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The Brazilian Experience With the Occupation of the Cerrados: The Dynamics of Large Farms x Small Farms

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Programa Cohesión Territorial para el Desarrollo

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Vian

ABSTRACT

In this paper we analyze the occupation of the Brazilian Center-West, focusing on how the appearance of large modern commercial farms devoted mostly to planted pastures and soybeans plantations affected the existence of small farms, and shaped the actual pattern of production in those regions. We will focus on the “traditional” agricultural frontiers of the seventies, comprising the present states of Mato Grosso do Sul, Mato Grosso, Goiás and Tocantins . For the sake of easy of exposition, however, data will be shown in the state definition of the seventies: the present states of Mato Grosso (MT) and Mato Grosso do Sul (MS) will be aggregated (MS+MT, the Center-West frontier), and the present states of Goiás (GO), the Federal District (DF) and Tocantins (TO) will be shown as another aggregate (GO+DF+TO, the Central-East frontier). We will refer to the individual states on the text only when required to clarify particular points. And finally, we will not approach in this text the evolution of agriculture in the more recent Northeast frontier, the MAPITO (Maranhão, Piauí and Tocantins states) region, in which the occupation process goes beyond the scope of this paper.

Keywords: Brazilian Experience, Farms, Occupation, Brazilian Center-West, Agriculture, Rural, Brazil.

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1. INTRODUCTION

After the World War II the Brazilian economy started a period known as the “forced industrialization period”, which lasted for almost 30 years. The dominant vision in the period was that the recurrent balance of payment crises in the region were linked to the secular trend of falling agricultural prices, according to the CEPAL view. The military coupe of the sixties, although changing the political lines of the country, reinforced the strategy of industrialization, resumed by the “fifty years in five” program of former president Juscelino Kubitschek.

The many different development plans which followed from the sixties comprised measures targeted to speed up industrialization, launching the basis for the high rates of growth observed in the seventies in Brazil, based mainly on external indebtedness, a period which was threatened by the first oil shock, and actually interrupted by the second oil shock of the seventies. In essence however, and in what relates to the agricultural sector, the industrialization period required from agriculture to play three classical roles: to supply labor for the growing urban activities, to supply food at stable prices, and to supply foreign currency to finance the imports of machinery and intermediates goods needed for capital formation in the urban sector.

This created a strong pressure on the agricultural sector, and a new dynamics start to develop to meet those challenges. The creation of Embrapa, the Brazilian Federal Agricultural Research Institute in the early seventies was one of the mechanisms created to facilitate the expansion of the Brazilian agriculture on a completely different path than followed before, and which was based on the fertile soils of the South/Southeast regions in Brazil. Coffee, in particular, was entirely produced in Sao Paulo and Parana states, already among the richest states in the country.

The necessity to generate foreign exchange through agricultural trade led to the stimulus of production of tradable agricultural products, especially soybeans, an extraordinary change that would dramatically modify the landscape of the vast unoccupied *cerrados*¹ areas in the Brazilian Center-West region in the ensuing years. The substitution of vast low productivity pastures areas prevalent in the past by modern agriculture is one of the most striking chapters in the recent Brazilian economic history. This process was backed by public policies of research and rural credit, and led to a fast transfer of capital and population to the region, with important changes in the economy and the agrarian structure of those areas.

In this paper we analyze the occupation of the Brazilian Center-West, focusing on how the appearance of large modern commercial farms devoted mostly to planted pastures and soybeans plantations affected the existence

¹ The Cerrado biome comprises a Savannah type vegetation, with different classifications included in this general denomination.

of small farms, and shaped the actual pattern of production in those regions. We will focus on the “traditional” agricultural frontiers of the seventies, comprising the present states of Mato Grosso do Sul, Mato Grosso, Goiás and Tocantins². For the sake of easy of exposition, however, data will be shown in the state definition of the seventies: the present states of Mato Grosso (MT) and Mato Grosso do Sul (MS) will be aggregated (MS+MT, the Center-West frontier), and the present states of Goiás (GO), the Federal District (DF) and Tocantins (TO) will be shown as another aggregate (GO+DF+TO, the Central-East frontier). We will refer to the individual states on the text only when required to clarify particular points. And finally, we will not approach in this text the evolution of agriculture in the more recent Northeast frontier, the MAPITO (Maranhão, Piauí and Tocantins states) region, in which the occupation process goes beyond the scope of this paper.

² The present states didn't exist as such in the seventies. The former Mato Grosso state was split in two in 1977 (Mato Grosso and Mato Grosso do Sul). Goiás was also split in two in 1988 (Goiás and Tocantins).

2. THE EVOLUTION OF AGRICULTURE IN THE BRAZILIAN CENTER-WEST

The occupation of the Brazilian Center-West region started initially through the transformation of large traditional cattle ranching farms, largely based on extensive natural pastures, into more modern cattle ranching farms, with planted pastures.

This was made possible by the introduction of new grasses varieties in the seventies, notably the African Brachiaria grasses. As it can be seen in

Figure 1, which shows the evolution of the importance of the main agricultural activities in the frontier regions as a share of total production in Brazil, the initial occupation of the frontier happened as early as in the seventies, and initially mainly through the increase in livestock production. The figure shows also a distinctive fact in the occupation of the cerrados, the fast evolution of rice production in the early years.

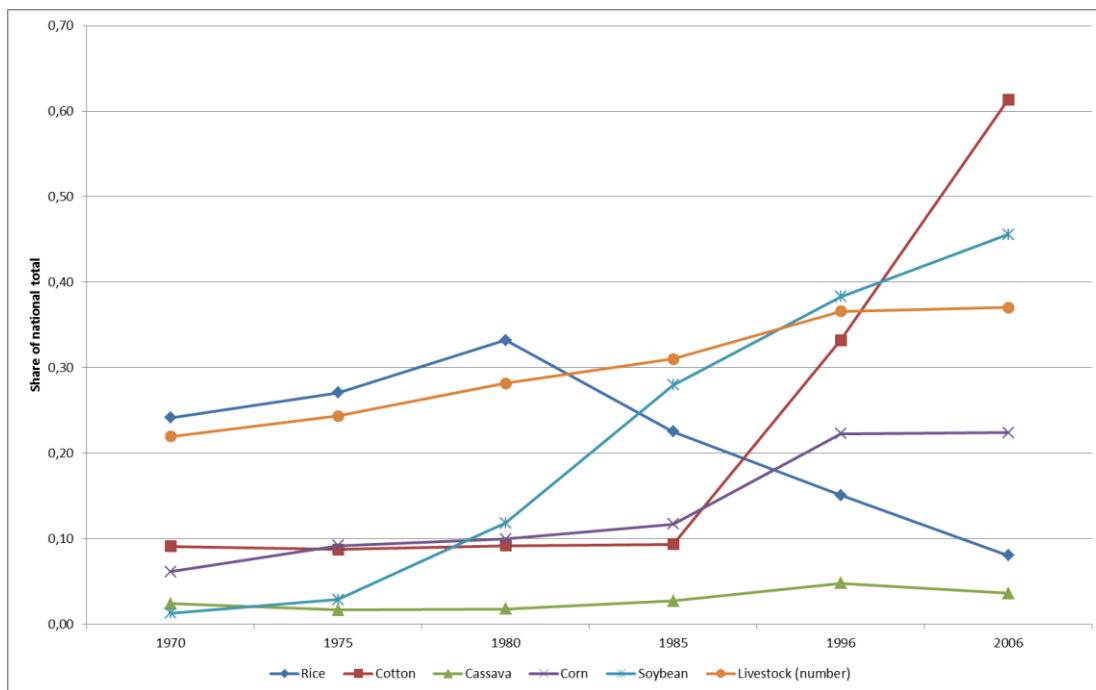
This is because rice is was a “pioneering” activity, following land clearing in time as a preparation of land for the introduction of planted pastures, and later soybean³. Rice, at the same time, has always been an important food product in Brazil, with a guaranteed internal market therefore. However, while the share of livestock in the frontier increases continuously, the share of rice starts to fall from 1980⁴.

The production of soybean started to increase fast from 1975 on. Until then, only the states of the South and Southeast regions in Brazil produced the crop, due to the lack of adaptation of seeds to the cerrados natural conditions. The investments on agricultural research start to give results and, from 1975 on, the annual rate of growth of soybeans production in the frontier reached values as high as 59% in the period 1970/1975 and 43% between 1975 and 1980.

³ The Brazilian cerrados soils are originally acid soils, with high contents of free aluminium, to which rice was relatively more tolerant than soybean.

⁴ This phenomenon is related to the introduction of other types of grasses, more tolerant to soil acidity.

Figure 1. Share of the main agricultural activities in the Brazilian agricultural frontier in total production in Brazil. 1970 - 2006.



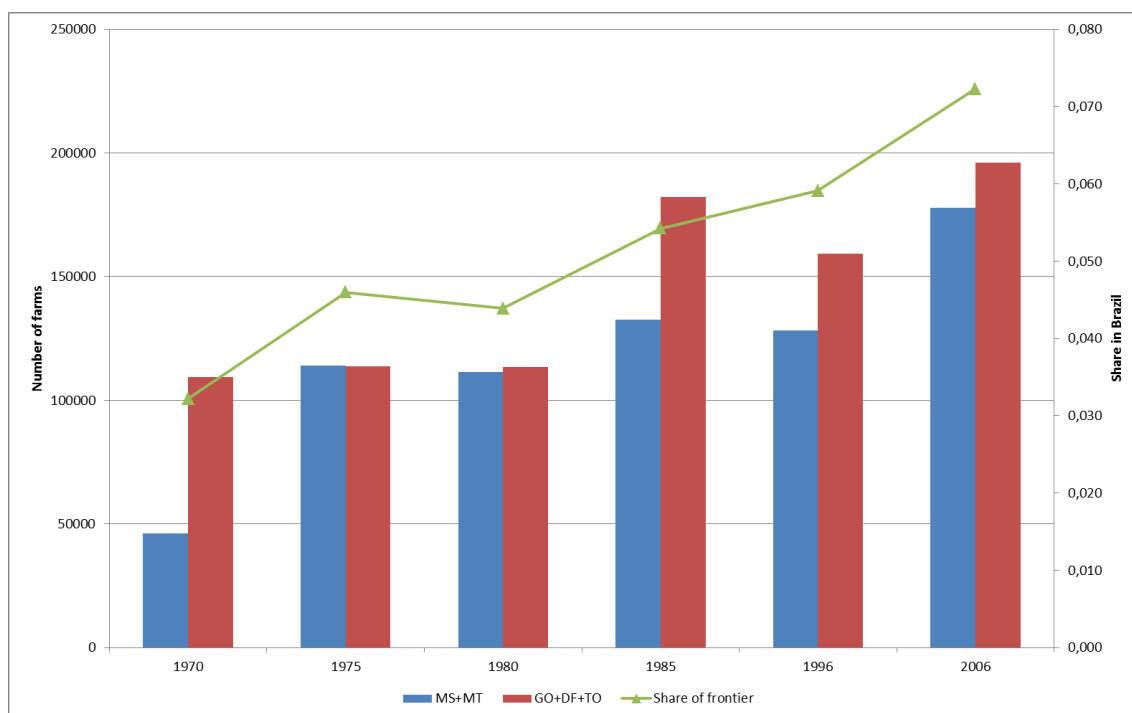
Source: Brazilian Agricultural Censuses, various years.

As a consequence of the advance of agriculture and planted pastures in the frontier, the total number of farms⁵ increased. As it can be seen in

⁵ In Brazil the word “farm” is more related to the large agricultural production unit. In this text we will use it to refer to the agricultural production unit of any size.

Figure 2, the share of the frontier in total number of farms in Brazil increased steadily in time. The Center-West frontier presented a strong rate of increase in the period 1970 to 1975, when the number of farms almost tripled, from 46,090 units in 1970 to 113,971 units in 1975.

Figure 2. Number of farms in the Brazilian agricultural frontier, and share of frontier in total number of farms in Brazil.



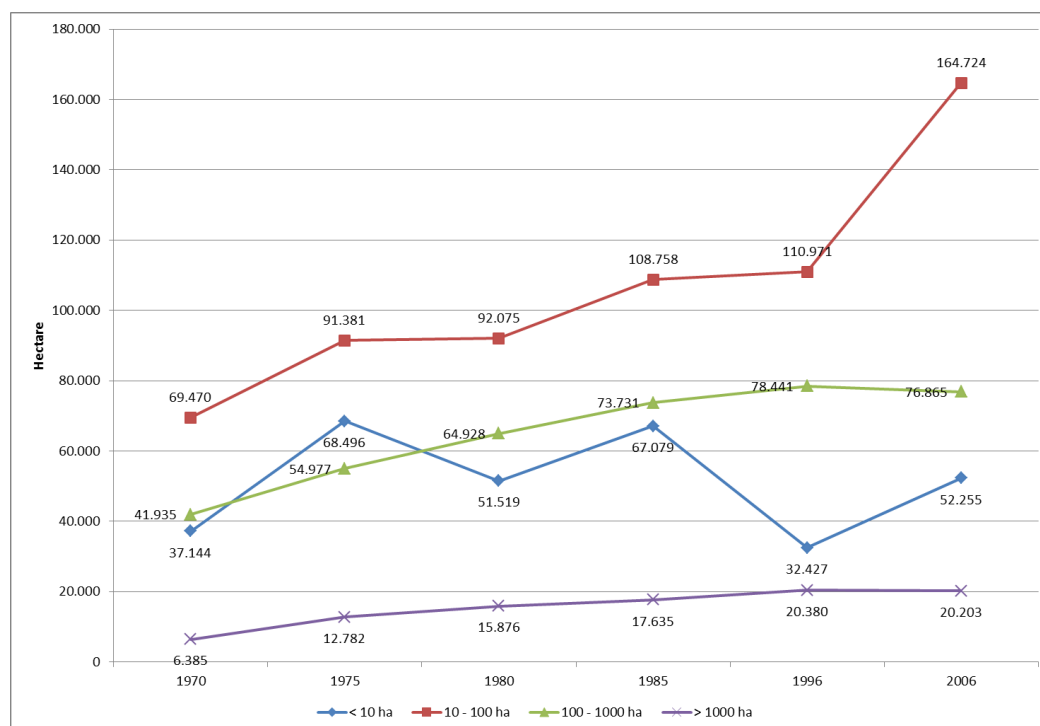
Source: Brazilian Agricultural Censuses, various years.

This increase in the number of farms, however, had a particular feature in Brazil. The occupation of the agricultural frontier, starting in the seventies, was a movement from the relatively richer South and South-East regions of Brazil towards the frontier. The nature of incentives granted by the government at that time (to be discussed in greater detail later in this text) stimulated, in many cases, the selling of land at a higher price in the traditional regions for the acquisition of much bigger land areas to be converted into productive farms at lower prices in the frontier. Medium and large producers moved in this process, generating a pattern of occupation characterized by medium sized and large properties, as can be seen in Figure 3, which displays a strong increase in the number of farms with size between 10 to 100 hectares. For the Brazilian Center-West standards those properties can be considered small, even though from a technological standpoint a property of about 100 ha can be considered medium size.

Notice that while the number of medium and large units (> 10 ha) in the frontier increased, the number of small farms (< 10ha) remained relatively stable, meaning that their number reduced significantly in relative terms. Indeed, the share of the number of the smaller farms in the Center-west total number of farms fell from

0.24 in 1970 to 0.17 in 2006⁶. But the relative stability in the absolute numbers of those smaller properties in time is a phenomenon observed all over Brazil: there were around 2.5 million farms with less than 10 ha in the country, both in 1970 and 2006. This suggests that the advance of the large properties in the frontier did not actually displace the small ones, but happened through the fractioning of even bigger (and extensive) livestock farms that existed previously and, in some cases, on public owned land. As it will be seen later, however, the survival strategy of those small units implied a different composition of production, an important feature of the Brazilian economy until presently.

Figure 3. Number of farms in the Brazilian agricultural frontier (Center-west), by area (ha).



Source: Brazilian Agricultural Censuses, various years.

The numbers in **Figure 3**, however, don't really give a fair idea of the degree of land concentration in the frontier, what can be better evaluated comparing the total area of each of those area groups above. This can be seen in **Table 1**. The total area of agricultural properties with less than 10 ha in the frontier evolved from 181,150 ha in 1970 to 243,140 ha in 2006, accounting for a very small share of total area in both cases.

⁶ This fall in the share of the number of less than 10ha farms in the total number of farms between 1970 and 2006 was observed also in the North and Northeast regions, but with less intensity. It was stable in the Southeast region until 1995, increasing in 2006, and was stable in the South region, around 0.4.

Table 1. Area of farms in the Brazilian frontier (Center-west), by farm size. Millions of hectares

	1970		1975		1980		1985		1996		2006	
Area (Million ha)	Area (Mha)	Share	Area (Mha)	Share	Area (Mha)	Share	Area (Mha)	Share	Area (Mha)	Share	Area (Mha)	Share
< 10 ha	0,18	0,00	0,34	0,00	0,26	0,00	0,33	0,00	0,16	0,00	0,24	0,00
10 - 100 ha	2,91	0,07	3,62	0,05	3,77	0,04	4,42	0,04	4,69	0,04	6,34	0,06
100 - 1,000 ha	12,49	0,30	17,25	0,22	20,63	0,22	23,21	0,23	25,36	0,23	24,93	0,24
> 1,000 ha	26,20	0,63	57,31	0,73	70,11	0,74	71,17	0,72	78,29	0,72	72,28	0,70
Total	41,78	1	78,52	1	94,77	1	99,12	1	108,50	1	103,80	1

Source: Brazilian Agricultural Censuses, various years.

It's interesting to note from Table 1 that large properties accounted for most of the area shares in the frontier since the beginning of the period under analysis. The total area of properties bigger than 100 ha accounted typically for more than 90% of total area in the frontier, and properties greater than 1,000 ha for around 70%. This shows that the occupation of the Brazilian agricultural frontier didn't imply a reduction of the small properties, since their proportion in total area remained relatively constant in time, and the same happened to the number of those units.

The number of persons working in agriculture in Brazil fell from 17.5 million workers in 1970 to 15.9 million in 2006, a 9.4% fall in the period. The number of persons working on farms with less than 10 ha fell by just 5.3% in the same period, from 7.1 million workers in 1970 to 6.8 million in 2006. In the frontier states (Center-west) the fall in the same period was 23% for farms with less than 10 ha, from about 0.16 million to 0.13 million workers, while the total workers in agriculture in the region increased by 9%, from about 0.92 million to 1.0 million.

With that, the share of persons working in farms with less than 10 ha in total agricultural workforce remained relatively stable in Brazil, 0.41 in 1970 to 0.43 in 2006, and fell in the frontier, from 0.18 to 0.13 respectively in the same years. This resilience of the workforce in small properties is noticeable, if one takes into account the low level of income generated in those farms, in general. It is consistent, however, with the stability of the total number of small (< than 10 ha) farms in Brazil, which remained fairly stable between 1970 (2.495 million units) to 2006 (2.477 million units).

The high concentration on property of land has been an historical aspect of the Brazilian economy. Dias et al (2001) situate the historical roots of this phenomenon in the first Brazilian Law of Lands (Lei das Terras, 1850), still in colonial times. This law aimed to discipline the way the free land could be appropriated privately, and favored the strong land ownership concentration process in Brazil which existed then and that lasts until presently. According to the authors, the law didn't create any mechanism to grant access to land for small producers and migrants. Instead, the purchase of land was the only mechanism to acquire free public land (terras devolutas). This option is pointed by the authors as an imposition of slave masters, as the preferred way of transition from slavery to a free workers labor market. In this system, the migrants were confined to the

condition of employees (colonos) in the big farm, and not as proprietaries of land, reinforcing a system of land concentration that shaped the present situation in Brazil.

Hoffmann and Ney (2010) calculated the evolution of the GINI index for the inequality of ownership of land in Brazil, shown in

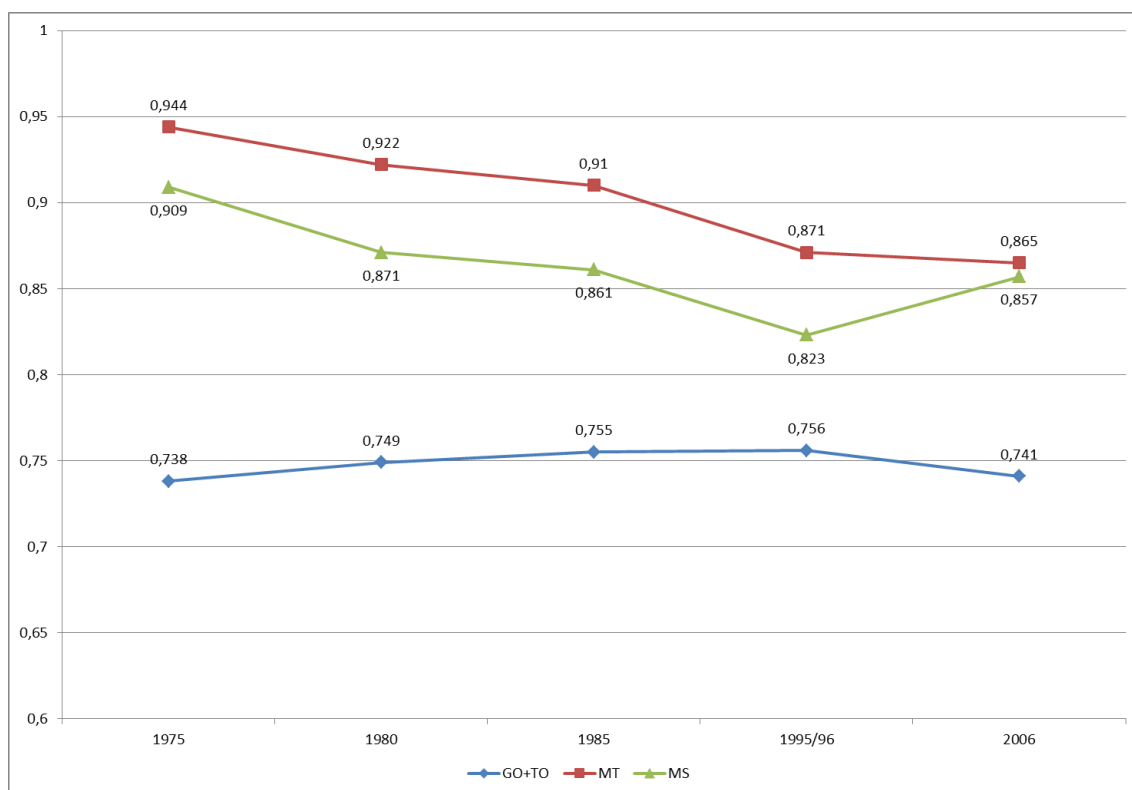
Figure 4. In this figure, the inequality is calculated only for land owners, meaning it does not include other possible productive arrangements, like renters, partners and occupants⁷. As it can be seen, for Mato Grosso (MT) state, for example, the GINI index fell from 0.907 in 1975 to 0.865 in 2006, a slight reduction to a still very high value. The same process happens in Mato Grosso do Sul (MS), which started the occupation earlier, but still shows a very high degree of land ownership inequality. The index is slightly smaller in Goias plus Tocantins (GO+TO), but still very high. The slight reduction in inequality shown in

7 Renters, partners and occupants are different productive arrangements on land exploited by someone who is not the owner.

Figure 4, together with the information about the increase in the area share and in the number of the bigger farms shown in Table 1 conforms to the idea that the reduction in inequality happened through the increase in the number of the larger properties in the frontier, as seen in Figure 3, but with a reduction in their average area. This can actually be confirmed by data from the Brazilian Agricultural Censuses, which shows that while the average area of farms between 100 and 1,000ha increased by 9% in the period 1970-2006, the average area of farms larger than 1,000 ha decreased by 13% in the same period⁸.

⁸ Farms with area less than 10 ha showed a 5% decrease and farms between 10 to 100 ha a 8% decrease in average area in the same period.

Figure 4. GINI index of the distribution of land ownership (only land owners) in Brazil, selected frontier states. 1975-2006.



Source: Hoffmann and Ney (2010)

The agricultural development in the Brazilian frontier, then, started with big farms⁹. It didn't occur through a slow process of merging of smaller properties, or absorption of smaller units into larger ones. It can be inferred from the evolution of the GINI index showed before, as well as from the stylized facts about the phenomenon, that what happened was a fractioning of even larger former low productivity ranching farms, with thousands of hectares, into other large agricultural farms. The land from those large ranching farms were sold to agricultural producers coming from Southeast and South Brazil, which in many cases sold their properties at a high prices in the traditional regions and used the money to buy a larger amount of relatively cheap land in the frontier, as mentioned before. As pointed out by Rezende (2003), the price of land for crops was around 7 times higher in São Paulo state (Southeast Brazil), 5 times higher in Parana state, and 4 times higher in Rio Grande do Sul state (South Brazil) than the in the states of Mato Grosso do Sul and Mato Grosso (frontier), in the average of years 1977 to 1989.

The share of the frontier in total number of smaller farms, then, has never been high in Brazil. Data from the Brazilian Agricultural Census show that the number of The share of the frontier in total number of smaller farms, then, has never been

⁹ If the decade of 1970 is taken as the starting point for this analysis.

high in Brazil. Data from the Brazilian Agricultural Census show that the number of farms smaller than 10 ha in the Center-west region (

Figure 2) changed from 37,144 to 52,255 (respectively 1.5% to 2.1% of the total farms in the same range) from 1970 to 2006, while the Northeast region accounted for about 60% of those farms for the two years, and the South region about 21.6% in 1970, changing to 16.4% in 2006¹⁰. As it can be seen in the Appendix, the relative stability of the share of small properties in the total number of properties in the period, mentioned before, is a general feature of the Brazilian economy.

The reasons behind the relatively small number of small properties in the Brazilian Center-west frontier are manifold, and were further discussed by Rezende (2003). In first place, the author notes that the cerrados frontier weather has a markedly dry seasonal period, what makes it not appropriate for small producers, who would lack the means of subsistence during important part of the year¹¹. This same factor, together with an adequate topography, would also favor the mechanization of activities by large farmers, since the absence of small farms means a short supply of labor for the larger farms. Second, the author calls the attention to the need of “building” the soil in the frontier, due to its chemical characteristics mentioned before, what would be harder for a small producer. This was also in the root of the low prices of land in the frontier in the decades of 1970 and 1980, mentioned before¹².

Additionally, in the early seventies, the already mentioned introduction of new varieties of pastures (mainly *Brachiaria*) with good adaptation to the poor natural fertility and high acidity of the cerrados soils stimulated the increase of planted pastures. But at the same time, official subsidized credit lines were created to fund the modernization of the Brazilian agriculture, with the aim of supporting the ongoing industrialization process, as mentioned before. Given the importance of the rural credit policies in Brazil for the problem at analysis, it will be discussed in more details in the next section.

10 More information on this distribution can be seen in the Appendix.

11 We notice, however, that the northeast region of Brazil, which concentrates the bulk of the small properties, has also a very dry season, and is subject to severe periodic droughts. The small number of small properties in the Center-west is probably more related to the colonization dynamics, which started on the coastal areas, than to the weather.

12 Actually, the author uses this argument to criticize the tentative of agrarian reform in the cerrados areas.

3. THE SUBSIDIZED RURAL CREDIT POLICIES IN BRAZIL

Among the many policies put at action in the seventies aiming the modernization of the Brazilian agricultural sector, the rural credit policy was one of the most important. Based on subsidies to the use of modern agricultural inputs, the rural credit policy served two main purposes: at the same time that it stimulated the adoption of modern inputs (pesticides, fertilizers, machinery) by agriculture, it also backed the consolidation in Brazil of the agricultural inputs and tractor industries, regarded by the government then as part of the “national security” strategy . According to Araújo and Meyer (1979), the main objectives of the rural credit policy were:

- Provide external funds to finance a significant share of the operational costs in agriculture;
- Stimulate capital formation in agriculture;
- Speed up the adoption of modern technology; and
- Strengthen the economic situation of agricultural producers, mainly medium and small.

Still according to Araújo and Meyer (1979), the implicit objective of the policy was to compensate producers for the discriminatory policies put at action with industrialization and price stabilization purposes, notably prices and exchange rates policies.

Despite being listed as one of the objectives of the rural credit policy in Brazil, the credit to small producers has never achieved a significant share of total rural credit during the frontier occupation period, as can be seen in Table 2. Among the farms that declared any type of expenses in the producing process in the 1970 Agricultural Census, only 5.4% were small, in the range of less than 10 ha of area. On the other hand, in the same year 23.7% of the units between 100 and 1,000 ha, 25.5% of those between 1,000 and 10,000 ha and 23.4% of those properties with area above 10,000 ha received rural credit.

The last three columns of Table 2 are even more informative, since they show the share of total rural credit given to different properties size. As it can be seen, the share of the smaller properties in total rural credit in the agricultural censuses of 1970, 1975 and 1980 were respectively 5.5%, 3.2% and 4.9%. It can be seen also that properties with size between 100 and 1,000 ha received the larger share of rural credit in those years.

Table 2. Distribution of rural credit among properties that declared expenses in Brazil, 1970-1980.

Groups of total area (ha)	Share of farms with rural credit			Share of total rural credit		
	Agricultural Census Year			Agricultural Census Year		
	1970	1975	1980	1970	1975	1980
Less than 10 ha	5,4	4,9	10,4	5,5	3,2	4,9
10 to less than 100 ha	17,6	23,3	32,6	33,1	28,7	31,7
100 to less than 1,000 ha	23,7	31,2	36,4	41,8	44,6	42,0
1,000 to less than 10,000 ha	25,5	40,7	34,9	15,6	19,7	18,1
10.000 ha and more	23,4	34,1	26,5	3,8	3,8	3,3

Source: Comin and Muller (1986).

The reasons for the unequal distribution of rural credit in Brazil in the period are well known. First, the cost (for the financial institution) of managing a contract tends to decrease with its size, what naturally led the banking system to avoid managing a large number of small contracts. Second, the bank branches responsible for the distribution of rural credit normally granted preference for the larger producers, with had more collateral to guarantee the grants, a risk minimizing strategy (for the bank). And, finally but not least important, it's naturally easier for a large producer to get a loan, since these producers tend to live in cities and have a higher level of education, skills and networking than small producers living in rural areas.

But to fully understand the importance of the unequal distribution of rural credit in the period in shaping the structure of occupation in the frontier, it's important to understand that the real basis of the rural credit policy in Brazil during the frontier expansion was the strong subsidies embodied in it. The way the subsidy was transferred was mainly through the inflation process: the contracts were denominated in nominal terms, in a period of growing inflation. Some further information on subsidies to rural credit in Brazil in the frontier expansion period can be seen in

Table 3.

Table 3. Inflation, real interest rates in rural credit loans, and rate of subsidy to rural credit in agricultural GDP. Brazil, 1974-1982.

Year	Year inflation rate	Real interest rates in rural credit	Subsidy/Agricultural GDP (%)
1974	24.25	-7.63	7.59
1975	27.9	-10.09	8.46
1976	41.2	-18.56	12.19
1977	42.7	-19.41	9.26
1978	38.7	-17.09	8.52
1979	53.9	-25.28	14.38
1980	100.2	-33.57	17.49
1981	95.2	-25.14	12.61
1982	99.7	-27.39	15.24
1983	211.0	-48.55	-

Source: Comin and Muller (1986).

As it can be seen, the real interest rates were negative in the agricultural loans in the period, and the more negative the higher the inflation rate. The values of subsidies entailed in rural credit, shown in the last column of

Table 3, peaked to 17.49% of total agricultural GDP at factor costs in 1980¹³. It's clear, then, that even if the rural credit program in the period was not the only factor behind the pattern of land structure in the agricultural expansion area in Brazil (which, as seen before, came from the past), it at least ratified the process, and did not create any counterforce to the natural pattern of expansion based on large properties. Besides, the credit was direct toward the use of modern inputs (fertilizers, pesticides and machinery), and the rural extension system that followed, both public and private, which was frequently linked to the financial system, naturally directed the technological pattern of the new properties to the adoption of those inputs.

It should also be noticed that soybean, the main agriculture product apart from livestock production in the frontier, was also introduced in the region in a modern basis, in technological terms. The reduced supply of workforce in the frontier, the distribution of rural credit and the existence of strong economies of size in soybean¹⁴ production were forces contributing to the consolidation of the large agricultural properties as the standard in the frontier. Rezende (2003), for example, refers to the indivisibilities of the mechanical technologies as one of the sources of size economies in the area. But other sources of size economies are also important, like the negotiation power of producers buying inputs in bulk. Conte and Ferreira Filho (2006) in an extensive study on size economies in soybean production in Brazil showed that the optimal scale (minimum average cost) for soybeans in the Center-West appears in a farm size around 4,000 ha. Still, most of the producers in the region were operating in the range of existing economies of scale, meaning that there was still room for further reductions in production costs through the increase in the area of exploitation. The authors also call the attention to the contrast with the South and Southeast regions in Brazil, where most of the producers were also operating in the range of strong economies of scale and therefore would reduce their costs increasing the area, a difficult task in the traditional region¹⁵.

3.1 The present configuration of small agriculture in Brazil

The consolidation of the large property in the Brazilian frontier, then, was motivated for many different factors, all operating in the same directions. In this section we investigate in more depth the consequences for the smaller properties of this pattern of expansion of the agriculture in the frontier. Instead of focusing exclusively on the frontier, however, we will try to show somewhat of the huge diversity of situations of what can be called the "small property" in Brazil.

With the lack of capacity to incorporate new technologies, or to modernize, and get the economies of scale embodied in it, the smaller properties adopted a different trajectory than the larger properties. In the absence of the large economies of

13 The subsidies to rural credit in Brazil were drastically reduced in the wake of the 1984 financial crisis, when the country had to resort to IMF to fund its external debts payments.

14 More recently the same phenomenon was observed in cotton production in the Brazilian cerrados.

15 In the traditional Southern and Southeastern regions the properties are smaller, and land more expensive, turning it harder to increase the size of the operation.

scale and access to credit, a risk diversification strategy developed, with a more diversified portfolio of products in the smaller properties, but typically food products. The next tables display more information on the evolution of the production composition in two different strata of area, for the states located in the Brazilian agriculture frontier.

Table 4. Shares in total values of production of farms in the frontier, by product and farm area. 1970.

1970											
Until 10 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,41	0,01	0,13	0,12	0,00	0,03	0,06	0,18	0,07	0,00	1,0
Mato Grosso	0,33	0,01	0,06	0,08	0,02	0,06	0,15	0,11	0,05	0,13	1,0
100 to 1000 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,33	0,01	0,07	0,09	0,01	0,01	0,08	0,32	0,09	0,00	1,0
Mato Grosso	0,24	0,01	0,03	0,06	0,01	0,04	0,04	0,45	0,12	0,01	1,0

(1)Goiás + Tocantins. (2) Mato Grosso+Mato Grosso do Sul. Source: Brazilian Agricultural Census 1970.IBGE.

Table 5. Share in total values of production of farms in the frontier, by product and farm area. 1980

1980											
Until 10 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,35	0,00	0,23	0,23	0,00	0,02	0,00	0,09	0,06	0,00	1,0
Mato Grosso	0,44	0,00	0,32	0,14	0,00	0,06	0,00	0,03	0,01	0,01	1,0
Mato Grosso do Sul	0,18	0,00	0,33	0,12	0,14	0,13	0,00	0,07	0,03	0,00	1,0
100 to 1000 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,18	0,01	0,07	0,09	0,01	0,01	0,08	0,32	0,09	0,00	1,0
Mato Grosso	0,52	0,00	0,04	0,03	0,04	0,01	0,00	0,31	0,05	0,00	1,0
Mato Grosso do Sul	0,09	0,00	0,01	0,02	0,31	0,01	0,00	0,50	0,05	0,00	1,0

Source: Brazilian Agricultural Census 1980. IBGE.

Table 6. Shares in total values of production of farms in the frontier, by product and farm area. 1995.

1995											
Until 10 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,05	0,00	0,23	0,23	0,00	0,02	0,00	0,09	0,06	0,00	1,0
Mato Grosso	0,10	0,01	0,05	0,12	0,05	0,15	0,04	0,15	0,34	0,00	1,0
Mato Grosso do Sul	0,02	0,01	0,02	0,05	0,05	0,55	0,11	0,09	0,11	0,00	1,0
Tocantins	0,37	0,01	0,00	0,09	0,00	0,17	0,00	0,26	0,10	0,00	1,0
100 to 1000 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,02	0,02	0,02	0,17	0,17	0,00	0,03	0,35	0,20	0,00	1,0
Mato Grosso	0,05	0,12	0,00	0,08	0,39	0,01	0,02	0,28	0,06	0,00	1,0
Mato Grosso do Sul	0,02	0,02	0,00	0,10	0,24	0,01	0,01	0,55	0,05	0,00	1,0
Tocantins	0,11	0,00	0,00	0,04	0,00	0,02	0,00	0,72	0,11	0,00	1,0

Source: Brazilian Agricultural Census 1995-1996. IBGE.

Table 7. Shares in total values of production of farms in the frontier, by product and farm area. 2006.

2006											
Until 10 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,02	0,01	0,00	0,10	0,00	0,04	0,00	0,18	0,64	0,00	1,0
Mato Grosso	0,05	0,03	0,02	0,10	0,00	0,24	0,00	0,18	0,37	0,00	1,0
Mato Grosso do Sul	0,03	0,03	0,03	0,14	0,05	0,33	0,00	0,12	0,27	0,00	1,0
Tocantins	0,19	0,00	0,03	0,12	0,00	0,13	0,00	0,23	0,30	0,00	1,0
100 to 1000 ha											
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts	Total
Region											
Goiás	0,01	0,03	0,01	0,10	0,37	0,00	0,02	0,35	0,14	0,00	1,0
Mato Grosso	0,01	0,09	0,00	0,11	0,38	0,01	0,02	0,35	0,05	0,00	1,0
Mato Grosso do Sul	0,01	0,04	0,00	0,12	0,35	0,00	0,01	0,44	0,03	0,00	1,0
Tocantins	0,06	0,00	0,00	0,04	0,16	0,01	0,00	0,61	0,12	0,00	1,0

Source: Brazilian Agricultural Census 2006. IBGE.

It can be seen from

Table 4 that in 1970¹⁶ the composition of production, in terms of shares of value of production of the selected products displayed in the table¹⁷, didn't differ too much between the two selected area strata (small and medium/large farms). Rice, beans, livestock and milk productions accounted for the bulk of the value of production in both farms sizes, with some regional differentiation. We call the attention to the importance of cotton production in the smaller properties in 1970, around 15% of total value of production in Mato Grosso state. Cotton gradually disappeared from the small properties production after the introduction in Brazil of the boll weevil¹⁸ in the eighties¹⁹. Notice also that livestock (for beef production) was more important than milk in the seventies, for the smaller properties, and that rice, beans and corn were more important for the smaller properties than for the larger properties, which had in livestock production their main product.

This particular feature, the relative specialization of the smaller properties in food products, as opposed to the export crops (soybeans and sugar cane) is an important characteristic of small production in Brazil that remains until presently,

¹⁶ In 1970 the states of Mato Grosso do Sul and Tocantins were part, respectively, of Mato Grosso and Goiás. For this reason the Censuses only show the aggregated results.

¹⁷ The selected products displayed in the tables typically respond for more than 95% of total value of production of those farms.

¹⁸ The boll weevil (*Anthonomus grandis*) is a beetle which feeds on cotton buds and flowers

¹⁹ Cotton is presently being produced almost entirely in properties larger than 1,000ha, in the Center-west and Northeast regions of Brazil.

and was also noticed by other authors, like Guanziroli and Cardim (2000)²⁰, who show also that the “family agriculture” is responsible for a significant share of food production in Brazil, and identify also “market niches” where family producers are the main producers. Notice that beans, corn, cassava and milk (for most of the census years) tend to be more important, as a share of the total value of production of farms, for the smaller farms than for the larger ones, which tend to specialize more in soybeans and livestock (beef)²¹. This also confirmed by Guanziroli (2013) who analyzed the main products of the family agriculture in the Brazilian regions. In The Center-west region the main products of those farms were, in 2006, milk, cassava, bananas, tomatoes, chayote, firewood and watermelon. Cassava, milk and bananas are important for the small producers in every region of Brazil, except the South region, where the weather is not suitable for the culture²².

Small agriculture became an explicit focus of economic policies in Brazil in 1996, with the creation of the Programa Nacional da Agricultura Familiar (National Program of Familiar Agriculture - PRONAF), a rural credit program directed to small producers²³. According to Conti and Roitman (2011) the goal of the program is “promote sustainable development of the rural segment constituted of agriculture family producers, in order to allow the increase of their production capacities, employment generation and income improvement”²⁴. The PRONAF program is a particular funding line in the general framework of the National System of Rural Credit, is subject to the same general rules and gets yearly 20% of mandatory amounts of resources for the general rural credit system (Conti and Roitman, 2011).

²⁰ Those authors, however, used a different concept for farm type classification, the “family agriculture” concept, which is different from the one used in this text.

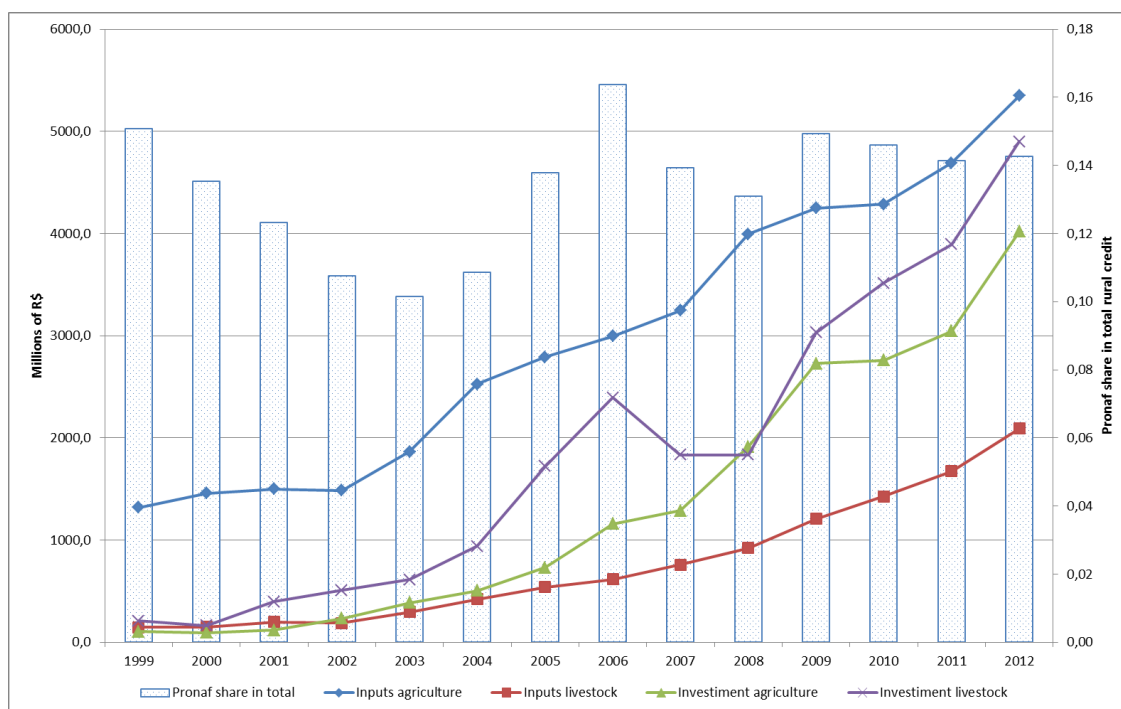
²¹ Sugar cane doesn't appear as a relevant activity in the frontier, since the states in southeast Brazil, mainly São Paulo, are the main producers. The production is increasing in the Center-west, however.

²² In this region grapes appears instead.

²³ The concept of “family agriculture” is not exactly the same of small production, even though there is a correspondence between them. The term “family agriculture” will be used here interchangeably with “small production”.

²⁴ Decreto 1946, de 28 de junho de 1996.

Figure 5. Rural credit in Brazil and evolution of PRONAF share in total. 1999 – 2012.



Source: PRONAF: Ministério do Desenvolvimento Agrário. Total Rural Credit: Central Bank of Brazil (Anuário Estatístico do Crédito Rural, various years).

The amount of PRONAF loans increased markedly since 1999, following the general trend of increase in total rural credit available to agriculture. The share of the program oscillated during the decade, but is stable in the last years, with loans amounting to about 15% of total rural credit²⁵. The most important modality of PRONAF is the loans for agricultural inputs, followed by investment in livestock, which includes the purchase of animals for reproduction and herd improvement.

3.2 The Food Security measures and support to small agriculture²⁶

It's clear from

²⁵ Total rural credit in Brazil in 2012 amounted to R\$114.7 billion, or about US\$49.8 billion.

²⁶ This chapter is largely based in Ferreira Filho and Vian (2013, forthcoming).

Figure 5 that the amount of credit allocated to the small farmers in Brazil started to increase faster from 2002. This is due to the launch by the Federal government in that year of the Zero Hunger Program, a program that aimed to conciliate issues of food security with social and economic development, and brought a new impetus to the support of small agriculture. This program gained new status after 2002, with the election of President Luiz Inácio Lula da Silva, when the new Ministério Extraordinário de Combate à Fome (The Extraordinary Ministry of Fight to Hunger) was created, later substituted by the present Ministério de Desenvolvimento Social e Combate a Fome (Ministry of Social Development and Fight to Hunger - MDS) and the Ministério de Desenvolvimento Agrário (Ministry of Agrarian Development - MDA).

In 2003 the Programa de Aquisição de Alimentos – PAA (Food Acquisition Program) was created, managed by the Companhia Nacional de Abastecimento – CONAB and linked to the two above mentioned ministries, which supply resources for the acquisition and distribution of food in Brazil. The PAA was created in July, 2, 2003, by law no. 10,696 with the objective of stimulating family farm production through market operations, with a regional focus. In this sense, the PAA has two main goals: to promote the access to food and to incentive family agriculture. It operates, then, both like a minimum prices policy as well as like an assistance policy. The program acquires agricultural products from family producers through a simplified process, and distributes it to households in situation of food insecurity, or to stock formation for future sales. In many cases the distribution is made regionally²⁷. The PAA comprises the marketing of many different food types in each region, and the main public to be assisted is composed of households in situation of food insecurity, like attendees of the agrarian reform program, indigenous communities, families affected by large public investments like dams for electricity generation, and other endangered families.

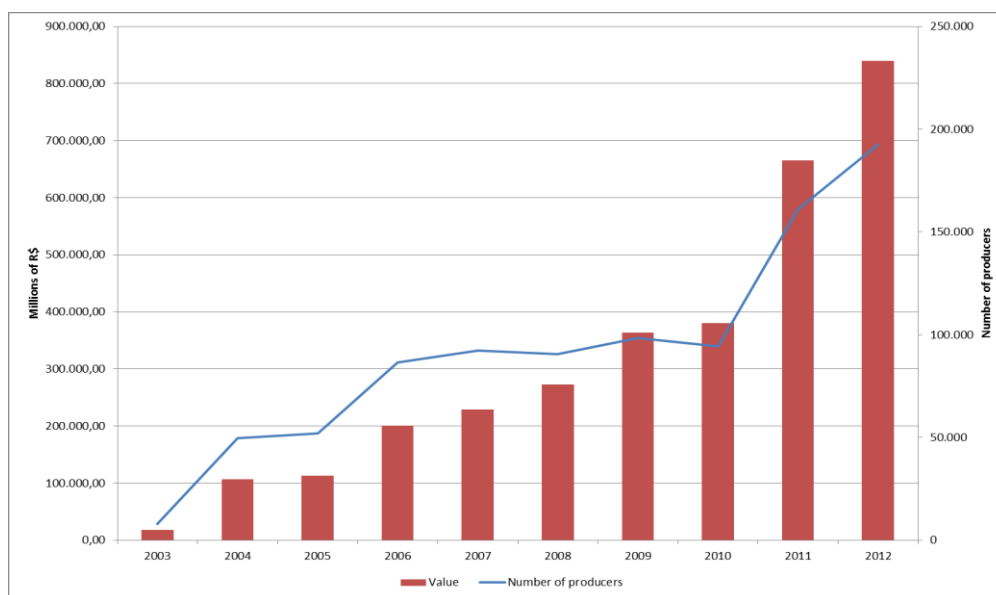
The food security programs at work in Brazil presently, then, recognize the important role of small producers in food production in the country. The objective of those policies is to reduce the transaction costs and guarantee access to markets to the small producers, through linking these producers directly to the public food security programs²⁸. The evolution of the value of purchases in the PAA program, as well as the number of producers assisted by the program can be seen in

27 <http://www.mds.gov.br/segurancaalimentar/aquisicao-e-comercializacao-da-agricultura-familiar>

28 One of those programs, for example, purchase food directly from small producers for further distribution in the meals programs in public schools.

Figure 6. The amount of resources spent on the PAA program increased markedly from 2003 to 2012, reaching the value of R\$839.2 million in that year. It should be noticed, however, that the number of 192,493 producers assisted in 2012, although increasing strongly since 2003, is still small compared to the total of 2.5 million producers with land area less than 10 hectares in Brazil, what illustrates the difficulty of assisting all those producers.

Figure 6. Value of purchases in the PAA program and number of producers assisted 2003-2012



Source: Secretaria de Avaliação e Gestão da Informação. PAA Data.

Actually, there is a great deal of variation in the universe of small producers in Brazil. Guanzioli (2013), using the concept of family agriculture mentioned before, did an evaluation of this heterogeneous universe, classifying the family producers according to their annual money income, and trying to identify markets suitable for the insertion of the small production. The author showed that between 1996 and 2006 there was an increase in the trend of familiar producers toward food crops, or domestic crops, like rice, corn, beans and cassava, and a reduction in their production of animal products (except milk) and other cereals. The author also identified an increase in the specialization of those farms, or a reduction in the diversification of products inside the property.

The extent to which the present policies will be successful in boosting the small production remains to be seen. Buainain and Garcia (2013) analyzed the possibilities of different ranges of small producers to engage in markets and being incorporated to the commercial agriculture. Analyzing specifically farms between 0 and 10 hectares, the authors conclude that all of those producers would be below the poverty line, according to the official poverty criterion²⁹. The authors also point out that...“those producers have structural deficits in basically all variables relevant to explain income levels. Most of them don’t have enough land, have low capital endowment, low human capital, low organizational level, and show a significant technological gap....apart of being located in many cases in restricted regional contexts...” (Buainain and Garcia, 2013). The authors conclude that only a small share of those small producers have conditions to survive as agriculture producers, generating enough income from agriculture to live in adequate standards.

²⁹ Less than 1/2 minimum wage of per capita income.

4. FINAL REMARKS

The evolution of agriculture in the Brazilian Center-west frontier starting in the seventies was a movement of fractioning of large private farms, into smaller but still large farms. The process precluded the appearance of a large number of small commercial producers in the agricultural frontier, as seen in other parts of the world. The economic policies that followed reinforced the process, contributing to shape the actual pattern of unequal distribution of land that characterizes Brazil. The small production that developed in parallel to the large properties tend to produce more food products than export commodities, although there is a variety of different situations in this universe of small farms. Due to that occupation process, the number of small farms in the frontier is relatively small when compared with the traditional regions of Northeast and South Brazil. In spite of that, the number of workers in those small properties fell faster in the Center-west than in the traditional regions, what can be linked to the increase in the importance of livestock production in the frontier, typically less labor intensive than agriculture.

In the historical context, the small properties started to receive special policy attention in the nineties, with explicit inclusion in the rural credit policy first (the PRONAF program), and in the food security program (the PAA) later. These efforts aim to support small producers, alleviating rural poverty and, at the same time, increasing food security. The chances of success of those small farms, at this point, however, seem to be restricted to a small share of the identified 2.5 million small producers³⁰ in Brazil, those able to be included in modernization process via policy stimulus. For the largest part of those small producers, however, the future is uncertain, and the efforts to support them seem to be more complex, including actions in the field of social assistance, besides the agricultural policy. This is a valid effort, however, that should be accompanied of educational policies to prepare the next generations to engage in a different activity, either rural or not, or to move to the urban centers in conditions to be absorbed by the urban labor market.

This raises important points for consideration. Brazil has attracted a lot of international attention recently, for many different reasons. In agriculture, specially, the successful experience of occupation of the Brazilian cerrados is worldwide recognized as the result of a combination of many different policies in the fields of agricultural research, credit and rural extension. This has led to a series of initiatives in the field of international cooperation, as is the case of the creation of EMBRAPA offices in Africa, with the explicit aim of ...“Help, promote and foment social development and economic development through technology transfer and knowledge and experiences sharing in the field of agriculture research”.³¹The Brazilian experience with policies for small agriculture as a goal of economic development, however, is limited and recent. The extent to which the biological

30 With farm areas less than 10 ha.

31 http://www.embrapa.br/a_embrapa/labex/africa/Escriorio_Africa/. Author's free translation.

and processes innovations – the Embrapa’s expertise - are the determinant factors for the success of the small properties is not completely clear, and other structural factors have to be carefully taken into account when dealing with the development of small agriculture.

And, finally, another important point to consider when dealing with the Brazilian experience in the occupation of the cerrados is that, apart from comprising a massive transfer of physical capital to the frontiers, it also promoted a transfer of human capital, in the form of the new settlers coming from the relatively more modern agriculture of the Southeast and Southern Brazil. Actually, Cunha and Silveira (1999) showed that around 55% of the migrants in the Center-west region in the 1970-80 period came from the South and Southeast regions. The agrarian structure in those settlers’ regions of origin was such that operated as expulsion factors (the fractioning of small properties due to inheritance) that, together with the attraction factors represented by the low prices of land in the frontier, the expansion of infrastructure and the economic incentives, mostly the subsidized rural credit, boosted the frontier increase. Those migrants didn’t find any particular barrier related to language or culture, and as producers they were previously used to a more modern pattern of agriculture in their regions of origin, and already adapted to the use of improved seeds, lime for soil acidity correction, and other modern agricultural inputs. This was certainly one of the most important factors to explain the fast increase in agriculture production in the Brazilian cerrados. The extent to which this is a reproducible – or desirable – model of agrarian development in other regions is open to debate.

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6. APPENDIX

Table 8. Number of farms, by farm size and region, in Brazil. 1970-2006.

Region	Area	1970	1975	1980	1985	1996	2006
North	Less than 10 há	109435	153224	149600	167804	134803	126532
Northeast	Less than 10 há	1499625	1641931	1654841	1971391	1570510	1498389
Southeast	Less than 10 há	310205	277485	290196	355873	286872	393414
South	Less than 10 há	538865	460724	451860	502675	377761	406481
Center-west	Less than 10 há	37144	68496	51519	67079	32427	52255
	TOTAL	2495274	2601860	2598016	3064822	2402373	2477071
		1970	1975	1980	1985	1996	2006
North	10 to less than 100	122690	150185	204450	264705	217097	229105
Northeast	10 to less than 100	560893	567033	637263	667491	604261	650855
Southeast	10 to less than 100	484775	459961	458805	494263	428912	411437
South	10 to less than 100	674185	630591	624181	625123	555246	515456
Center-west	10 to less than 100	69470	91381	92075	108758	110971	164724
	TOTAL	1912013	1899151	2016774	2160340	1916487	1971577
		1970	1975	1980	1985	1996	2006
North	100 to less than 1000 há	56995	69590	88078	102022	83647	80709
Northeast	100 to less than 1000 há	126124	131045	141134	143965	125406	115487
Southeast	100 to less than 1000 há	125833	131738	131408	133294	118080	91880
South	100 to less than 1000 há	55462	58820	62973	64419	64390	59965
Center-west	100 to less than 1000 há	41935	54977	64928	73731	78441	76865
	TOTAL	406349	446170	488521	517431	469964	424906
		1970	1975	1980	1985	1996	2006
North	1000 há and above	4386	5700	7597	8412	8023	8274
Northeast	1000 há and above	8660	9120	10235	10552	8907	8165
Southeast	1000 há and above	7746	8663	8585	8364	7017	5801
South	1000 há and above	4790	5202	5550	5448	5030	4468
Center-west	1000 há and above	6385	12782	15876	17635	20380	20203
	TOTAL	31967	41467	47843	50411	49357	46911