



***Evolution of poverty and income distribution among Brazilian agricultural workers and families: an analysis by gender between 1992 and 2007***

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**Abstract**

This paper investigates changes in income composition, income distribution and poverty in Brazilian agriculture by gender between 1992 and 2007. A series of variables, including personal characteristics such as education, occupation, activity sector and sources of income are considered. In particular, it aims to contrast the evolution of differences by gender and to check if they have decreased over time. Logit models are adjusted to support the investigation of poverty determinants. Data used come from the National Household Sample Survey (PNAD) from 1992, 1999 and 2007 and the analysis is developed for five Brazilian geographic regions.

**Key words:** Poverty, Income distribution, Gender, Agriculture

## 1. Introduction

Brazil is a country of contrasts: it is rich in natural resources, but with a large portion of its population being poor. According to the 2007 data, national per capita income was US\$7 220, which places the country among the middle-income economies. Nevertheless, according to the average household income, 43.7 million people, or 23% of the Brazilian population, can be considered poor and 8% live in extreme poverty (IPEADATA, 2009). From a historical perspective, its economic development occurred while a large portion of the population did not participate in the benefits of growth. Nowadays, perverse asset and income distribution and regional disparities are considered the principal causes of poverty in the country.

Empirical evidence shows that poverty has decreased slowly since the onset of the 90s and inequality, which was extremely high and stable during the 90s, fell slightly between 2001 and 2005 due to a relatively higher growth of the poor income (Ferreira *et al.*, 2006; Hoffmann, 2007; Barros *et al.*, 2007; Neri, 2007). Differently from previous periods of falling poverty rate (i.e. during the 70s and mid 90s, immediately after the Plano Real), the recent one is mostly due to the reduction in income inequality (Barros *et al.* 2007; Neri, 2007).

In spite of the improvement in poverty and inequality levels, the proportion of poor in Brazil is still high compared to that in other countries with a similar per capita income. Furthermore, income distribution places Brazil among the most unequal countries in the world (Barros *et al.*, 2007).

For agriculture, recent evidence shows that labour income<sup>1</sup> increased between 2002 and 2006, while income inequality fell. A diversification of sources of income was also observed with the extension of social security to include rural workers – as pensions and retirement benefits – and income transfers, particularly in favor of the poorest groups of the rural population. Pluriactivity, another possible pathway out of rural poverty, has meant low-quality rural non-agricultural jobs in Brazil. Presently, its impact on poverty seems to be quite restricted (Kageyama, 2008).

Nowadays, poverty is a crucial question in rural Brazil, as it affects about 65.1% of the rural population, according to Kageyama and Hoffmann (2007). In that study, using data for 2004, it was also found that 2.8 million people lived in extreme poverty (9.2% of the total rural population) and 81.1% of the poor suffered from food insecurity. The odds for severe food insecurity were higher when the household head was female (about 50% higher) or black (about 40% higher). More specifically, for those occupied in Brazilian agriculture (rural and urban residents), Corrêa and Figueiredo (2007) found an increase in household per capita income between 2003 and 2005 and a reduction in poverty, for both rural and urban residents. Income inequality decreased in all regions, except the state of São Paulo – the richest state in Brazil – and the Centre-West states – an agricultural frontier region.

Facing falling poverty and inequality in Brazil, recent investigations deal with the relationships between economic growth, poverty and income distribution and the

determinants of poverty and income distribution. The objective of this study is to investigate poverty and its relationship to gender in Brazilian agriculture from a regional perspective. Recent economic development in Brazil, mostly due to economic stabilisation and commercial opening during the 90s and the process of agricultural modernisation in this decade, has determined relevant transformations in the agricultural labour market. In this context, female participation and gender discrimination are key features.

Before defining in detail our objectives, it is important to address the concept and measurement of poverty. Poverty is a multi-dimensional phenomenon, embracing lack of resources, capabilities or freedoms. In this study, poverty is restricted to income insufficiency. Therefore, we focus on per capita family income, and a poverty line based on minimum wage will be used to classify individuals as poor. Many authors may consider different variables and/or methods to define poverty and poverty lines,<sup>2</sup> but it is unquestionable that income is to most the primary determinant of life conditions in modern societies.

Feminisation of poverty can be considered the tendency of poverty to become more feminised. As stated by Medeiros and Costa, “...*the feminisation of poverty is a change in poverty levels that is biased against women or female-headed households*. More specifically, it is an increase in the difference in poverty levels between women and men, or between households headed by females on the one hand and those headed by males or couples on the other” (Medeiros and Costa, 2008:1).

The present study investigates changes in poverty levels in Brazilian agriculture between 1992 and 2007, observing individuals occupied in agriculture as well as female-headed families and male-headed families. As far as feminisation of poverty is concerned, changes in poverty indexes will be studied to verify if they are biased against female workers and female-headed families.

Our hypothesis is that in spite of gender discrimination, i.e. a higher poverty rate and lower income levels for female-headed families, the modernisation process has led to a “defeminisation” of poverty among Brazilian agricultural workers. In other words, we expect substantial improvements among female-headed families and female workers.

### ***Primary purposes***

Using data for 1992, 1999 and 2007, the primary objective of this study is to analyse changes in income composition, income distribution and poverty in Brazilian agriculture by gender. First, agricultural workers are investigated with the aim of (1) describing socioeconomic and demographic characteristics of female and male agricultural workers; (2) analysing labour market participation of women by occupational group, i.e. employer, self-employed worker and employee; (3) studying labour relations changes by gender, focusing on informality; and (4) estimating by logit model the odds of being poor for agricultural workers, considering

factors like age, gender, color/race, education, occupation etc..

Then for agricultural families (i.e. those whose head of family's primary source of income is agriculture who live in rural or urban areas) income distribution and poverty will be investigated in order to identify differences by gender of the head of family as well as changes in the same.

## 2. Methods and Sources

### *Data*

Data used come from the National Household Sample Survey (PNAD) for 1992, 1999 and 2007, conducted by the Brazilian Institute of Geography and Statistics (IBGE). Annually, the PNAD surveys various demographic, economic and social characteristics of the Brazilian population, based on a probabilistic household sample, which may be expanded by specific weights – personal, family or household – , to describe different groups.

As any survey data, the PNAD has some limitations. Specifically for studies on income, inequality and poverty, the primary restrictions are (1) income understatement, particularly in the higher income strata, a common situation in any country surveys based on interviewee declarations, which can lead to the underestimation of income and income inequality; (2) missing variables related to personal or family assets, which restrains the assessment of the effect of physical capital on individual income; (3) missing questions to survey several income sources, such as the 13th salary and non-monetary benefits (for housing, transport, education, health, etc.); and (4) lack of information on profit and business participations, commissions, prizes and rewards.<sup>3</sup>

According to IBGE criteria, labour is any activity developed by individuals, including entrepreneurs. Labour earnings include monetary and non-monetary earnings from a primary job, a secondary job and other jobs. IBGE also surveys other sources of income such as retirement benefits (official and private), pensions (official and private), rent, interest, government transfers, donations, etc. In the case of production for own consumption, it is necessary to estimate the correspondent value. Since this was not done for the years 1992 and 1999, this item was not included in our analysis.

### *Sample and unit of analysis*

The analysis is developed for four Brazilian geographic regions, the Northeast, the Southeast excluding the state of São Paulo, the South, the Centre-West with the state of Tocantins and the state of São Paulo. The state of São Paulo deserves a separate analysis because its level of development is even higher than that of the other states in the Southeast region. Since the PNAD does not survey the rural population in the northern states of Brazil, the North is dropped from our study. The state of Tocantins, the only northern state for which rural data are available, was included into the Centre-West, the region to which it belonged until 1988.

Two population samples will be investigated: (a) economically active people whose primary activity is in agriculture; (b) agricultural families, whose head of family works in agriculture.

In the first sample, the unit of analysis is the economically active person, whose primary activity is in agriculture, including fishing and forest resource exploration. This group includes both rural and urban residents working in agriculture. Because we are interested in labour income, the sample is limited to those who declared positive total labour earnings.<sup>4</sup> According to Hoffmann (2004), when studying labour market income distribution, the proper decision would be to consider only the labour earnings (Hoffmann, 2004 in Corrêa and Figueiredo, 2006:10). Another reason is that labour earning plays an important role in determining total income. For instance, according to the 2007 sample, earnings from primary occupation represent more than 87% of total income for agricultural workers.

Individuals who belong to agricultural families constitute the second sample unit. Poverty and inequality measures will be analysed, comparing families according to the gender of the head of family. In addition, the head of family profile will be discussed.

The analysis will be developed comparing results by gender, place of residence (rural or urban area) and the above-mentioned Brazil regions.

Basic samples sizes, expanded by the specific PNAD weights, are presented in Table 1.

**Table 1.** Samples size, Brazil, 1992, 1999 and 2007 in thousands.

Year	Sample 1: Agricultural workers <sup>(1)</sup>	Sample 2: Persons from agricultural families <sup>(2)</sup>	Sample 3: Female-headed families
1992	9 216.0	41 410.0	1 260.6
1999	8 841.6	39 084.7	1 364.2
2007	8 325.5	25 966.7	685.1

Source: PNAD 1992, 1999 and 2007.

<sup>(1)</sup> economically active person, whose primary activity is in agriculture.

<sup>(2)</sup> Agricultural family, where the main occupation of the head of family is in agricultural activities.

### ***Income, distribution and poverty measures***

Income values are presented as multiples of the minimum wage. To guarantee comparability over the years, these values were deflated by the INPC (National Consumer Price Index) controlling for the purchasing power of the minimum wage, according to Corseuil and Foguel (2002). These criteria are broadly used in studies on Brazilian poverty (see Hoffmann, 2005; Helfand and Levine, 2006).

Inequality is measured by the Gini and L-Theil coefficients, according to Hoffmann (1998). The former is more sensitive to regressive transfers around the median income, while the latter is more reactive to regressive transfers within the lower incomes (Hoffmann, 1992, p. 303). Inequality will be measured using *per capita* individual total labour earnings and *per capita* family income for individuals and family samples, respectively.

Poverty is measured using the Foster, Greer and Thorbecke class of indexes: FGT(0), FGT(1) and FGT(2), according to Hoffmann (1998). Two poverty lines were calculated: (1) poverty line, corresponding to half the minimum wage; and (b) indigence line, which is one-fourth the minimum wage<sup>5</sup>. Minimum wage values used for calculating poverty lines were adjusted, following the above-mentioned methodology. Poverty measures were calculated based on family per capita income, considering that family plays an important role in income redistribution among its members. To calculate family income, only family members were selected, i.e. aggregates, servants and their relatives living in the household and other persons not belonging to the family were excluded from our sample.

### ***Method***

An exploratory analysis, based on descriptive statistics, was developed for the following socioeconomic variables: education, occupation, activity sector and formal labour along with income sources, poverty and inequality.

Next, logit models, described by McCullagh and Nelder (1989), were adjusted to investigate some agricultural poverty determinants to identify those most likely to explain chances of Brazilian agricultural workers being poor.

If  $P_i$  is the probability of the  $i^{th}$  agricultural worker being poor and  $x_{hi}$ , ( $h = 1, \dots, k$ ) are  $k$  explanatory variables, then the logit model is expressed by the equations:

$$P_i = \frac{1}{1 + \exp(-y_i)} \quad (1)$$

$$y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki} \quad (2)$$

This model can be expressed by the equation:

$$\ln \frac{P_i}{1-P_i} = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki} \quad (3)$$

If the value of one variable, for example  $x_1$ , increases by one unit, keeping all other variables constant, the value of  $\ln[P_i/(1 - P_i)]$  changes by  $\beta_1$ . This corresponds to multiplying the ratio  $[P_i/(1 - P_i)]$  by  $\exp(\beta_1)$ , which is the odds ratio associated with the variable  $x_1$ .

For each explanatory variable, the odds ratio represents the factor by which the odds of being poor change for a one-unit change in the independent variable. If the odds ratio is less than one, the factor or independent variable reduces the odds of being poor. If the odds ratio is more than one, the independent variable increases the odds of being poor. If the odds ratio is one the factor has no effect.

The quality of the adjustments can be evaluated by observing the percentage of correct predictions, i.e. the overall percentage of predictions given by the model that matches the observed value of the dependent variable.

Under this condition and considering a canonical relation (by the logarithms), the logistic regression model given by equation (3) above was adjusted. The dependent variable is the natural logarithm of a binary variable, which is one if the person is poor and zero, if not. The dependent variables (co-factors) included in the model are

$X_1$ (FEMALE)	binary variable for gender that is one for women;
$X_2$ (AGE_ 60)	binary variable for age that is one for persons 60 years old or more, in order to investigate if the odds of being poor are greater for the elderly;
$X_3$ (WHITE)	binary variable for color/race that is one for blacks, “pardos” or natives and zero for whites or Asians;
$X_4$ (EDUCATION)	number of years of schooling;
$X_5$ (SLOPE_EDUC)	slope binary variable to evaluate the income return to high level of education (more than nine years of schooling). $X_5 = 1 * X_4$ if $X_4 > 9$ or $X_5 = 0 * X_4$ if $X_4 \leq 9$ ;
$X_6$ (ILLITERATE)	binary variable that is one if the person is illiterate and zero if not;
$X_7$ (FAMILY_REF)	binary variable that is one if the person is the family reference (head of family) and zero if not;
$X_8$ (EMPLOYER)	binary variable for occupational position of primary labour which is one for employer or self-employed and zero for employee;
$X_9$ (INFORMAL)	binary variable to evaluate formal labour, which is zero if the worker contributes to a social security institute and one if not;
$X_{10}$ (RURAL)	binary variable related to family residency, which is one if the

	person lives in a rural area and zero if in an urban area;
$X_{11}$ (SOUTHEAST)	binary variable that is one if the person lives in the Southeast region;
$X_{12}$ (SAO_PAULO)	binary variable that is one if the person lives in the state of São Paulo;
$X_{13}$ (SOUTH)	binary variable that is one if the person lives in the South region;
$X_{14}$ (CENTRE-WEST)	binary variable that is one if the person lives in Centre-West region or the state of Tocantins <sup>6</sup> ;

To adjust the logit models, data samples were revised in order to eliminate missing values of the model variables. Basically there were missing values for the following variables: color/race, age and schooling.

### 3. Agricultural workers in Brazil: 1992, 1999 and 2007

#### *Demographic and socioeconomic characteristics of agricultural workers*

In 2007 about 16.6 million people of Brazil's economically active population had agricultural activities as their primary occupation. This number had been relatively stable since the previous decade: there were 18.5 million people in 1992 and 17.4 million in 1999. Considering the four selected regions and a consistent sample of workers with positive total labour earnings we find that 8.3 million people of the economically active population had their primary occupation in agriculture in 2007, 8.8 million in 1999 and 9.2 million in 1992. Due to an incomplete data, these numbers do not include the North region (where an intense process of agricultural expansion is underway).

It is important to notice that starting in the 1960s Brazilian agriculture has experienced a continuous process of modernisation, responsible for setting the basis for the current success of agribusiness. Favourable conditions for commodities in international markets during the last decade as well as the expansion of sugar cane cultivation – as part of a government policy of fossil fuels substitution by renewable sources such as ethanol – contributed towards an acceleration of modernization process. The most dramatic consequences for rural employment occurred between 1960 and 1980, resulting in a sharp decline in the rural population. As the modernisation process evolved, not only rural workers were displaced, but farm workers in general, both urban and rural residents. In the state of São Paulo, for example, mechanisation of sugar cane cultivation and more efficient organisational arrangements resulted in fewer jobs available for less skilled workers (Camargo, 2007, apud Kageyama, 2008).

Considering the sample of workers whose primary occupation was in agriculture, we found a decline of almost 900 thousand men and women between 1992 and 2007 (about a 10% decline). Women's participation declined from 33.9% in 1992 to 32.1% in 2007.

Table 2 summarises some characteristics of this sample, according to workers' gender. A discussion about income, poverty and distribution will be provided later.

Women's engagement in agricultural activities as their primary occupation was near 14% in the years analysed. But the number declined by 9.6%, the same percentage observed for male workers. At the same time, female participation in the labour market as a whole increased by 65%. These contrasting results may indicate a preference for non-agricultural activities. Another interesting point is the increase in the participation of women in the richest regions (South, state of São Paulo and Centre-West) and the decline in the poorest.

**Table 2.** Socioeconomic and demographic characteristics of agricultural workers by gender. Brazil, 1992, 1999 and 2007.

	Female				Male			
	1992	1999	2007	% Diff.	1992	1999	2007	% Diff.
Number (in thousands)	1	1	994.8	-9.6	8	7	7	-9.7
Age	38.7	40.4	41.4	6.9	38.3	40.3	41.2	7.5
Family reference (%)	29.7	30.7	35.0	17.8	74.7	78.6	76.3	2.2
Formal education (avg)	1.9	2.4	3.9	106.7	2.3	2.7	3.7	59.0
Illiteracy rate (%)	46.7	41.4	25.8	-44.8	37.9	34.2	26.7	-29.7
Informality %	88.6	85.2	69.7	-21.3	82.6	80.2	73.2	-
Labour hours/week (avg)	38.8	36.9	36.0	-7.1	49.3	47.9	45.0	-8.7
Place of residence								
Rural (%)	67.4	72.4	61.8	-8.4	68.9	69.8	65.2	-5.4
Urban (%)	32.6	27.6	38.2	17.3	31.1	30.2	34.8	12.0
Region								
Northeast	50.4	54.7	46.1	-8.5	40.7	45.1	45.8	12.4
Southeast, excluding São	14.8	14.1	14.3	-3.2	20.2	19.1	18.2	-9.9
South	16.2	14.1	18.7	15.3	18.6	16.6	16.7	-10.4
Centre-West and Tocantins	4.4	4.6	5.7	30.5	10.0	10.2	10.5	5.5
State of São Paulo	14.2	12.5	15.1	6.6	10.5	9.0	8.9	-15.9

Source: PNADs 1992, 1999 and 2007.

Looking at the area of residence, we observe a 17.3% increase in female urban residents engaged in agricultural activities and a decline in female rural residents. These dynamics may be part of the urbanization process under way in Brazilian society as well as the expansion of pluriactivity among rural families. Women who recently migrated to urban areas may continue to work in agriculture, most probably in formal agricultural jobs; women living in rural areas may seek better wages in the urban areas.

An ageing process was observed for both groups, explained in part by population dynamics and in part by young people's preference for working in sectors other than agriculture, as has been observed for several traditional activities. Women also expanded their participation as family reference as part of the family profile changes, with a larger number of single female-headed families.

About 60% of the farm workers declared themselves as blacks or “pardos” in 2007. In the same survey, 50% of the total Brazilian population was black or “pardo”.

Formal education is extremely low: men had on average 3.7 years of schooling and women 3.9 years in 2007. This result is far below the national average of seven years.<sup>7</sup> Formal education improved and illiteracy declined for both sexes, but more sharply among women (female illiteracy fell by 44% in 15 years).

Most agricultural jobs are informal – only 30% of women and 27% of male workers had a formal job – as clear evidence of how precarious the working conditions in Brazilian agriculture are. The proportion of female workers in the informal labour market declined from 88.6% to 69.7% (21%). In 2007, the proportion of women in the formal labour market was greater than that of men.

Working hours decreased for both groups, partly due to the effects of the 1988 Constitution which made labour social security rights universal by extending to rural workers the rights already enjoyed by urban workers. Considering the time spent in all the jobs that the individuals have, we found that women work about 9 hours a week less than men. At the same time, according to the PNAD 2007, they dedicated 22.2 hours per week to household duties, while men spent only 9.6 hours per week, suggesting a very exhausting labour week for women.

Considering the number of persons working in agricultural activities as their primary occupation, we found a decrease of 785.4 thousand men and 105.2 women’s between 1992 and 2007, while women participation as employers and self-employed increased (Table 3), suggesting that they are assuming command positions in Brazilian agriculture, while men find occupations in other sectors. It will be interesting to observe what will happen in the forthcoming years. Will the family stay in the agriculture sector with the expansion of part time jobs? Or will a renewed rural exodus be observed in Brazilian agriculture?

Overall Tables 2 and 3 indicate that women improved their relative positions in all the principal items: illiteracy and informality declined more rapidly in this group and they increasingly occupied positions of responsibility in family and agricultural enterprises.

**Table 3.** Occupational position by gender in Brazilian agriculture. 1992, 1999 and 2007.

	<b>Employer</b>		<b>Self employed</b>		<b>Employee</b>		<b>Unpaid employee</b>	
	Number	%	Number	%	Number	%	Number	%
<b>Female</b>								
1992	29 654	2.7	454 461	41.3	601 882	54.7	13 975	1.3
1999	25 064	2.3	526 450	49.2	495 376	46.3	22 597	2.1
2007	31 074	3.1	457 086	45.9	497 107	50.0	9 518	1.0
□ 92-07	1 420		2 625		-104 775		-4 457	
□ 92-07	4.8		0.6		-17.4		-31.9	
<b>Male</b>								
1992	495 401	6.1	3 304 380	40.7	4 303 703	53.0	12 581	0.2
1999	414 548	5.3	3 571 408	46.0	3 755 798	48.3	30 383	0.4
2007	338 529	4.6	3 061 875	41.8	3 920 935	53.5	9 351	0.1
□ 92-07	-156 872		-242 505		-382 768		-3 230	
□ 92-07	-31.7		-7.3		-8.9		-25.7	

Source: PNADs 1992, 1999 and 2007.

#### *Income evolution by gender*

Female per capita income increased in real terms by 66.4%, considering all sources and by 53.7% considering primary job earnings only, in this case, agriculture (Table 4). The reduction in difference in male and female earnings may be related to better education and engagement in the formal labour market. Also a possible convergence of urban and rural wages as a consequence of urbanisation should be considered. A previous study showed that between 1992 and 2006 rural and agricultural income increased more rapidly than urban and non-agricultural income, pointing to a possible positive effect on the Brazilian income distribution (Figueiredo *et al.*, 2008). Our results show a similar slow convergence between male and female earnings in agricultural activities.

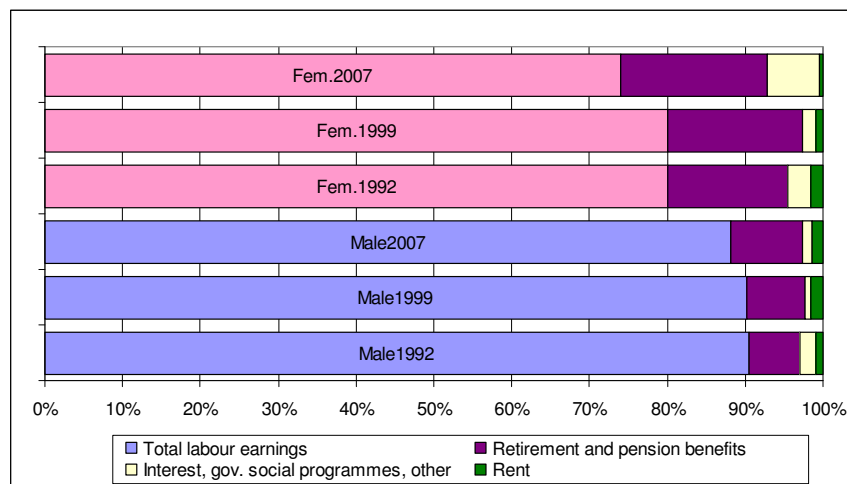
**Table 4.** Farm workers average earnings by gender and place of residence. Brazil, 1992, 1999 and 2007 (minimum wage)<sup>8</sup>

	<b>Primary job (agriculture)</b>	<b>All labour sources</b>	<b>All sources</b>	<b>All labour sources, urban residents</b>	<b>All labour sources, rural residents</b>
<b>Female</b>					
1992	0.68	0.70	0.87	0.94	0.58
1999	0.75	0.77	0.96	1.16	0.62
2007	1.04	1.07	1.45	1.26	0.95
□ % 1992-2007	53.70	53.70	66.40	34.69	64.04
<b>Male</b>					
1992	1.38	1.44	1.60	1.87	1.26
1999	1.37	1.45	1.61	1.90	1.25
2007	1.68	1.75	1.99	2.09	1.57
□ % 1992-2007	21.00	21.30	24.40	12.20	25.14

Source: PNADs 1992, 1999 and 2007.

In spite of this progress, there is still evidence of gender discrimination given that female labour earnings averaged 61% of male's, when considering only the primary job. When focusing on all sources of income, female incomes reached, on average, 73% of male incomes, mostly due to pensions, retirement benefits and an item that includes interest payments, dividends, government social programme benefits directed at the family (most of which are cash transfers paid directly to women).<sup>9</sup> Figure 2 shows the composition of personal income, according to its principal components. It is worth noting the weight of the component that includes cash transfers to female workers in 2007.

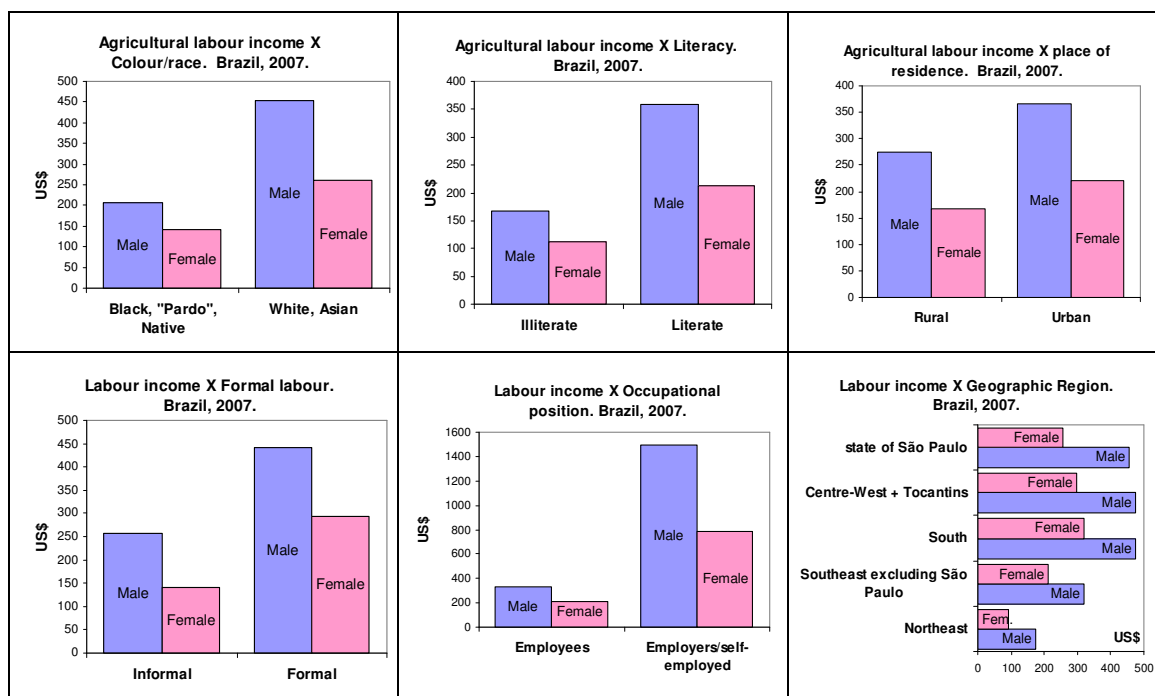
**Figure 1.** Composition of farm workers' income by gender. Brazil, 1992, 1999 and 2007.



Source: PNAD 1992, 1999 and 2007.

To better understand income distribution, a deeper analysis can be undertaken. First of all, *ceteris paribus*, women have always received a lower labour income in agriculture. Being illiterate implies a cut of 50% in their labour earning. (Figure 2) The same difference exists between blacks, “pardos” and natives and whites and workers of Asian origin. When engaged in the formal labour market, women’s average earnings are more than doubled. The most significant differences are found between employer/self-employed incomes and employee earnings, suggesting that working as an employer or being self-employed, women can find a way out of poverty. Regional differences are also very sharp – women’s average earning in the Northeast is as much as US\$90 a month, while that in the South is twice as high. By these results it is clear that in spite of improvements during the last 15 years, much more has to be done to lessen gender inequality in Brazilian agriculture.

**Figure 2.** Farm workers average income according to some socioeconomic and demographic categories and gender. Brazil, 2007

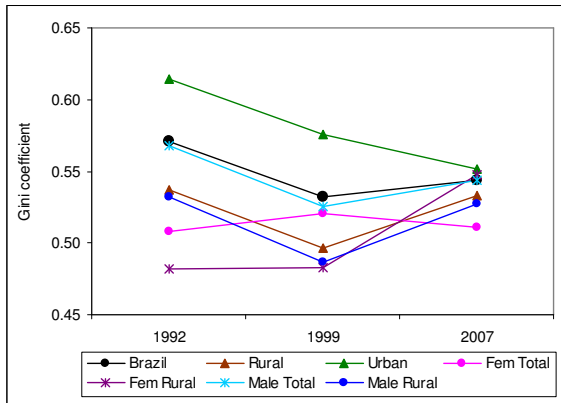


Source: PNAD 2007.

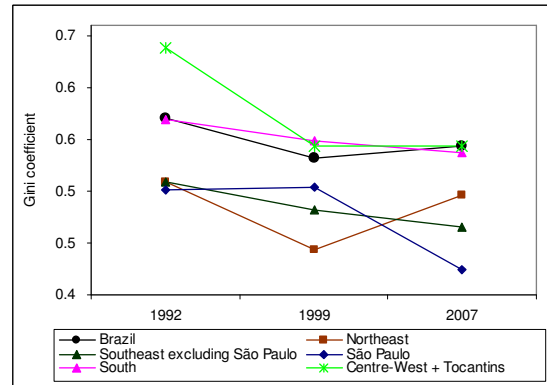
### *Income distribution and poverty*

Labour income inequality for those occupied in agriculture, measured by the Gini and L-Theil coefficients, in general, decreased. For the Gini coefficient it was observed a 4.7% decrease between 1992 and 2007. Inequality fell most strongly for female and urban farm workers, considering both the Gini and the L-Theil coefficients. Figure 3 helps to follow tendency over time. Except for rural female worker, inequality declined between 1992 and 1999. Apparently, there is a change of tendency in the 1999-2007 period, except for urban agricultural residents. Another interesting point is a convergence of Gini values for the subsets analysed, except for urban female, whose Gini value was 0,437 in 2007. In a situation of decreasing labour market segregation and discrimination labour income distribution patterns would be expected to converge. This hypothesis should be studied in forthcoming investigations.

Considering the income distribution of agricultural workers, according to regional subsets, we confirm the Gini coefficient decline in the first period in most regions, except the



**Figure 3.** Gini coefficient for labour earnings distribution by gender and place of residence. Brazil, 1992, 1999 and 2007.  
 Source: PNAD 1992, 1999 and 2007.



**Figure 4.** Gini coefficient for labour earnings distribution by geographic region. Brazil, 1992, 1999 and 2007.  
 Source: PNAD 1992, 1999 and 2007.

state of São Paulo (Figure 4). In the second period that tendency is not uniform, noting a discrete increase in inequality for Brazilian agricultural workers as a whole. The 13% achievement of the Northeast in the first period was almost offset by a 12% increase in Gini coefficient in the following period. The state of Sao Paulo had the lowest Gini coefficient in 2007.

Poverty and indigence measures show a decline, considering labor’s family per capita income. As seen in Table 5 and Figure 5, the fall was greater between 1999 and 2007 as well as for female workers. With respect to place and geographic region, we found lower poverty and indigence for urban residents and for those living in the state of São Paulo, the Southern and the Centre-West.

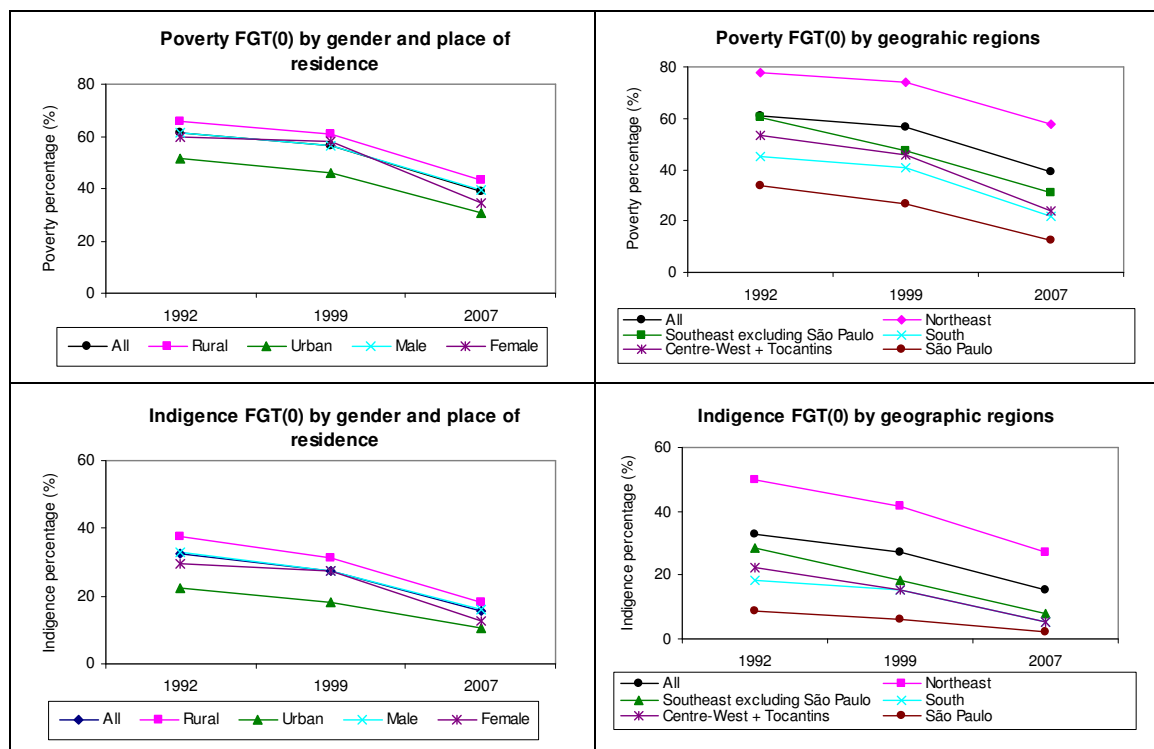
It interesting to observe that the Northeast is the country’s poorest region and has been the focus of public policies of famine combat and family farming among others, particularly during the period 1999-2007. Nevertheless, poverty affected 57% of this region’s farm workers in 2007, corresponding to 2.2 million persons, or 67% of all Brazilian poor farm workers. Indigence declined by 27%, but still affected one million persons in 2007. Notice also a recent increase in the inequality reported previously. These results suggest that the social programmes under way have to be improved to lower poverty and inequality in this region.

**Table 5.** Poverty and indigence FGT(0) for farm workers by gender, place of residence and region, according to per capita family income. Brazil, 1992, 1999 and 2007.

	Poverty				Indigence			
	1992	1999	2007	%	1992	1999	2007	% Diff
All farm workers	61.2	56.3	39.0	-36.2	32.7	27.2	15.5	-52.8
Female	59.6	58.1	34.6	-41.9	29.6	27.4	12.6	-57.5
Male	61.4	56.4	39.6	-35.5	33.1	27.1	15.8	-52.2
Place of residence								
Rural	65.7	60.7	43.4	-33.8	37.5	31.0	18.1	-51.6
Urban	51.3	46.1	30.9	-39.8	22.2	18.1	10.5	-52.6
Region								
<b>Northeast</b>	<b>77.6</b>	<b>73.8</b>	<b>57.4</b>	<b>-26.0</b>	<b>49.7</b>	<b>41.7</b>	<b>27.0</b>	<b>-45.6</b>
Southeast excluding São	60.2	47.1	30.9	-48.7	28.3	18.3	8.0	-71.6
São Paulo	33.7	26.7	12.5	-63.0	8.6	6.0	2.2	-74.7
South	45.0	40.6	21.6	-52.0	18.3	15.4	5.4	-70.5
Centre-West + Tocantins	53.4	45.4	24.0	-55.1	22.5	15.4	5.3	-76.2

Source: PNAD 1992, 1999 and 2007.

**Figure 5.** Poverty and Indigence FGT(0) for Farm workers family, according to gender, place of residence and geographic region. Brazil, 1992, 1999 and 2007.



Source: PNAD 1992, 1999 and 2007.

#### 4. Poverty determinants in Brazil: 1992, 1999 and 2007.

According to the poverty logit model previously defined, equations were adjusted for 1992, 1999 and 2007 and are presented in Table 6. Parameter estimate (b) gives the contribution of the corresponding variable to the probability of a person being poor, all other variables being constant. All estimated coefficients are significant ( $p < 0.001$ ) and by the chi-square test (Hosmer and Lemeshow's goodness of fit test) we conclude that the models adequately fit the data.

Based on the parameter estimate we obtain the odds ratio for each independent variable, given by  $\exp(b)$ . In our equation, considering a binary independent variable, an odds ratio smaller than one means that the odds of being poor are greater in the base category of the considered variable. On the other hand, an odds ratio greater than one indicates that the chance of being poor is greater in the base category of the independent variable. If the odds ratio is one, the independent variable has no effect over the odds of a person being poor.

Considering the variable FEMALE for the 1992 output (female = 1), the odds of a female being poor are 1.36 times the odds of a male being poor, controlling for other variables. We can also say that the odds of being poor are about 36% greater for a female than the odds for a male, when other variables are controlled. For a continuous covariate as EDUCATION, the 1992 odds ratio of 0.860 means that for every additional year of schooling the odds of the event “being poor” decrease by about 14%. ( $1 - 0.86$ ), controlling for other variables in the model.

The results indicate that for those whose primary occupation is agriculture, the odds of being poor increase if the person is a woman, illiterate, the family reference, informal and a rural resident. On the other hand, the chances are smaller if a person is white, better educated, a employer, 60 years or more and living in any region but the Northeast (taken as a base for the region variables).<sup>10</sup> With respect to the variable “family reference”, our interpretation is that the head of family considered in this population works in agriculture (primary job), which is a sector that pays on average low earning. Therefore, it is expected that family per capita income – the income measure used for calculating poverty indexes – is lower for heads of family working in the agriculture sector. Another interesting result is that a person 60 years old or more has a lower chance of being poor, a result that supports the exploratory analysis. This can be explained by the income composition of this population, where retirement benefits and pensions contribute more, associated with the fact that, in general, women are the primary pension and retirement beneficiaries (since they live longer). These findings are also supported by the lower poverty indexes found for women and discussed previously in this article.

**Table 6.** Logit adjusted models 1992, 1999 and 2007 for the odds of a farm worker being poor<sup>(1)</sup> in Brazil. Parameter estimates, standard errors, odds ratios, probability and model significance.

	1992 adjusted model				1999 adjusted model				2007 adjusted model			
	B <sup>(2)</sup>	S.E. estim.	odds ratios	Prob. (%)	B <sup>(2)</sup>	S.E. estim.	odds ratios	Prob. (%)	B <sup>(2)</sup>	S.E. estim.	odds ratios	Prob. (%)
FEMALE	0.182	0.019	1.199	54.52	0.232	0.019	1.262	55.79	0.082	0.019	1.085	52.04
AGE_60	-1.404	0.037	0.246	19.74	-1.661	0.039	0.19	15.97	-2.026	0.05	0.132	11.66
WHITE	-0.345	0.017	0.708	41.45	-0.446	0.017	0.64	39.02	-0.395	0.019	0.674	40.26
EDUCATION	-0.150	0.004	0.86	46.24	-0.137	0.004	0.872	46.58	-0.082	0.004	0.921	47.94
SLOPE_EDUC	-0.057	0.004	0.944	48.56	-0.066	0.003	0.936	48.35	-0.07	0.003	0.933	48.27
ILLITERATE	0.066	0.028	1.068	51.64	0.109	0.029	1.116	52.74	0.074	0.032	1.077	51.85
FAMILY_REF	0.721	0.019	2.056	67.28	0.684	0.019	1.981	66.45	0.741	0.019	2.098	67.72
EMPLOYER	-0.608	0.019	0.544	35.23	-0.599	0.019	0.549	35.44	-0.451	0.02	0.637	38.91
INFORMAL	0.973	0.018	2.645	72.57	0.884	0.019	2.421	70.77	1.046	0.02	2.847	74.01
RURAL	0.768	0.02	2.156	68.31	0.801	0.019	2.227	69.01	0.651	0.021	1.918	65.73
SOUTHEAST	-0.844	0.022	0.43	30.07	-0.994	0.022	0.37	27.01	-1.045	0.023	0.352	26.04
SAO_PAULO	-1.577	0.025	0.207	17.15	-1.668	0.026	0.189	15.90	-1.478	0.027	0.228	18.57
SOUTH	-1.097	0.026	0.334	25.04	-1.032	0.026	0.356	26.25	-1.335	0.029	0.263	20.82
CENTRE-WEST	-0.843	0.03	0.431	30.12	-0.954	0.029	0.385	27.80	-1.132	0.031	0.322	24.36
Constant	0.089	0.032	1.093	52.22	-0.085	0.033	0.919	47.89	-0.908	0.034	0.403	28.72

Source: PNAD 1992, 1999 and 2007.

<sup>(1)</sup> The variable poor is 1 if the family's per capita income is less than one half of minimum wage, controlling for inflation and the purchasing power of the minimum wage.

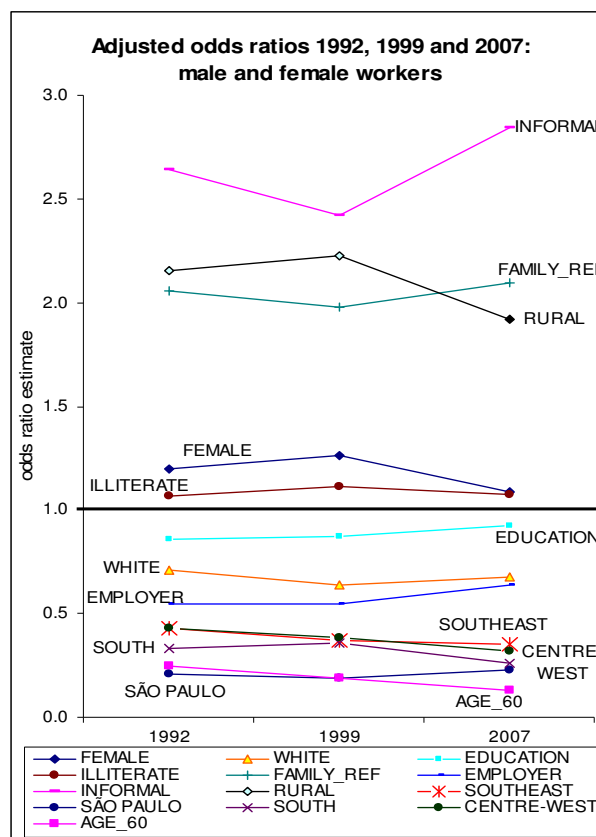
<sup>(2)</sup> Coefficients are statistically different from zero at the 0.01% level, except for the ILLITERATE variable coefficient, which is significant at the 0.025% level.

A second logit model was adjusted considering only the female workers. Given that their number are much lower than men's in the agricultural labour market, with that second model we intended to investigate if there were some specific results for the female group. The obtained numbers are quite similar to the ones for both male and female workers considered as a whole. The only noticeable features are that (1) the odds ratio for the variable ILLITERATE are around one for the three observed years – 1,006, 0,989 and 0,998, for 1992, 1999 and 2007, respectively –, indicating that this variable seems to be not important in determining poverty; and (2) the chance of being poor if a female worker is engaged in the informal market is much higher in 2007 than that in the previous years, indicating that formalization in the job plays an important role in determining poverty among the female workers.

Figure 6 illustrates odd rates movements along the period, considering female and male workers as a whole. Informal labour market and family reference have greater influence over the condition of being poor in 2007 than in 1992. On the other hand, the odds of a person being poor if she/he is 60 years and over, white or Asian, or living in regions other

than the Northeast are smaller in 2007 than in 1992. This means that these factors are more important to determine a way out of poverty in 2007. Also we verify that being a woman, or an employer in the agricultural sector or living in a rural area lost importance in spite of remaining important factors in determining the chances of a person's being poor. For other variables, odds ratio values are relatively stable, indicating that these variables have about the same importance in 1992 and 2007. The same tendencies were observed for the subset of the female workers.

**Figure 6.** Co-factors odds ratios estimates of adjusted models for the probability of an agricultural worker to be poor. Brazil, 1992, 1999 and 2007.



Source: PNAD 1992, 1999 and 2007.

From these results it is possible to visualise the importance of public policies for the development of Brazil's poor regions, formalisation of the labour market and deepening law enforcement to make social security benefits universal. According to our results, discrimination by gender and by colour/race constitutes a barrier to the way out of poverty, and for this reason, should be eradicated from society. We are talking here about well-known aspects that are still present in Brazilian society

## 5. Agricultural families

Poverty studies look at family (or household) well-being, since the importance of family relationships in the sharing of income and consumption is well known.

Considering that Brazilian agricultural families are defined as families whose head of family's primary occupation is in agriculture, the changes that have occurred since 1992 can be observed in Table 7. The most striking evidence is the sharp fall in the number of female-headed families, by almost 50% from 1992 to 2007, with a fall occurring during the current decade. The number of male- and couple-headed families also falls but at a much low rate of almost 27%.

**Table 7.** Agricultural families and members, Brazil, 1992, 1999 and 2007 in thousands.

	Female head of family		Male and couple head of family	
	Families	Individuals	Families	Individuals
1992	1 260.6	3 580.8	8 847.5	37 830.2
1999	1 364.2	3 737.5	9 000.3	35 347.2
2007	685.1	1 904.6	6 589.8	24 062.1
$\Delta\%$ 1992-2007	-49.8	-49.0	-26.8	-31.9
$\Delta\%$ 1999-2007	-45.7	-46.8	-25.5	-36.4

Source: PNAD 1992, 1999 and 2007.

For a better understanding of the poverty and income distribution of the Brazilian agricultural family, some characteristics of the head of family as well as of the family have been summarized in Table 8. First of all, female-headed families represented slightly more than 9% of agricultural families in 2007, 12.4% in 1992 and 13% in 1999.

The process of ageing, mentioned before when analysing individual characteristics of agricultural workers, is confirmed. In addition, female heads of family, on average, are 9 years older than in the other subsample. They are not only older but have a higher illiteracy rate (more than 40% in 2007 against 31% of the other group). Formal schooling is quite low for both groups ranging around 3 years and showing a tendency to fall.

Informality rate is very high and growing for both subsamples: 88% and 75.6% respectively in 2007. At the same time almost three fourths of female heads of family work as employees. Combining these two features, we have a quite somber insight into their labour market conditions. In conclusion female heads of family are older women with little formal education and high rates of illiteracy and informality.

Looking at family characteristics, one must observe the drastic changes that occurred in the past decade. Female-headed families in the 90s were primarily involved in family

farming (around 62%); only one third concentrated their working efforts in agriculture and lived in rural areas. In the current decade the picture has undergone important changes. Around 80% of female-headed families are involved in family farming (28% increase) and agricultural activities and 60% live in rural areas. In other words, it seems that the families whose head left the agricultural sector in the past years were those already involved in other economic activities (as illustrated by the reduction in pluriactive families) and living primarily in urban areas

**Table 8.** Agricultural families: Head of family and family profile, family composition.  
Brazil, 1992, 1999 and 2007.

	Female				Male and couple			
	1992	1999	2007	% Diff.	1992	1999	2007	% Diff.
<b>Head of family profile</b>								
Number (in thousands)	1 260.6	1 364.2	685.1	(45.7)	8 847.5	9 000.0	6 589.7	(25.5)
Age	53	54	55	3.6	44	45	47	6.1
Male (%)					99.6	99.0	97.9	
Female (%)					0.4	1.0	2.1	
Colour/Race								
Native	0.1	0.1	0.4	378.9	0.1	0.2	0.3	182.1
White	48.7	51.7	37.8	(22.4)	52.1	50.6	42.5	(18.4)
Black	9.1	9.0	8.4	(6.8)	5.6	5.6	6.8	22.0
Asian	0.4	0.2	0.1	(67.3)	0.4	0.4	0.3	(29.8)
"Pardos"	41.7	39.1	53.2	27.5	41.7	43.3	50.0	19.9
Formal education (avg)	2.8	3.6	2.7	(3.1)	3.1	3.4	3.3	5.9
Illiteracy rate (%)	44.9	37.0	41.2	(8.1)	33.7	31.2	31.5	(6.3)
Informality %	80.5	78.3	88.2	9.6	71.1	72.1	75.6	6.4
Occupational position								
Employee	66.7	67.8	73.2	9.8	51.1	49.5	53.9	5.3
Employer or self-employed	33.3	32.2	26.8	(19.6)	48.9	50.5	46.1	(5.6)
<b>Family profile</b>								
Family Farming (%) <sup>(1)</sup>	62.9	62.6	80.52	28.0	46.3	50.3	54.93	18.6
Pluriactivity								
Only agricultural activity	32.0	34.0	80.4	151.1	34.3	36.5	73.9	115,3
Pluriactivity	68.0	66.0	19.6	(71.2)	65.7	63.5	26.1	(60,2)
Place of residence								
Rural	36.4	34.6	59.2	62.8	54.0	54.7	66.1	22,3
Urban	63.6	65.4	40.8	(35.9)	46.0	45.3	33.9	(26,2)
Region								
Northeast	41.6	38.1	50.6	21.8	36.4	39.2	46.5	27.9
Southeast excluding the state of São Paulo	18.5	20.6	17.4	(6.1)	18.4	17.7	17.0	(7.7)
South	19.6	20.0	18.9	(3.5)	22.4	20.9	18.4	(17.8)
Centre-West and Tocantins	8.6	9.1	6.5	(24.6)	10.8	10.7	10.4	(4.5)
State of São Paulo	11.6	12.3	6.5	(43.8)	12.0	11.5	7.8	(35.3)
<b>Family composition</b>								
Mother - all children <14 years	17.2	14.3	16.2	(5.7)				
Mother - all children ≥ 14 years	36.7	41.2	38.7	5.4				

Mother -children $\leq$ or $\geq$ 14 years	14.2	12.3	12.6	(11.3)				
Couple without children					15.6	17.5	20.9	34.1
Couple - all children <14 years					39.6	35.1	29.7	(25.1)
Couple- all children $\geq$ 14 years					15.2	18.4	22.0	44.3
Couple - children $\leq$ or $\geq$ 14 years					21.4	19.4	15.9	(25.7)
Other type of family	31.9	32.3	32.5	1.9	8.1	9.6	11.5	

NOTE: (1) % of family members occupied in family farming.

Source: PNAD 1992, 1999 and 2007.

The improvements mentioned previously for female agricultural workers do not totally apply to female head of family working in agriculture. While female agricultural workers, on average, recorded a reduction in illiteracy rate and informality and in 2007 almost 50% worked in agriculture as employer and self-employed, female heads of family recorded a smaller reduction in illiteracy rate while informality increased as well as the percentage working as employees (reaching 73.2%).

### *Poverty and income distribution*

On average, female-headed families' income amounts to 95% of male- and couple-headed families' income in 1992, 98% in 1999 and 79% in 2007. The fall in 2007 was due to a dramatic reduction in the labour earning component of total family income associated with an increase in government transfers (retirement and pension benefits as well as public social programme benefits) (Table 9).

**Table 9.** Income composition of agricultural families. Brazil, 1992, 1999 and 2007 (minimum wage)<sup>1</sup>

	All labour sources	Pension and retirement earnings	Total family income	Per capita family income
<b>Female</b>				
1992	4.7	1.3	6.2	0.80
1999	4.4	1.7	6.4	0.90
2007	1.2	1.0	2.4	0.83
<b>Male</b>				
1992	5.5	0.8	6.5	0.77
1999	5.1	1.2	6.5	0.86
2007	2.3	0.5	3.0	0.84

Source: PNAD 1992, 1999 and 2007.

<sup>1</sup> Current values were deflated by INPC (National Consumer Price Index) controlling for the minimum wage purchasing power, according to Corseuil and Foguel (2002).

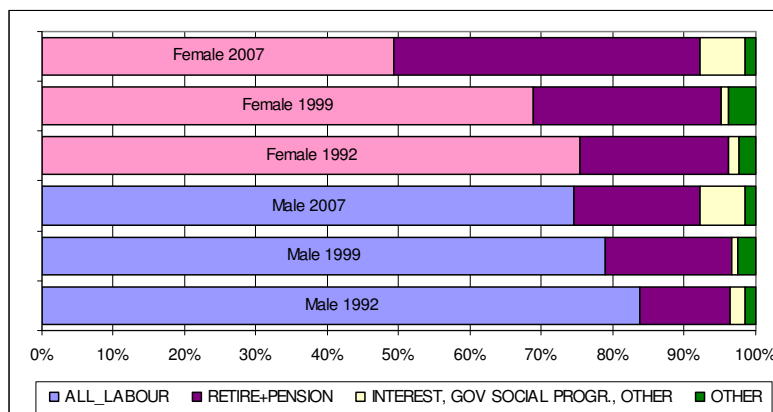
Figure 7 better illustrates the changes in total family income composition that occurred from 1992 to 2007. In 1992 and 1999 retirement and pension benefits were more important in female family income than in male (21% and 26% versus 13% and 18% for male-headed families). But for female-headed families in 2007 the share of labour earnings dropped to 50%, while that of pensions and retirement benefits rose to 43%. The increasing weight of public transfers will help to understand changes in poverty and income distribution

for those families.

In recent years, Brazilian public policies aimed toward poor and old grew both in the number of recipients (beneficiaries) and in the value of payments. According to Del Grossi and Graziano 2006 in Campolina and Silveira (2008), the increasing importance of non-labour income for rural workers can be explained by the spreading of retirement benefits among almost all old agricultural workers, the increase in minimum wage values (in some years well above the inflation), and the dissemination of social programmes in which rural workers were involved. More specifically, those programmes directed towards families (aiming to improve the minimum living conditions) or youth (stimulating school frequency and reducing child labour) have mainly women as the beneficiaries of public transfers.

In comparison with the above-commented farm worker results, we verify that in 2007 agricultural families headed by women recorded lower family per capita income and a stronger dependence on non-laboural sources of income than male-headed families.

**Figure 7.** Agricultural family income composition by gender of the head of family. Brazil, 1992, 1999 and 2007.



Source: PNAD 1992, 1999 and 2007.

Inequality, measured by the Gini and L-Theil coefficients, increased for both groups, but while for male- and couple-headed families this is a result of a changing trend in the last subperiod, for female-headed families there was no change in this tendency (Table 10).

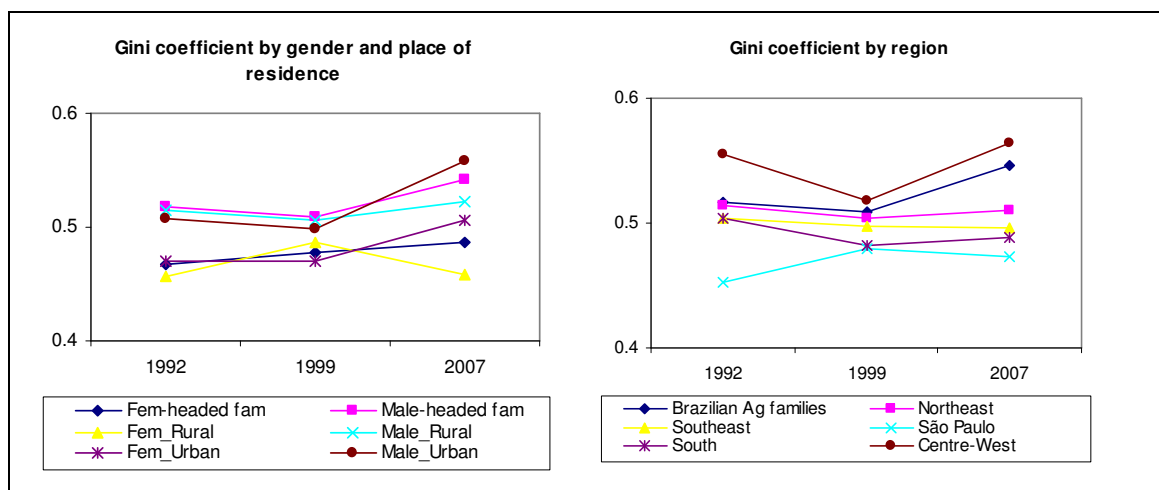
**Table 10:** Family Inequality Indexes by gender of head of family, Brazil, 1992, 1999 and 2007.

	Female-headed families		Male- and couple-headed families	
	Gini coefficient	Theil coefficient	Gini coefficient	Theil coefficient
1992	0.468	0.396	0.518	0.496
1999	0.478	0.405	0.509	0.464
2007	0.486	0.464	0.542	0.553

Source: PNAD 1992, 1999 and 2007.

In general, female-headed families recorded less inequality than male- and couple-headed families and inequality grew at a slower pace. When comparing the place of residence, rural inequality grew less than urban for both subsamples. Differently from the tendency of all subgroups, rural female-headed families recorded a fall in Gini coefficient from 1999 to 2007 (Figure 9). The Centre-West region had, for the three years studied, the highest inequality rate, resulting in a higher rate in 2007 than in 1992. With the exception of São Paulo (the state with the lowest inequality) and the Centre-West region mentioned above, all others had a lower inequality rate in 2007 than in 1992. An improvement in inequality happened in the 1990s in all regions but the state of São Paulo (Figure 8).

**Figure 8.** Inequality coefficients for agricultural families by gender, place of residence and region. Brazil, 1992, 1999 and 2007.



Source: PNAD 1992, 1999 and 2007.

Female-headed families recorded a lower overall poverty rate than male- and couple-headed families. For the former subsample the proportion of poor families fell by almost 21%, between 1992 and 2007, relatively more in the 90s than in the current decade. The latter fell by only 9.5% in this period, declining in the 90s and rising in the decade of 2000 (Table 11 and Figure 9).

All other poverty indexes, for both subsamples, show a similar pattern: a reduction in the 90s and an increase in the current decade. For female-headed families this means that if the proportion of poor families decreased (measured by FGT(0) or Head Count Ratio), poverty intensity (measured by FGT(1) or Income Gap Ratio) increased as did inequality among the poor (measured by FGT(2)).

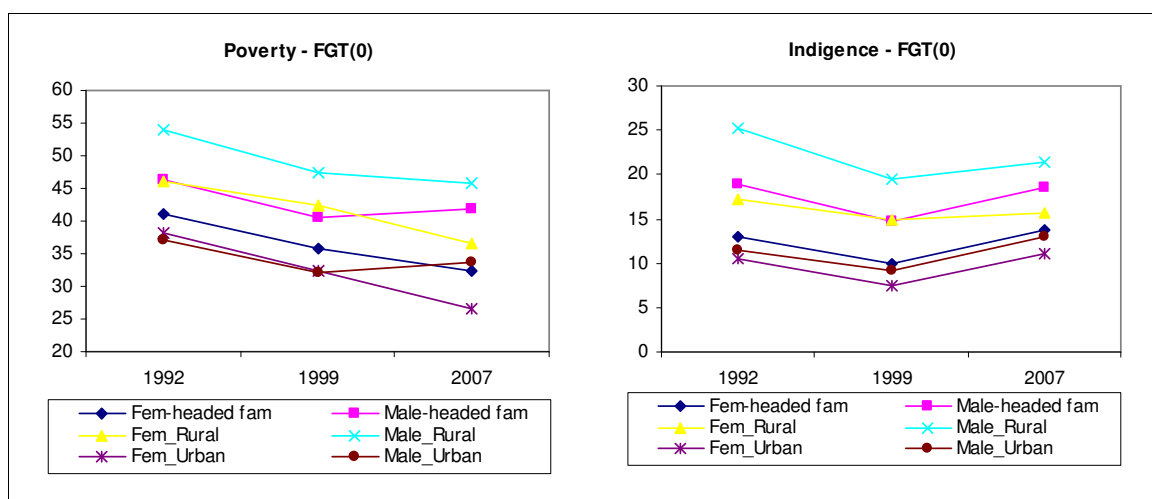
**Table 11.** Family Poverty and Indigence Indexes, Brazil, 1992, 1999 and 2007.

	Female-headed families			Male- and couple-headed families		
	FGT(0)	FGT(1)	FGT(2)	FGT(0)	FGT(1)	FGT(2)
Poverty						
1992	41.1	15.6	8.4	46.2	20.1	46.2
1999	35.8	13.0	6.7	40.5	16.4	40.5
2007	32.5	15.2	9.4	41.8	19.1	41.8
Indigence						
1992	12.9	4.8	2.5	18.9	7.4	4.1
1999	10.0	3.5	1.8	14.8	5.3	2.7
2007	13.8	6.6	3.9	18.5	7.2	4.0

Source: PNAD 1992, 1999 and 2007.

Defining indigence using one fourth of the minimum wage as the value of indigence line, female-headed families show slightly better indexes than male- and couple-headed families, but their relative position has been deteriorating quickly in the past decade. In 2007 all indigence indexes indicated a worse situation than in 1992, more than canceling out the improvements recorded in 1999. Poverty and indigence rate are always lower in urban than in rural areas. While in 2007 the poverty rate was always lower than in 1992 for all subgroups, the indigence rate increased for female-headed families due to a rise in extreme poverty within this subsample in urban areas (Figure 9)

**Figure 9.** Poverty and indigence indexes for agricultural families by gender and place of residence. Brazil, 1992, 1999 and 2007.

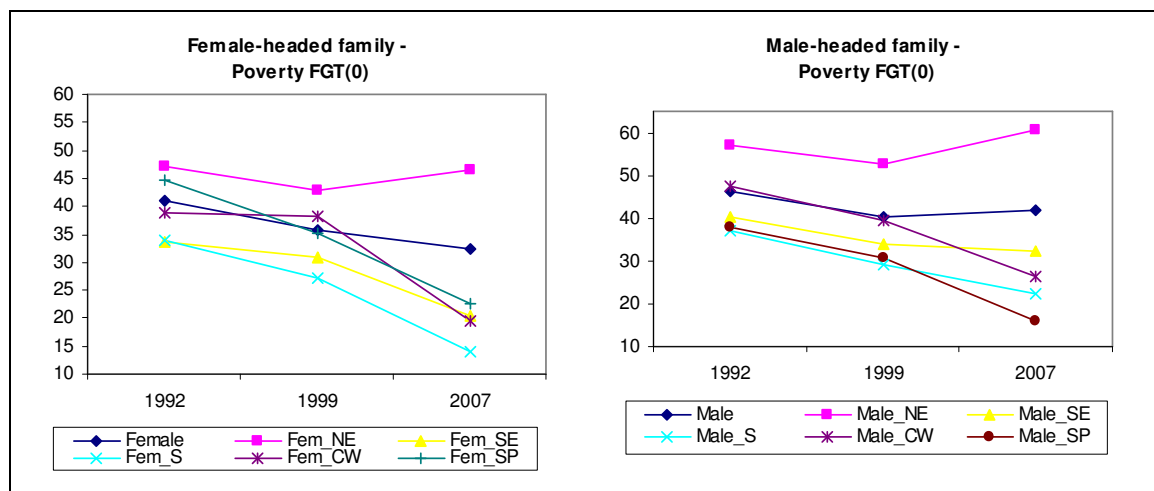


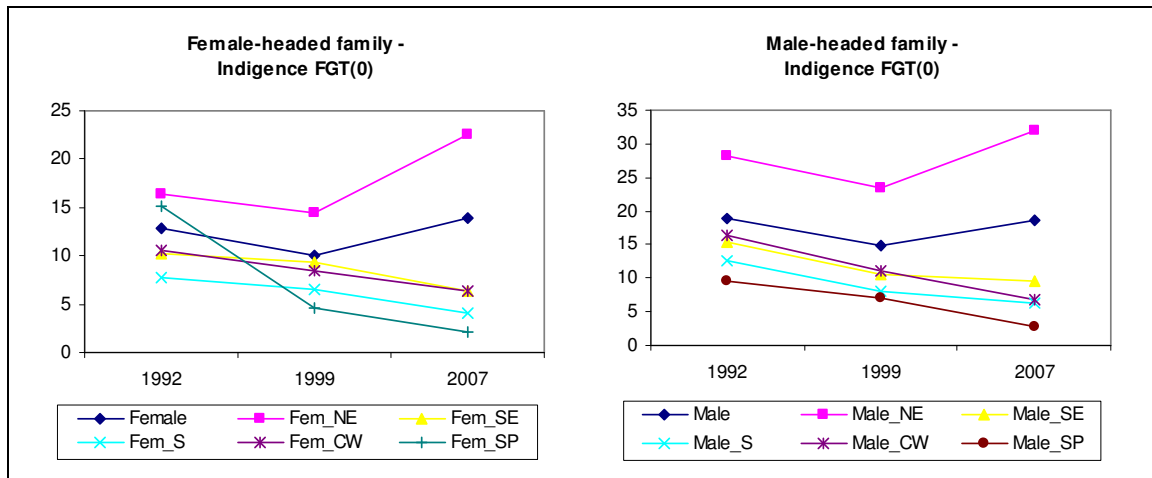
Source: PNAD 1992, 1999 and 2007.

When observing regional behaviour, one can notice that the poverty rate is lower for female-headed families than for male- and couple-headed families, except for the state of São Paulo where the poverty rate for the former group ranged from four to six percentage points above the latter. The poverty rate fell for all regions but the Northeast, the poorest region where poverty has risen in the current decade, for both subsamples. Similar trends are observed for extreme poverty (Figure 10).

In conclusion female-headed families showed a lower and decreasing poverty rate and a lower but increasing family income inequality than male- and couple-headed families. A possible explanation is based on labour market discrimination and on family income distribution. Families whose heads are single women tend to receive lower labour earnings due to labour market discrimination (as mentioned on page 10). At the same time, a growing share of these families' incomes comes from government benefits. While these benefits help to alleviate poverty, labour market discrimination along with the peculiarities of the female head of family (high illiteracy rate, low formal education, older age, mostly employees and employed in family farming) contribute towards deepening income inequality.

**Figure 10.** Poverty indexes for agricultural families by gender and region of residence. Brazil, 1992, 1999 and 2007.





Source: PNAD 1992, 1999 and 2007.

## 6. Conclusions

The picture of female participation in the Brazilian agricultural sector resulting from the present research illustrates some interesting features like the reduction in illiteracy and informality rate and a fall in the earning gap between men and women. In spite of this progress, gender labour market discrimination is still present. Thanks to the expansion of pension and retirement benefits as well as cash transfer social benefits contributing to total income, a decreasing poverty rate was recorded in the 1999-2007 period for women working in agriculture. Considering the rural residents female workers, it was observed an increase in the Gini inequality coefficient.

Regional disparities have not changed much in the period analysed in spite of public policies aimed towards this objective. The Northeast, the country's poorest region, presently retains 67% of all Brazilian poor farm workers, corresponding to 2.2 million persons. Indigence affected one million persons in 2007 and inequality recrudesced in the 2000s offsetting previous achievements. All this suggests that the social programmes under way have to be improved to lower poverty and inequality in this region.

Once the focus of analysis switched from individual to family, the picture is quite different. Female-headed families still have per capita income lower than male- and couple-headed families, with little or no change over time, their poverty rate is falling while income inequality is increasing, except for rural female-headed families.

According to the results of the logit estimation, being female, the head of a family, illiterate, informal and living in rural area increase the odds of being poor. These seem to be confirmed by results for female heads of family, which unlike those for individual workers,

showed an increase in illiteracy rate and informality and a fall in the average number of years of schooling.

In 2007 the number of female-headed families had fallen almost 50% in relation to the number in 1999 and their profile had changed considerably. Almost 50% lived in the Northeast, 59% resided in rural areas (versus 35% on average in previously years) and 80% of their members were involved in family farming and a similar percentage received labour earning only from agriculture.

A possible explanation is based on the low wages paid in agriculture, the preference of youth for working in other sectors and the process of urbanisation (or the spreading of urban residential areas into formerly rural areas). In 2007 female heads of family living in urban areas represented only 30% of the 1999 female heads of family living in urban areas. In other words, almost 70% of urban agricultural female heads of family have left agricultural activities as their primary job in the current decade. Almost 75% of female heads of family have left the agricultural sector in the state of São Paulo vs 33% in the Northeast in the current decade.

It seems that those whose primary occupation is still in agriculture are “weaker” women, weaker meaning they are having more difficulty in changing occupation because of their personal profile and location. The pathway out of poverty for them seems to rely heavily on public programmes and transfers. Hopefully, these programmes stimulating youths to spend more time in school will help them to improve (on a personal and economic level) in relation to their parents.

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## Notes

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<sup>1</sup> In this article labour income refers to all types of remuneration from work and includes income from self-employment, employer incomes and employee incomes.

<sup>2</sup> For an example, see Rocha (1997).

<sup>3</sup> For a more detailed discussion on PNAD limitations, see Vaz and Hoffmann, 2007.

<sup>4</sup> Children less than 10 years old are not included in the agricultural workers sample.

<sup>5</sup> For a discussion about methodological aspects of determining poverty lines and the advantages of each criterion, see Rocha (1997).

<sup>6</sup> The Northeast is the basis for the regional binary variables.

<sup>7</sup> The average years of schooling was calculated considering the population aged 10 or more years.

<sup>8</sup> Current values were deflated by the INPC (National Consumer Price Index) controlling for the minimum wage purchasing power, according to Corseuil and Foguel (2002)

<sup>9</sup> Unfortunately, the PNAD questionnaire combined all these income sources into a single question, which makes it impossible to precisely evaluate the portion corresponding to government cash transfers within programmes like famine combat, family farming and rural development. For the agricultural workers, it is unlikely that the portion corresponding to interest and dividends on average is substantial.

<sup>10</sup> According to 2007 results, the odds of being poor are 87% lower if the person is 60 years old or more, 33% lower if white and 40% lower if employer or self-employed. On the other hand, the odds of a person being poor are about 92% greater if the person lives in a rural area and more than twice as high if the person is the family reference or has an informal job. Odds ratios for variables related to region indicate that the odds of being poor are at least 64% lower if the person does not live in the Northeast region. Education variables seem to be of less importance in determining farm worker poverty, as their contributions are smaller than 8%.