

THE BEHAVIOR OF EMPLOYMENT IN PARANA'S AGRICULTURE – FROM 1970 TO 1996¹

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ABSTRACT

This paper analyzes the behavior of employment in Parana's agriculture from 1970 to 1996. For that, data collected from Agricultural and Demographic Census and National Households Sample Research (PNAD), in aggregate and individual forms, have been used. A downward trend in employment created by plantation activities in relation to the total agricultural employment was observed. However, that activity keeps being the main source of employment in rural zone. It was also found that self-employed and unpaid workers have a large importance in the total amount of working people in agriculture. In the last years, corn has been the most important activity in terms of employment in Parana's agriculture. That crop uses mainly self-employed and unpaid workers. Considering the labor skill, a downward trend in the share of unskilled people and an upward trend in the share of skilled people working in Parana's agriculture was observed.

Key words: labor force, composition, skill, State of Parana.

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1. Introduction

This paper analyzes the behavior of employment in Parana's agriculture from 1970 to 1996. During those years, that sector had significant changes, which affected the amount and kind of jobs generated into it.

The State of Parana is placed in the south of Brazil and has great importance in the Brazilian agricultural Gross Domestic Product (it was 9.4% in 1994, according to Silva & Considera, 1996). That state has been one of the most important producers of a large group of products such as: soybean, wheat, corn, bean, cotton, and several others.

First, the paper discusses the methodological differences among the sources of information about working people in agriculture. It also shows how this information can be articulated in order to analyze the evolution, skill, and share of each category of rural workers into the total working population in the Parana's agriculture.

Some papers have already analyzed the changes which took place in the labor market of Parana from 1970 to 1985 (see Carvalho, 1993; IPARDES, 1981 and Feb./1983; Istake, 1992). In this paper, some information is added from 1985 to 1996 and rural workers' skill is observed.

This paper is made up of six more sections besides this introduction. In the second section, methodological aspects of the main sources of data about working people in agriculture are discussed. The third section analyzes the evolution of the rural population and its relation to the change in Parana's agricultural production function. The 4th, 5th, and 6th sections analyze, respectively, data on evolution, composition, and rural laborers' skills from the Agricultural Census, National Households Sample Research (PNAD) and Demographic Census. Finally, the 7th section shows the conclusions of this paper.

2. Data sources about rural employment

In order to analyze employment in Parana's agriculture, we shall consider its evolution, composition and skill. Thus, data from 1970 to 1996 were collected from Agricultural and Demographic Census and from PNAD (National Households Sample Research). This information refers to working population.

Picture 1 shows the main characteristics of PNAD and Agricultural and Demographic Censuses when considering working people in rural activities. The scope and periodicity of that information have been evaluated. One can observe that since these information differ, they should be used in separate ways.

In order to analyze the evolution and composition of working people in the Parana's agriculture in the '80s and the '90s, Demographic Census data have been used. They are also useful in the evaluation of the population distribution according to whether they live in an urban or rural area.

The agricultural census data enables an evaluation of the total amount of agriculture workers, considering the type of activity and the position in the occupation. However, such data does not allow one to evaluate the specialization and skill of the labor force. The latter is done by using the PNAD and the Demographic Census data.

Additional observations must be made about the PNAD data. According to Silva (1996), PNAD data from 1992 to 1993 is not comparable to the PNAD from 1990, because changes occurred in the criteria used to count the working people. In those years, they included: a) people who declared they worked more than 1 hour per week (they used to consider people who worked more than 15 hours per week); and, b) workers in the production for the self-consumption and in the building of their own houses (those categories were not previously considered).

The last inclusion in the PNAD was result of critics such as the one made by Corrêa (1995, p.19). According to that author, "*the*

Picture 1 - Some information about the main data of working people in Parana's agriculture

	National Households Sample Research - PNAD		Agricultural Census	Demographic Census
	Aggregate data	Individual data		
Type of information	Working people who had worked full or part-time during the reference week, including people on vacation, license, strike, etc.	It is the person's occupation in the reference week.	Comprising working people, with and without remuneration, who were executing farming jobs in the date of the Census. It does not include people working under the responsibility of contractors.	10 year-old people or more who worked in the reference year
Division of the information	Working people in agricultural activities are divided in: <ul style="list-style-type: none"> - employees - self-employed - employers - unpaid worker - without remuneration 	Occupation types found in the enterprises: <ul style="list-style-type: none"> - occupation in the week of reference - form of recruiting 	Some information about plantations, livestock, vegetable crops and flower culture, forestry, poultry culture, rabbit culture / bee-keeping and vegetal exploitation. The working people are divided as: <ul style="list-style-type: none"> - Responsible and unpaid members of the family; - employees in permanent jobs; - temporary employees; - other condition; 	Economically active people in agricultural activities and vegetal exploitation are divided in: <ul style="list-style-type: none"> - Skilled workers: agricultural overseer; office assistant and administrative person; Bachelor in agricultural science and veterinary-surgeon; drivers of farm tractor and operators of agricultural machines; driver; agricultural technicians; and occupations in the wood and furniture industries. - Unskilled workers: other workers in agriculture, lumbermen and lumberjacks, producer of charcoal, workers in vegetal exploitation and "breakers" of exploitable native products, unskilled mechanic, bricklayers, bricklayer assistants, and other occupations.

cont.

	National Households Sample Research - PNAD		Agricultural Census	Demographic Census
	Aggregate data	Individual data		
Periodicity	Until 1979, the data in this publication were aggregated for the south region. Since then, the available publications are: 1981, 82, 83, 84, 85, 86, 87, 88, 89, 90, 92, 93 and 95.	There are information for 1992, 93, 95 and 96	For the period here analyzed, there is available information for 1970, 1975, 1980, 1985 and 1995/96.	For the period here considered, there is available information for 1970, 1980 and 1991.
Scope	It is a research made through a probability sample of households. For the expansion of the sample an estimate of population growth rate is used considering the last two years when demographic census were made. These data include resident households.	The same methodology of PNAD that shows the aggregate data.	The Agricultural Census applies questionnaires to all farms. The information is obtained directly from the person responsible for the farm administration.	Everybody has been investigated in some aspects ¹ . Other more complex questions were investigated using samples. The expansion of the sample is made through estimates, using weights attributed to people of the same extract.

Notes: (1) household situation, sex, presence condition, conditions in the household, age and literacy. Using samples, the following aspects have been investigated: family structure, religion, color, maternal orphanage, married situation, nationality, internal migrations, school attendance, education level, courses finished, fecundity and mortality.

exclusion of production for self-consumption⁴ underestimates the income in the lowest stratum, at some specific time and can imply a overestimation of the inequality of agricultural income distribution”.

Grossi (1996) showed that the PNAD of 1990 has “overestimated” Parana’s population, because that research was based on samples and considered a projection of the population growth rate according to the Demographic Census of 1980, which was not verified in the ‘80s. Thus, the PNAD of 1990 estimated that Parana had 9.1 million inhabitants, while the Demographic Census of 1991 totaled 8.4 million people. In the rural zone the difference between those publications reached 630 thousand people.

Furthermore, the PNAD is based on a sample of households. The labor force is obtained this way, that is, the amount of potential workers who could be used. A different methodology is used in the Agricultural Census, where questions are answered by agricultural producers and they report effective workers on duty. Thus, in Agricultural Census we have the total working population.

3. Rural population and the Agricultural Production Function

Two different movements can be observed in the State of Parana about the behavior of its rural population. The first one ends at the late ‘60s, when that State was a great labor receiver; and, the second happened after 1970, when there was a reduction of the rural population and an increase in urban population in Parana.

According to Table 1, the rural population of Parana in 1940 totaled 934 thousand people, which represented 75.57% of the total population. In 1970, that population went up to 4,450 thousand inhabitants, having a 376.45% increase in relation to 1940. The main factor which accounted for those high growth rates of rural population at the end of the ‘60s

⁴ Frequently, production by self-consumption is an important part of the real income of small rural producers.

was the expansion of coffee culture, mainly in the new-north region⁵, where most of the coffee was planted.

Table 1- Total, rural and urban population in Parana - absolute and relative values, 1940, 50, 60, 70, 80, 91 and 96 (absolute values in thousands).

Year	Total		Rural		Urban	
	Absolute		Absolute	%	Absolute	%
1940	1,236		934	75.57	302	24.43
1950	2,115		1,587	75.04	528	24.96
1960	4,296		2,968	69.10	1,327	30.90
1970	9,668		4,450	63.60	2,547	36.40
1980	7,750		3,183	41.07	4,567	58.93
1991	8,443		2,250	26.65	6,193	73.35
1996	9,004		1,992	22.12	7,012	77.88

Source: Contagem da População, 1996.

During the '70s, that situation was inverted, and the largest share of the population was living in cities. In 1980, the urban population was 58.93% of the overall population, and the rural population decreased 28.47% from 1970 to 1980. In 1991, the rural zone of Parana had no more than one-fourth of the overall population. The last reaffirmed the process of urbanization in that State during the '80s. And the urbanization expansion went on in the '90s. In 1996, the rural population represented 22.12% of the total population of State of Parana.

It has been noted that the reduction of the rural population was five times higher than the decrease of working people in rural zones⁶ from 1970 to 1980 and 5.4 times more from 1980 to 1991 (according to Parana's Demographic Census of 1970, 1980 and 1991).

The change in the agricultural production function was the main cause of the decrease of the rural population during the '70s.

⁵ According to the Demographic Census of 1980, the main cities in that region are: Londrina, Maringa, Arapongas, Astorga, Cambé, Mandaguaçu, Mandaguari, Marialva, Rolândia, Lobato, etc.

⁶ 10-year-old people or above working in plantations, livestock, forestry, vegetal exploitation, hunting and fishing.

Alves (1997), studying the whole of Brazil and its regions, highlights two reasons for the rural exodus:

- 1 - attraction to the city: working conditions and lifestyle in cities are better than the rural ones, in terms of wages, facilities (schools, medical services, etc.) and public programs; and,
- 2 – expelling forces out of the rural zone: represented by the lack of social infrastructure in rural zone, the lack of opportunities to acquire land and the subsidized credit that conduct to the mechanization of agricultural activities.

According to Alves (1997, p.19), those two forces acted together from 1950 to 1985 causing the rural exodus in Brazil and its regions. After 1985, the same author stands out that the exodus has been caused mainly by the expelling forces than by the other factors. According to his words “*The consolidation of the labor market, more intensive public supervision and an increase in employer/employee disagreements have made the farmers accelerate the substitution of workman by machines*”.

The change in Parana’s agricultural production function caused a reduction in the demand for labor. Istake (1995) estimated agricultural production functions for that State in 1970 and 1985. These are:

For 1970

$$VP_i = 1.97 \cdot PO_i^{0.41} \cdot VB_i^{0.48} \tag{1}$$

For 1985

$$VP_i = 0.08 \cdot PO_i^{0.35} \cdot VB_i^{0.76} \tag{2}$$

Where:

i = indicates the micron region (a group of cities aggregated by IBGE- Brazilian Geographical and Statistical Institute);

VP = value of the production ⁷(Cr\$ thousand in 1970 and CZ\$ thousand in 1985);

PO = people with or without remuneration, but working in farms when the Census was done; and,

VB = Value of capital. It was used as *proxy* for the sum of following values: lands, buildings, permanent plantations, among others, that were registered in December 31 of 1970 and 1985.

The exponential values of labor (PO) and capital (VB) presented in equations (1) and (2) represent the elasticities of production in relation to those variables. Analyzing those coefficients, it can be noted that the importance of capital in the productive process in 1970 was already bigger than the labor one. And, that difference increased in 1985. It shows a larger capital participation in the productive process in relation to the labor contribution. That situation is explained by the substitution of coffee by soybean and wheat plantations. The first has a bigger coefficient of labor occupation per hectare than the other plantations⁸.

4. The evolution and composition of working people in Parana's agriculture according to the Agricultural Census

Over the past two decades, there has been a decrease in the participation of agriculture in generating jobs, as well as a reduction in the percentage of rural population in Parana. According to PNAD data, in 1981 47.58% of working people had jobs in the agricultural sector, 15.44% in the industrial sector and 36.98% in the service sector. In 1995, those shares were 30.81%, 18.93%, and 50.26%, respectively. The inversion between agricultural and service sectors positions regarding the generation of jobs happened in the middle of the '80s.

Table 2 shows the activities executed in Parana's agriculture and their share in working people. It is observed that plantations were the main activity employing people both in 1970 (85.15% of the working

⁷The agricultural census of 1985 was published in 1988, when the Brazilian currency was Cruzado (CZ\$) although the currency in 1985 was cruzeiro (Cr\$).

⁸ According to a research conducted by State of Parana's Agricultural and Food Bureau/ Department of Rural Economics (SEAB/DERAL), those coefficients (indicating the quantity of workers used per day) are: 164.86 in implantation of an intensive coffee plantation, 104.00 in the second year and 388.16 in the third year. For soy plantation that coefficient is 3.71 and for wheat is 0.77.

people in agriculture) and in 1980 (78.87% of the working people in agriculture). The livestock is the second most important activity to employ people in Parana's agriculture: 10.29% in 1970 and 14.89% in 1980 of the working people in agriculture. In 1995 the share of plantations in the total of working people fell down to 58.79% and shares of livestock and mixed farming (i.e., farms conducting plantations and growing animals simultaneously) were 21.18% and 16.44%, respectively.

The reduction of working people on duty in plantations, simultaneously to the expansion of agricultural production, happened for two reasons: change in the sort of plantation and increase of labor productivity. The agricultural production in Parana has been concentrated in soybean, corn and wheat, which demands less labor than the other crops previously more important in that State, such as coffee. Besides, plantations have used more mechanical force than it did in the past (the relationship "quantity of hectare per farm tractor" was reduced by 59% between 1975 and 1995, according to Agricultural Census of Parana). That caused the increase in labor productivity and substitution of labor by other assets.

Table 2 - Growth rate¹ and the working people's share in Parana's agriculture, 1970-95, according to the classes of economic activity

Activities	Growth rate				Share (%)		
	1970-75	1975-80	1980-85	1985-95	1970	1980	1995
Plantations ²	9.76	-23.01	-0.01	-46.91	85.15	78.87	58.79
Livestock	-13.97	53.38	17.89	-14.02	10.29	14.89	21.18
Vegetable crop	103.25	35.04	32.92	138.27	0.13	0.38	1.71
Forestry	-30.27	74.65	20.17	49.55	0.49	0.65	1.64
Mixed farming ³	-65.20	164.38	-26.33	406.36	3.11	3.14	16.44
Others ⁴	173.95	176.51	25.29	-93.39	0.83	2.07	0.24
Total	4.93	-13.05	2.61	-30.59	100.00	100.00	100.00

Source: Agricultural Census of Parana, 1970, 1980, 1985 and 1995.

Note: (1) Growth rate in the period = $\left(\frac{y_{t2}}{y_{t1}} - 1 \right) \cdot 100$, where:

y_{t1} = working people at time 1 and y_{t2} = working people at time 2.

(2) In 1995, working people in temporary and permanent plantations were considered.

(3) Crops are grown and animals are kept on the same farm.

(4) In this item, from 1970 to 1985, were added: poultry culture, rabbit culture, bee-keeping, silkworm culture and vegetal exploitation. In 1995 was considered, besides these activities, the fishing and aquaculture and the production of vegetal charcoal.

According to Table 2, the number of working people in livestock increased from 1975 to 1980 and again from 1980 to 1985. But, in the first five years of the '70s and from 1985 to 1995 there were negative growth rates for working people in that activity (-13.97% between 1970 and 1975, and -14.02% between 1985 and 1995).

During the 25 years here analyzed, the vegetable crop increased the number of people employed, and forestry presented positive growth rates in the number of people employed since 1975.

From 1985 to 1995, the mixed farming went to the activity that had the largest growth rate of people employed into the agricultural

sector, it was 406.36%.

It is also verified in Table 2 that the total number of employment generated in all agricultural activities in the State of Parana decreased considerably from 1985 to 1995 (-30.59%). The latter overcame the relative decrease observed from 1975 to 1980 (-13.05%), when there was a great improvement in the modernization of Parana's agriculture.

In relation to gender distribution in Parana's agriculture, we observed that, according to data from Agricultural Census, women represented 33% of the working people from 1970 to 1985.

Regarding categories of working people in the Parana's agriculture, it is observed that foremen and unpaid members of family are the largest important ones. In 1970, they represented 86% and, in 1995, 76% of all working people (Table 3). That category includes producers and farm foremen, receiving fixed shares or quota-parts of the production, and members of their families who helped them in farming tasks without payment.

Table 3 - Growth rate¹ and percentile participation of the several categories in working people - Parana's agriculture, 1970, 75, 80, 85 and 95.

Categories	Growth rate				Share (%)		
	1970-75	1975-80	1980-85	1985-95	1970	1985	1995
Foreman and unpaid members of the family	-1.31	-18.21	0.42	-28.48	85.61	74.12	76.36
Permanent employees	35.59	7.88	-13.14	-14.70	6.67	9.05	11.12
Temporary employees	35.87	17.69	33.56	-53.34	6.01	13.71	9.22
Partner	133.89	-12.96	-25.14	-51.03	1.24	2.02	1.43
Others	-29.14	-27.26	321.45	18.36	0.47	1.10	1.87
Farms without working people	-17.23	-7.52	1.98	-20.78			
Total	4.93	-13.05	2.61	-30.59	100.00	100.00	100.00

Source: Agricultural Census of Parana, 1970, 1980, 1985 and 1995.

Note: (1) growth rate in the period = $\left(\frac{y_{i2}}{y_{i1}} - 1 \right) \cdot 100$, where:

y_{i1} = working people at time 1 and y_{i2} = working people at time 2.

According to Table 3, it is also verified that temporary and permanent employees have their shares increased from 1970 to 1995. Permanent workers increased from 6.67% of total working people in 1970 to 9.05% in 1985, and to 11.12% in 1995. The shares for temporary workers were 6.01%, 13.71%, and 9.22%, respectively⁹.

As previously observed, the largest drop in the Parana's agricultural employment happened from 1985 to 1995. According to data from Table 3, the categories that had larger relative reductions in the number of working people were temporary employees (-53.34%) and partners (-51.03%). The only category that presented a positive growth rate in that decade was classified as "others", which accounts for all people whose jobs are different from the other groups. The foreman and unpaid members of the family decreased 28.48% and the number of permanent employees decreased 14.70% from 1985 to 1995.

5. Evolution and constitution of Parana's agricultural workers, according to PNAD data

The evolution of working people is again analyzed, but now using annual data from PNAD. We are looking for possible behavior changes that cannot be observed through the data from the Agricultural Census. Furthermore, the PNAD data enables one to analyze the distribution of working people according to performed activities in agriculture more accurately than the Agricultural Census data.

Initially, it is necessary to take into account the following aspects already presented in section 2 about PNAD data:

- a) there was an overestimation of Parana's population in PNAD until 1990, since to that research was based on projections of population growth that were not confirmed;

⁹ However, from 1980 to 1985 the number of permanent workers decreased 13.14%, while the number of temporary workers increased from 1970 to 1985 (see Table 3).

b) in 1992 and 1993 the IBGE enlarged the concept used about the economically active population, incorporating people that worked less than 15 hours per week and incorporating two new categories. Thus, the series of PNAD data was divided in two (see Tables 4 and 5).

From 1981 to 1990, the employment level in Parana's agriculture had a negative growth rate (it was -1.50% per year, according to Table 4). Only the number of self-employed workers had a positive growth rate, 0.91% per year. Unpaid workers had the greatest relative reduction, -3.01% per year; followed by employers, with -2.68% per year (but the last rate was not significant at the level of 10%), and by employees, with -1.65% per year.

According to PNAD data presented in Table 4, the reduction of working people in Parana's agriculture occurred mainly since 1986. Between 1981 and 1985 there was a slight increase in the total number of working people in Parana's agriculture. However, the number of employees and employers was lower. That situation (reduction in the number of employees and a small increase in the total amount of working people between 1981 and 1985) is compatible with the Agricultural Census' results (see Table 3).

The decrease in the number of working people in the Parana's agriculture continued in the following period, from 1992 to 1996. Now, there was a fall in numbers of employers, self-employed and unpaid workers. However, only growth rates of self-employed and unpaid workers were statistically significant. The first was -6.16% per year, and second, -8.89% per year (according to table 5). The number of employees had strong fluctuations in that period.

Table 4 - Categories of working people on duty in the week of reference - agricultural sector of Parana, from 1981 to 1990

Years	Employee	Employer	Self-employed	Unpaid	Total
1981	467,249	56,798	387,688	626,379	1,538,11
1982	430,674	47,089	387,633	669,221	1,524,61
1983	461,580	41,674	376,840	635,686	1,515,78
1984	426,791	31,544	389,639	638,576	1,486,55
1985	426,367	50,166	423,763	662,608	1,562,90
1986	493,166	38,295	380,695	469,566	1,381,72
1987	434,998	26,935	398,522	604,550	1,465,00
1988	365,155	27,035	435,002	481,830	1,309,02
1989	412,712	54,735	413,701	539,309	1,420,45
1990	397,107	42,680	404,066	526,575	1,370,42
Growth rate ¹	-1.65	-2.68	0.91	-3.01	-1.50
Significant at 10%	yes	no	Yes	yes	yes

Source: National Households Sample Research of Parana, from 1981 to 1990.

(1) annual growth rate (β) was calculated making use of $Y_i = \alpha.e^{\beta.t} . u_i$, where: Y_i = amount of working people in each one of categories in agricultural activity, in Parana and; t_i = time, in years

Table 5 - Categories of working people on duty in the week of reference - agricultural sector of Parana, from 1992 to 1996

Years ¹	Employee	Employer	Self-employed	Unpaid worker	Total
1992	347,592	43,885	335,629	538,124	1,265,230
1993	250,316	32,741	311,558	510,705	1,105,320
1995	333,127	32,551	283,137	473,579	1,033,394
1996	334,442	34,575	282,220	410,297	1,061,534
Growth rate ²	1.70	-4.30	-6.16	-8.89	-5.01
Significant at 10%	no	no	yes	yes	No

Source: National Households Sample Research - PNAD, Parana, from 1992 to 1996

Note: (1) PNAD was not published in 1991 due to the last Demographic Census refereed to that year. In 1994 was not made that research.

(2) annual growth rate (β) was calculated making use of $Y_i = \alpha.e^{\beta.t} . u_i$, where: Y_i = amount of working people in each one of categories in agricultural activity, in Parana and; t_i = time, in years

Analyzing the relative composition of working people in Parana's agriculture (Figure 2), we can observe that unpaid workers are more important than the others. It can also be observed an inverse trend between the evolution of employees and unpaid workers.



Figure 2 Share distribution of categories of working people in Parana's agriculture, from 1981 to 1995.

Source: National Households Sample Research of Parana, from 1981 to 1995.

The most important activities employing workers in Parana's agriculture¹⁰ are in Table 6. Corn crop were the most important source of employment for workers in the '90s. That activity represented an average of 24% on average of the people involved in Parana's agriculture.

Cotton and coffee plantations have lost relative importance in relation to other activities in the occupation of workers. Individual data of PNAD from 1992 to 1996, indicate that 70 thousand people working in coffee plantations were redundant. In 1996, cotton plantations employed 125 thousand people less than it did in 1992. That last loss represented 61% of 204 thousand jobs closed in that period¹¹.

¹⁰ It contains plantation, forestry, livestock, vegetal exploitation, fishing and auxiliary services linked to the formers.

¹¹ The last information can be deduced from the last column in Table 5.

Table 6 - Share distribution of working people in Parana's agriculture - 1992, 93, 95 and 96

Rural Activities	1992	1993	1995	1996
Cotton	8.96	4.74	3.62	0.54
Rice	0.43	0.62	1.15	0.40
Coffee	11.19	9.08	5.88	7.75
Sugar-cane	3.45	4.90	4.60	5.68
Tobacco	3.29	2.43	2.49	2.42
Cassava	3.37	4.19	3.51	4.05
Corn	24.66	27.16	19.36	23.73
Soybean	9.61	8.05	8.88	9.04
Wheat	0.77	1.61	0.09	1.33
Vegetable crop	9.04	9.72	7.50	7.41
Forestry	1.35	1.24	1.65	0.96
other plantations	8.61	11.58	16.22	13.41
Breeding of animals	9.19	6.83	13.78	12.62
Poultry culture	5.48	5.65	8.39	6.59
Breeding of bee	-	1.46	1.62	2.05
Mixed farming	0.13	0.16	0.29	1.08
Mate extraction	-	-	0.17	-
Wood production	-	0.41	0.46	0.25
Charcoal production	-	-	0.04	0.07
Herb extraction	-	0.07	0.02	0.05
Agent of workers	0.46	0.10	0.29	0.58
Total	100.00	100.00	100.00	100.00

Source: share calculated using individual data of PNAD

Regarding the reduction in the number of workers employed by cotton farms, it is necessary to take into account the large drop in the area destined to that crop in the whole of Brazil and in Parana during the '90s. It was caused mainly by an increase in the competition between Brazilian and foreign cotton industries and due to a reduction of import tariffs for the latter. Both caused a reduction in the price of imported product¹².

¹² Other facts need to be taken in count, such as: high production cost, scarce of credit, and financial restriction of Brazilian cotton farmers.

¹³ See Istake and Bacha (1999) for more information.

The number of people working with poultry and animal breeding has been increasing. From 1992 to 1996 the first employed more than 18 thousand and the second more than 36 thousand people. Thus, they increased their shares in total of working people (Table 6). Since 1982, poultry culture has had a great expansion in Parana¹³, which explains the increase in the labor used in that activity.

The shares of each categories of labor according to activities into agricultural sector are showed in Table 7. The self-employed represented 21.71%, and the unpaid worker represented 35.80% of the total amount of working people in Parana's agriculture from 1992 to 1996.

¹³ See Istake and Bacha (1999) for more information.

Table 7. Participation of the occupation type in activities developed into the agriculture of Parana - average of 1992, 1993, 1995 and 1996 (values in percentages)

Main activity	Permanent Employee	Temporary Employee	Self-employed in agriculture	Agricultural Employer	Unpaid worker	Worker producing for Self-Consumption
Cotton	2.42	12.87	27.25	5.44	51.15	0.88
Rice	5.02	12.55	20.32	-	36.83	25.28
Coffee	11.11	19.84	21.44	2.83	43.08	1.70
Sugar-cane	34.33	60.41	1.75	1.76	1.76	-
Tobacco	2.60	1.59	30.76	2.60	61.79	0.66
Cassava	3.75	44.41	15.77	3.71	24.02	8.34
Corn	3.29	10.76	33.10	1.12	47.26	4.48
Soybean	12.95	10.21	30.37	8.63	37.35	0.48
Wheat	23.33	13.73	20.11	10.28	32.55	-
Vegetable crop	5.29	3.60	8.17	1.33	14.90	66.70
Forestry	77.20	14.45	0.00	2.40	5.95	-
Other plantations	7.47	9.23	26.18	2.00	46.04	9.08
Breeding of animals	30.03	3.86	16.93	6.73	29.58	12.87
Poultry culture	5.13	8.08	2.08	-	10.37	74.33
Bee-keeping	7.49	8.18	24.72	-	59.60	-
Mixed farming	29.79	12.44	9.54	-	37.66	10.57
Mate extraction	-	-	-	-	100.00	-
Wood production	-	68.40	-	-	31.60	-
Charcoal production	-	100.00	-	-	-	-
Herb extraction	-	-	-	-	100.00	-
Agent of workers	87.77	-	-	-	12.23	-
Total	11.39	13.62	21.71	3.01	35.80	14.47

Source: shares were calculated based on individual data of PNAD.

Corn, the most important activity to take on workers, is based largely on family agriculture. In that activity, self-employed and unpaid workers represented 80.36% of working people from 1992 to 1996 on average.

The unpaid worker has significant importance in a great majority

of activities developed into the agriculture. Only in sugar cane and forestry that kind of worker has a small relative importance. Permanent employees represent 34.33% and temporary ones 60.41% of total working people involved with sugar cane. Temporary employees had also a great importance in tasks linked to the wood production and cassava (according to Table 7). The importance of permanent employees was bigger in forestry, animal breeding and mixed farming. In the last activity, permanent employees have not been the main source of labor.

6. Skill of workers involved with Parana's agriculture

Using the information of Brazil's Demographic Census, one can observe more details about the skill of working people in agricultural activities (including also vegetal exploitation and forestry).

Table 8 shows the education level of workers involved in Parana's agriculture in two specific years: 1970 and 1991. There was a decrease in the relative importance of workers who had completed elementary school (maximum of four years of education). They were 97.57% of working people in Parana's agriculture in 1970 and dropped to 82.77% in 1991. On the other hand, workers with higher education levels have increased their relative importance. The amount of workers with middle and high school levels rose from 2.35% and 0.07% in 1970 to 11.40% and 5.4% in 1991, respectively. However, most of the agricultural workers still have low education levels. In 1991, over 82% of workers had only elementary education.

Table 8 - Education level of agricultural workers – State of Parana in 1970 and 1991

Education Level	1970		1991		1970-91
	Absolute	%	Absolute	%	Growth rate
Elementary	143,009	97.57	369,941	82.77	160.68
Middle school	3,443	2.35	50,969	11.40	1,388.58
High school	106	0.07	24,115	5.40	22,650.00
College	7	0.00	1,948	0.44	27,728.57
Total	146,565	100.00	446,973	100.00	207.30

Source: Demographic Census of Parana, 1970 and 1991,

Note: elementary, middle, and high school levels contain people with at most four, eight, and eleven years of education, respectively.

Considering the great reduction in number of working people in Parana's agriculture, the increase in the education level would imply that unemployment affected people with low education levels more severely.

Information from the Demographic Census and individual data of PNAD have been again used to verify the skill¹⁴ of workers take on by agriculture and their . Those information are in Table 9. They have been divided in two groups: the first contains workers with large skill and the second one contains workers with little skill.

¹⁴ It is considered qualified the occupation requiring some skill.

Table 9 – Share distribution of workers with large and little skills in agricultural activities (including forestry and vegetal exploitation) - Parana, 1970, 1980 and 1991

Worker type	1970	1980	1991
<i>Worker with larger skill</i>	<i>1.66</i>	<i>5.94</i>	<i>6.58</i>
Administrators in agriculture	0.56	1.42	1.54
Auxiliary of office and administration	0.06	0.11	0.23
Agronomist	0.00	0.01	0.04
Veterinary-surgeons	0.00	0.01	0.02
Agricultural technician	0.02	0.05	0.11
Drivers of farm tractor/ other operators	0.74	3.73	3.74
Drivers	0.24	0.47	0.43
Occupation in wood and furniture industries	0.04	0.15	0.48
<i>Workers with little skill</i>	<i>98.34</i>	<i>94.06</i>	<i>93.42</i>
Woodworkers and woodcutters	1.06	0.44	1.03
Producer of charcoal	0.01	0.05	0.15
Person who cut mate	0.05	0.16	0.14
Pickers, cutter and breaker of vegetal products	0.12	0.03	0.23
Unskilled Mechanic	0.00	0.04	0.03
Bricklayer	0.01	0.04	0.03
Bricklayer assistant	0.02	0.03	0.03
Other workers in agriculture	97.07	93.27	91.79
<i>Total</i>	<i>100.00</i>	<i>100.00</i>	<i>100.00</i>

Source: Demographic Census of Parana, 1970, 1980 and 1991.

In the past three decades, the shares of people with larger skills into the total working people in Parana's agriculture have increased. They were 1.66% in 1970, 5.94% in 1980, and 6.58% in 1991. The main categories inside that group are administrators in agriculture and drivers of farm tractor and other operators. In 1970, they represented 0.56% and 0.74% of the total amount of working people in agriculture, respectively; rising to 1.54% and 3.74% in 1991, respectively.

Workers with little skill have lost importance, dropping from 98.34% in 1970 to 93.42% of the working people in Parana's agriculture in 1991. Inside that group, "other workers in agriculture" is the most important category, representing 97.07% of total working people in 1970, and 91.79% in 1991.

That last category (“other workers in agriculture”) includes: owners of small farms near town, people working in country hotels, florists, gardeners, manual workers (mainly making use of a hoe), cowboys and agricultural autonomous producers. It has not been possible to separate those categories because changes occurred in the way of variables were aggregated in the Demographic Census of 1970, 1980 and 1991. The only affirmative that can be made is that manual workers were 94.69% of workers with little skill in 1970 (according to the Demographic Census of that year).

Using the data of PNAD it is possible to analyze the recent evolution of agricultural worker’s qualifications in Parana. In Table 10 there is a share distribution of workers according their occupation in agriculture, in the week of reference, from 1992 to 1996. Among several categories, the most important are: agricultural employer, self-employed farmer, agricultural operator, and rural worker. The latter is the most important along with self-employed farmer (that is part of family agriculture).

Table 10 - Share distribution of occupations exercised during the week of reference in Parana's agriculture - 1992, 1993, 1995 and 1996

Occupation in the week of reference	1992	1993	1995	1996
Agricultural employer	2.79	2.29	3.00	2.4
Grower of small animals	0.12	0.04	0.04	0.1
Grower of animals	0.08	-	0.13	0.2
Agricultural manager	0.36	0.49	0.61	0.6
Administrative assistant	0.17	0.06	0.06	-
Agronomist	-	-	0.10	0.0
Self-employed farmer	22.40	21.63	20.28	22.4
Agricultural technician	0.09	0.04	0.17	0.0
Agricultural operator	4.08	3.07	3.99	4.6
Rural Worker not linked to a specific crop	67.38	70.24	68.80	66.7
Rural Worker linked to small animals	0.04	0.21	0.17	0.2
Rural Worker linked to fishing	0.58	0.41	0.85	0.7
Rural Worker linked to wood production	0.58	0.21	0.21	0.1
Rural Worker linked to firewood production	0.18	0.40	0.30	0.3
Rural Worker linked to charcoal production	-	-	0.04	0.0
Rural Worker - collector	0.25	-	0.13	-
Woodcutter	-	0.08	0.04	-
Driver	0.15	0.22	0.25	0.5
Guard	0.08	-	0.10	-
Bricklayer assistant or cleaner	0.04	-	0.04	-
People who rent agricultural machines	0.04	-	0.04	-
General Assistant	0.23	0.49	0.42	0.3
Others	0.36	0.12	0.21	0.1
Total	100.00	100.00	100.00	100

Source: shares were calculated based on individual data of PNAD.

Keeping our attention just on employees, we can observe that rural workers (not linked to a specific crop) represent 68%, on average, of the total amount of occupations, followed by agricultural operator, with 4% of the total amount of working people. Rural workers refer to the lowest qualified labor in agriculture. That category includes manual workers, workers using only a hoe, herdsmen, harvester (such as cotton, sugar cane, coffee, banana, tobacco, etc.), cutter, people taking care of animals, daily workers, among others. An explicit downward trend in the relative employment of that kind of worker has happened since 1995.

The agricultural operator presents more skills than the rural

worker. That category includes: farm tractor drivers and operators of several agricultural machines (such as harvester, incubator, among others). An increase in the relative employment of that category has been verified since 1995.

The last two verifications indicate the continuity in the advance in the use of skilled people in Parana's agriculture during the '90s.

Table 11 gives more information about the relationship among agricultural operators, rural workers and farmers in the '90s. Mostly, agricultural operators are unpaid or permanent workers. On the other hand, most of the rural workers are unpaid workers, followed by workers producing for self-consumption, temporary and permanent workers.

Table 11- Agricultural operators and workers in Parana according to their situation - 1992, 1993, 1995 and 1996 (values in percentage)

Situation	1992		1993	
	Operator	Worker	Operator	Worker
Permanent employee	34.05	11.67	48.08	10.53
Temporary employee	8.51	17.23	12.02	18.75
Unpaid worker	49.58	50.15	34.72	49.20
Worker producing for self-consumption	7.03	20.07	1.34	20.18
Others ¹	0.83	0.88	3.85	1.33
Total	100.00	100.00	100.00	100.00

Cont.

Situation	1995		1996	
	Operator	Worker	Operator	Worker
Permanent employee	31.92	10.81	34.87	14.09
Temporary employee	11.70	16.83	11.62	20.00
Unpaid worker	52.13	47.55	49.28	45.53
Worker producing for self-consumption	1.06	22.65	0.00	19.04
Others ¹	3.19	2.16	4.23	1.34
Total	100.00	100.00	100.00	100.00

Source: shares were calculated based on individual data of PNAD.

Note: (1) it contains: permanent employee in auxiliary service and other activities; self-employed workers in auxiliary service, agriculture and another activities; agricultural employees in other activities; and, other unpaid workers.

7. Conclusion

Over the past two decades, the rural population has decreased in the State of Parana. Simultaneously, plantations have diminished their share in working people with respect to other activities in Parana's agriculture. Notwithstanding, plantations are still the most important activity employing people in Parana's agriculture.

From 1985 to 1995, rural employment was reduced by 30.59%, which was the major one in entire period here analyzed. That reduction was bigger than the one occurred in '70s. The latter was caused by the agricultural modernization process.

Self-employed and unpaid workers answered for most part of the working people in Parana's agriculture. In the '90s, those categories together represented 57% of the total amount of working people, according to individual data from PNAD. This implies that it is necessary to formulate public policies to stimulate plantations and other activities which support people in rural zones avoiding their moving to big cities or becoming part of the homeless group. Public policies need also to take into account families which have insufficient amount of land in order to obtain their subsistence.

Corn was the most important plantation employing people in the '90s. It has been conducted by self-employed and unpaid workers, which are responsible for 80% of the working people in that crop. Those kind of workers are part of family agriculture. In the '90's, cotton went through an economic crisis which brought about the State's biggest dismissal. In recent years, cotton, soybean and corn have mainly been grown in the Midwest of Brazil, because that region has comparative advantages.

In Parana's agriculture an increase in the demand for skilled workers has been taking place and that has resulted in a higher share of that kind of worker into the total amount of working people. On the other hand, there has been a decrease in the amount of unskilled workers. That fact implies that public policies investing in human assets are

necessary, such as: rural extension services and better elementary schools. Those kinds of instruments are essential to adapt rural labor of modern agriculture.

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