North. 1980-2010.

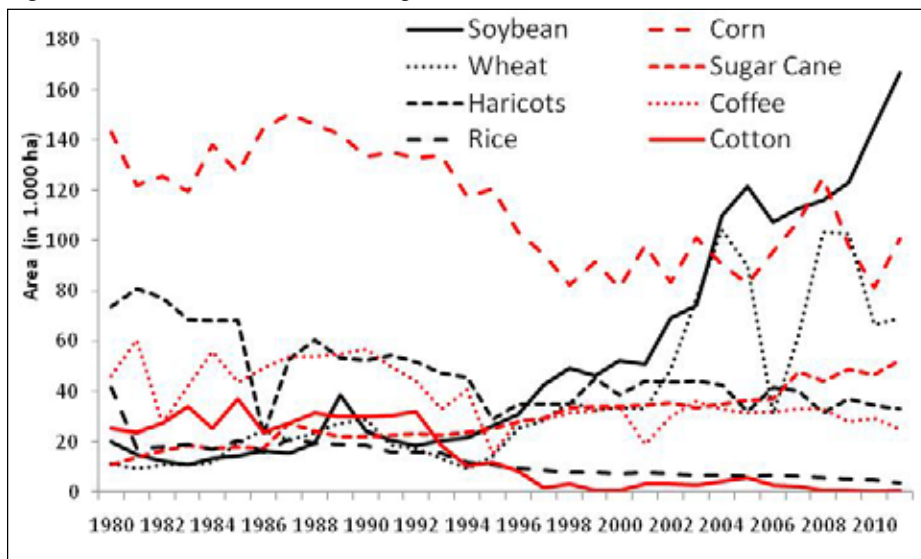
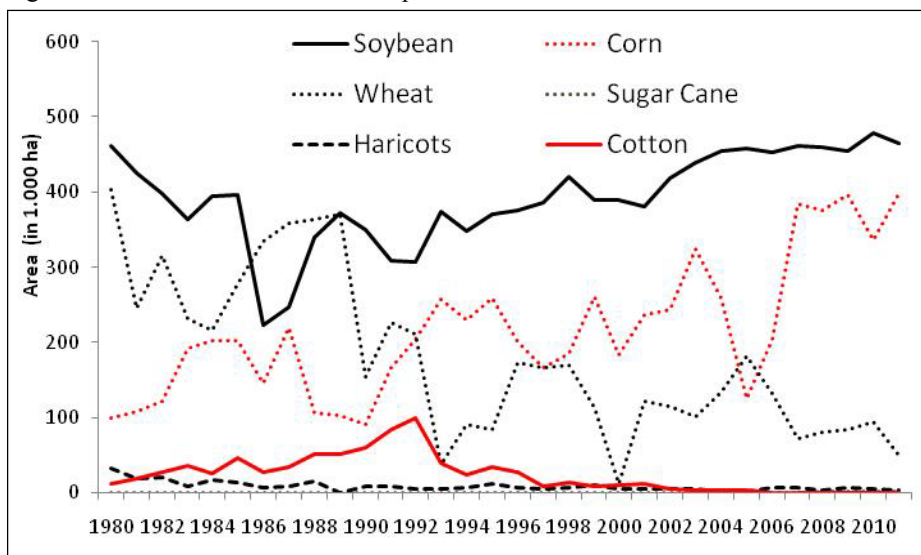


Figure 4: Area evolution of the main products. West Paraná. 1980-2010.



In the North Pioneer, the crops are predominant for composes the Gross Value of Agricultural Production (GVAP). Analyzing the GVAP one can observe cyclic variations in the coffee production, the recent acquired soybean leadership and the decrease of beans production relative importance.

Additionally, in the West Paraná it is observed that poultry meat and swine breeding reassures the supremacy in the total GVAP. We can observe the total supremacy of soybean production with the decrease of corn production, making the milk production move up to the second position, once taken by the production of corn. As one can see in the above description, this culture has amplified its importance in cultivated crop areas, consolidating the production of grains and milk, at the same time that corn has been used as animal food, assuring the product increased value.

Is important to note that even in face of these transformations in the agrarian structure and productive scenario, the farms classified as family farms according to the Federal Law criteria, still represent 83% of the farms in Pioneer North and 89% in West Paraná, confirming their adaptive capacity.

### **The population**

Naturally, the changes in the agrarian structure and in the productive systems define and are defined by transformations of demographic characteristics. Such transformations are clearly observed in Paraná and studied regions during the observed period, noting that in the state the majority of the population was already urban in the 80's.

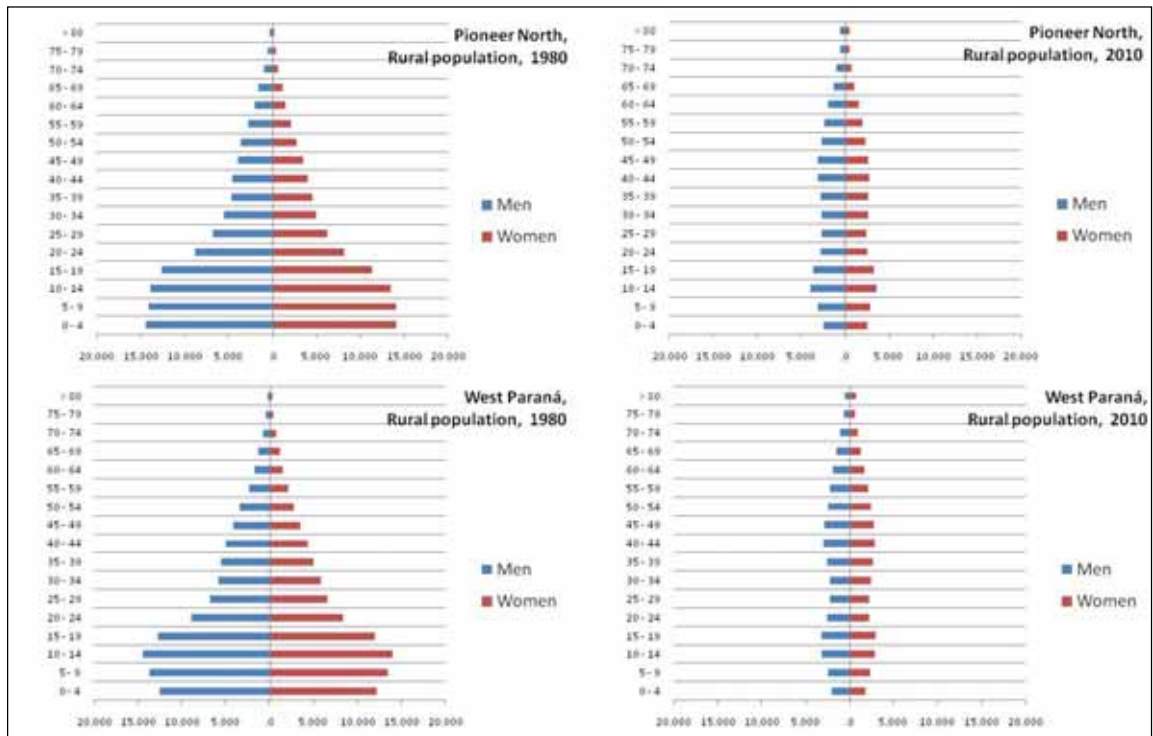
The analysis of the occurred changes indicates that at state level, while the urban population practically doubled up, the rural population was reduced in half. Observed migratory movements of time associated to changes in the natality and life expectancy numbers in the studied period, modify the population regarding age and gender.

The urban male population outnumbers the female one, while the reduction in numbers of women working in rural areas outnumbers the reduction in numbers of men in the same situation. Additionally, while the general growth in the cities increases with age range, the reduction of working population in the rural areas is continuously observed up to the age of 55 for men and 50 for women, with an increase of population from the mentioned age ranges.

The Pioneer North has seen its total population to decrease in 6.5% from 1980 to 2010, in contrast to the increase of its urban population in 67.6% and the reduction of its rural population in 60.2% in the same period of time. In addition to that, there's been a slower growth of the male population in the cities and it has been reduced to smaller proportions when compared to the female population reduction in the rural areas. The numbers in the rural population have continuously declined among the male and female population up to their 70's and a slight growth can be observed from this age range (Figure 5).

In West Paraná, between 1980 and 2010 the total population has grown in 7.2%, having its numbers doubled in the cities with a growth of 93.0% and reduced in 63.1% in the rural areas. In this region it has also been verified the female population growth phenomena, however differently from the observed in Paraná and Pioneer North, the reduction of women in rural areas was less significant than the reduction among male rural population.

Figure 5: Rural population pyramids. Pioneer North and West Paraná. 1980 and 2010.



Regarding the transformations in age composition of the referred groups, the described characteristics can be better observed when analyzed with the dependence ratio, defined as the number of existing inactive population (children  $\leq 15$  and the elderly  $>65$  years of age) among every 100 economically active inhabitants ( $>15 \leq 65$  years of age).

One can observe that the number of inactive people in the rural areas, which was notoriably superior than the one in the urban population in Paraná and studied regions in 1980, has intensely decreased after that, reaching compatible numbers between urban and rural areas.

Regarding the gender ratio of the population in general (number of males to 100 female), there's been a constant outnumber in the male population in the rural areas as opposed to of the female population in the urban areas in Paraná and studied regions. This predominance in numbers has slightly affected the growth in the North Pioneer in the analyzed period, while there's been a decrease in the West region.

However, when the gender ratio is calculated among the youth population between 15 and 24, one can observe a change in the population characteristics. In this age range male had outnumbered females in the rural areas, and an increase in the ratio has been observed, getting close to the ratio in the urban areas, demonstrating that in this age range the migratory movements were more intense among the youth female population.

### Conclusions and perspectives

The scenario of Rural Paraná faced an intense process of transformation in recent decades. About 30% of farms have disappeared, the rural population decreased, aged and became more masculine.

The number of units with small areas, apparently intended for leisure, grew and the agenda of crops and commodity systems such as soybean and animal proteins changed, consolidating their importance.

In this process, family farming systems were the most affected, with an important decrease of farms with the most frequent sizes for this segment, with the increase in the average area of operation and the need of adaptation to the changes determined by the the agro-industrial complex that was then consolidated.

However, in the two study areas over 80% of farms remain with familiar characteristics indicating the existence of adaptive capacity to cope with such changes (Darnhofer et al., 2010).

Preliminary analyses indicate the presence of certain strategies in this adaptation process. Such strategies include the technical progress with the increase of work productivity, as well as the vertical integration with agroindustrial systems, particularly in the West region.

However, this model faces challenges to its own sustainability as it has to be in accordance to some restrictive environmental legislation requirements and it has to face the presence of socio-economic matters, such as the fact that urban activities and nonagricultural rural activities grow rapidly in number and profitability (Graziano & Del Grossi, 2001), limiting the identification of successors within families, which have been continuously decreasing in size.

How will current strategies be able to be adapted in a way that allows them to continue to be successful? What are the new strategies necessary for the continuity of family farming systems? These are questions to be answered in the next steps of this work.

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