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The Brazilian experience with the occupation of the cerrado: the dynamics of large farms vs small farms

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1. Introduction

After World War II, the Brazilian economy started a period known as the "forced industrialisation period", which lasted for almost 30 years. The dominant view in this period, according to CEPAL,[1] was that the recurrent balance-of-payment crises in the region were linked to the secular trend of falling agricultural prices. The military coups of the 1960s, although changing the political lines of the country, reinforced the strategy of industrialisation, resumed by the "fifty years in five" programme of former president Juscelino Kubitschek.

The different development plans that followed consisted largely of measures targeted at speeding up industrialisation, launching the basis for the high rates of growth observed in the 1970s and based mainly on external indebtedness – a period that was threatened by the first oil shock, and actually was interrupted by the second oil shock of the seventies. In essence, the industrialisation period required agriculture to play three classical roles: to supply labour for the growing urban activities, to supply food at stable prices, and to supply foreign currency to finance the imports of machinery and intermediate goods needed for capital formation in the urban sector.

These requirements created strong pressure on the agricultural sector, and a new dynamic started to develop to meet those challenges. EMBRAPA, the Brazilian Federal Agricultural Research Institute that was established in the early 1970s, was one of the mechanisms created to facilitate the expansion of Brazilian agriculture on a different path to the former strategy, which was based on the fertile soils of the South/Southeast regions. Coffee in particular was produced largely in Sao Paulo and Parana states, which already were among the richest states in the country.

The necessity to generate foreign exchange through agricultural trade gave rise to the stimulus to produce tradable agricultural products, especially soybeans, an extraordinary change that would dramatically modify the landscape of the vast unoccupied cerrado[2] areas in the Brazilian Centre-West region in the ensuing years. The replacement of vast natural pastures with low productivity by modern, rain-fed cultivation is one of the most striking chapters in recent Brazilian economic history. This process was backed by public policies promoting research and rural credit, and led to a

[1] The United Nations Economic Commission for Latin America and the Caribbean (UNECLAC), or CEPAL in Spanish.
[2] The cerrado biome comprises a Savannah-type vegetation, with different classifications included in this general denomination.

rapid transfer of capital and population to the region, with important changes in the economy and the agrarian structure of these areas.

In this paper we analyse the occupation of the Brazilian Centre-West, focusing on how the appearance of large modern commercial farms devoted mostly to planted pastures and soybean plantations affected the existence of small farms, and shaped the pattern of production in these regions. The focus is on the "traditional" agricultural frontiers of the 1970s, comprising the present states of Mato Grosso do Sul and Mato Grosso (the Centre-West frontier), and Goias, the Federal District and Tocantins (the Centre-East frontier).[3]

2. The evolution of agriculture in the Brazilian Centre-West

The occupation of the Brazilian Centre-West region initially started through the transformation of large traditional cattle ranches, based on extensive natural pastures, to more modern operations with planted pastures. This was made possible by the introduction of new grass varieties in the 1970s, notably the African Brachiaria grasses.

Figure 1 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 1970s, and initially mainly through the increase in livestock production. The figure also shows the rapid early increase in rice production, largely because rice was a "pioneering" activity that was undertaken after land clearance and before land preparation for the introduction of the first planted pastures, and later soybeans.[4] At the same time, rice has always been an important food product in Brazil, and thus had a guaranteed internal market. However, while the share of livestock in the frontier increased continuously, the share of rice started to fall from 1980.[5]

The production of soybean started to increase rapidly from 1975. Until then, only the states in the South and Southeast regions of Brazil produced the crop because the seeds were not adapted to the subtropical conditions of the cerrado. The investments in agricultural research started to produce results and, from 1975 on, the annual rate of growth of soybean production reached as high as 59% in the period 1970/1975 and 43% between 1975 and 1980.

As a consequence of the advance of planted pastures and cultivation in the frontier region, the total number of farms[6] increased. As can be seen in Figure 2, the share of the frontier in the total number of farms in Brazil increased steadily over time. The Centre-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.

[3] The present states did not exist as such in the 1970s. The former Mato Grosso state was split in two in 1977 (Mato Grosso and Mato Grosso do Sul). Goias was also split in two in 1988 (Goias and Tocantins).
[4] The Brazilian cerrado soils are acidic, with a high content of free aluminium, to which rice is relatively more tolerant than soybean.
[5] This phenomenon is related to the introduction of other types of grasses that are more tolerant of soil acidity.
[6] In Brazil the word "farm" is used more in relation to large agricultural production units. In this text we will use it to refer to agricultural production units of any size.

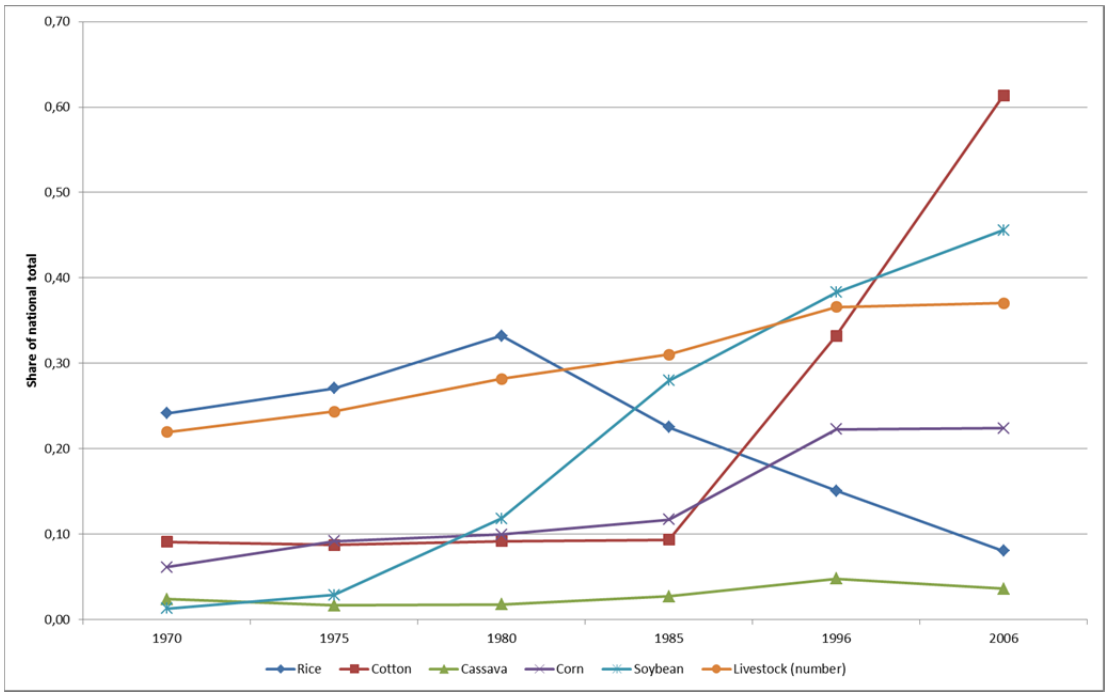

Figure 1: Share of the main agricultural activities in the Brazilian agricultural frontier in total production in Brazil, 1970 to 2006
Source: Brazilian Agricultural Censuses, various years

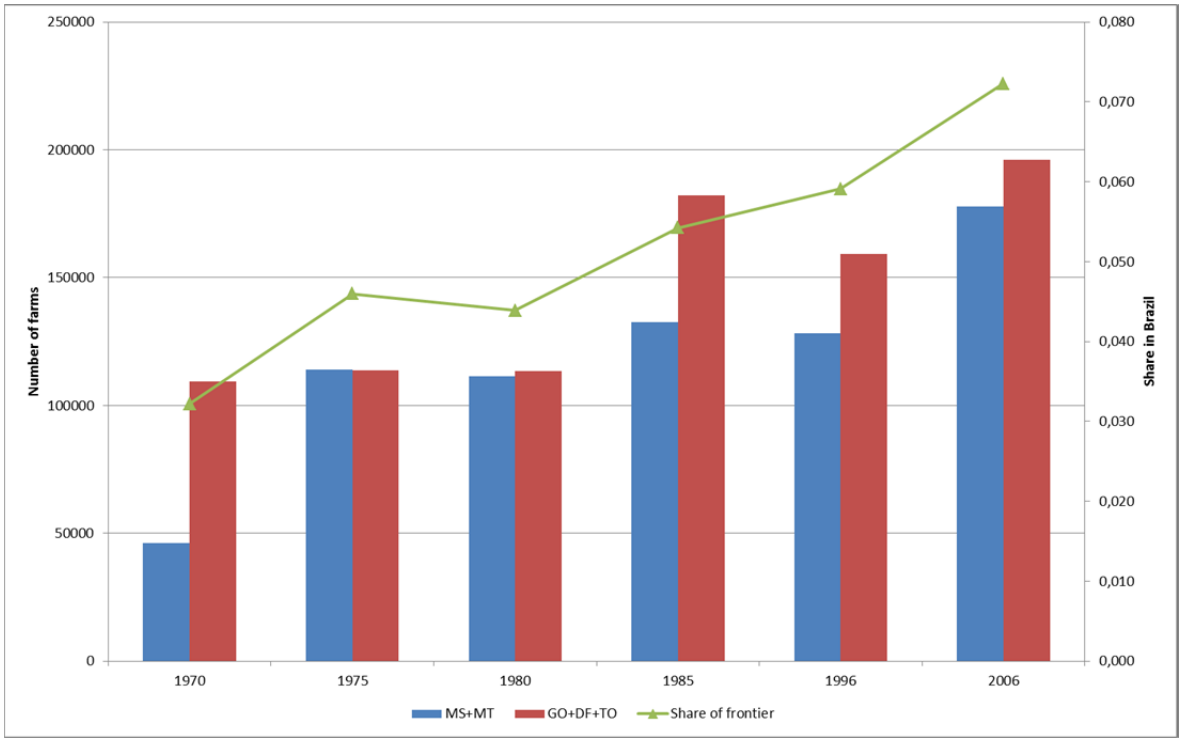

Figure 2: Number of farms in the Brazilian agricultural frontier, and share of frontier in total farms in Brazil
Source: Brazilian Agricultural Censuses, various years

The occupation of the agricultural frontier represented 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 later) stimulated the selling of land at higher prices in the wealthier areas and the buying of much bigger farms at lower prices in the frontier. Medium and large producers moved in on this process, generating a pattern of occupation characterised by medium-sized and large properties, as can be seen in Figure 3, which shows a strong increase in the number of farms between 10 and 100 hectares in size. By Brazilian Centre-West standards, these properties are small, even though a property of about 100 ha can be considered medium size from a technological standpoint.

Notice that, while the number of medium and large units (> 10 ha) in the frontier increased, the number of small farms (< 10 ha) remained relatively stable, meaning that their number reduced significantly in relative terms. Indeed, the share of the smaller farms in the Centre-West fell from 0.24 in 1970 to 0.17 in 2006.[7] But the relative stability in the absolute numbers of these smaller properties over time is a phenomenon observed all over Brazil: there were around 2.5 million farms of less than 10 ha in the country both in 1970 and 2006. This suggests that the advance of the large properties in the frontier region did not actually displace small farms, but happened through the breaking up of bigger (and extensive) livestock farms that existed previously and, in some cases, of public-owned land. As will be seen later, however, the survival strategy of those small units implied a different composition of production, an important feature of the current Brazilian economy.

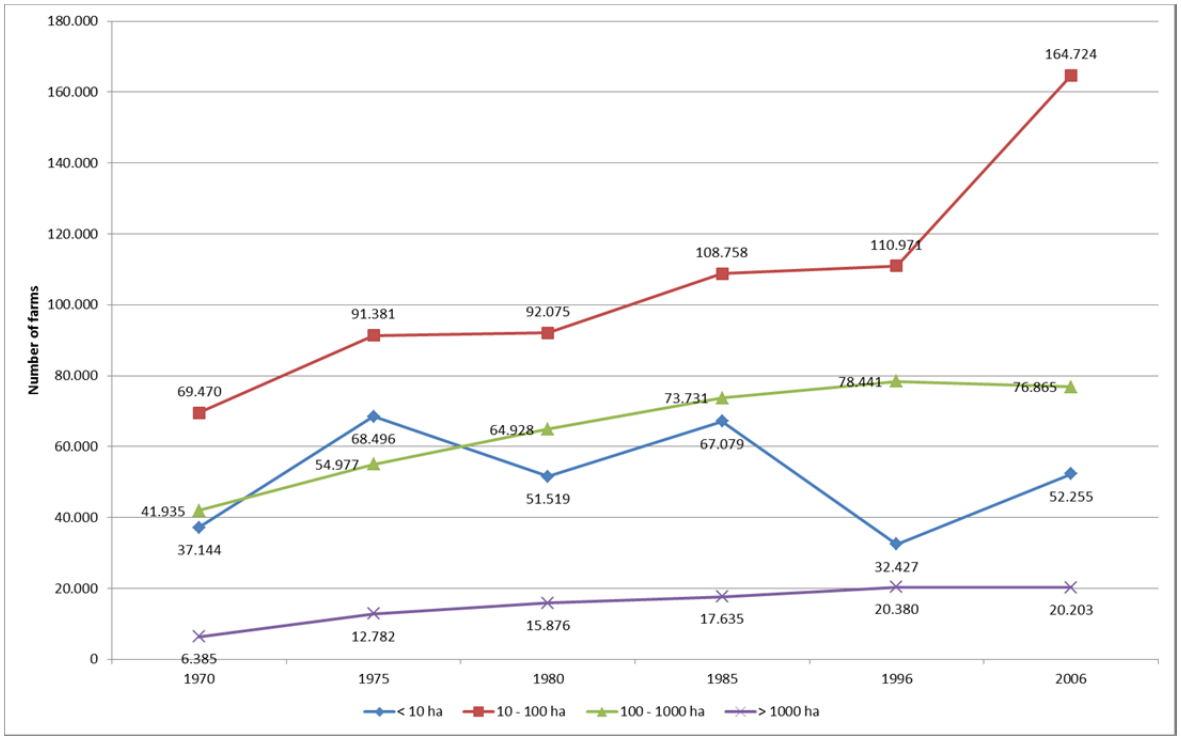

Figure 3: Number of farms in the Brazilian agricultural frontier (Centre-West), by area (ha)
Source: Brazilian Agricultural Censuses, various years.

The numbers in Figure 3, however, do not really give a complete picture of the degree of land concentration in the frontier region. This can be better evaluated by comparing the total area of each of the size groups (Table 1). The total area of agricultural properties of less than 10 ha in the

[7] This fall in the share of the number of farms smaller than 10 ha in the total number of farms between 1970 and 2006 also was observed in the North and Northeast regions, but with less intensity. The situation was stable in the Southeast region until 1995, increasing in 2006, and it was stable in the Southern region, at around 0.4.

frontier increased from 181 150 ha in 1970 to 243 140 ha in 2006, accounting for a very small share of the total area in both cases.

Table 1: Area of farms in the Brazilian frontier (Centre-West), by farm size

	1970		1975		1980		1985		1996		2006	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Million hectares											
< 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

Large properties accounted for most of the area in the frontier from the beginning. The total area of properties bigger than 100 ha typically accounted for more than 90% of the total area in the frontier, and properties greater than 1 000 ha accounted for around 70%. This shows that the occupation of the Brazilian agricultural frontier did not imply a reduction in small properties, since their proportion of the total area and of the number of units remained relatively constant.

The number of people working in agriculture in Brazil fell from 17.5 million in 1970 to 15.9 million in 2006 – a decline of 9.4%. The decline on small farms was smaller, at 5.3%, from 7.1 million workers in 1970 to 6.8 million in 2006. In the frontier states (Centre-West), the fall in the same period was 23% for farms of less than 10 ha, from about 0.16 million to 0.13 million workers, while the total number of workers in agriculture in the region increased by 9%, from about 0.92 million to 1.0 million. With that, the share of the total agricultural workforce of people working on farms of less than 10 ha remained relatively stable in Brazil, from 0.41 in 1970 to 0.43 in 2006, but fell in the frontier, from 0.18 to 0.13 in the same years respectively. The resilience of the workforce on small properties is noticeable if one takes into account the low level of income generated on those farms. It is consistent, however, with the stability in the total number of small farms in Brazil.

The high concentration of land ownership has been an historical aspect of the Brazilian economy. Dias *et al*. (2001) situate the historical roots of this phenomenon in colonial times, in the first Brazilian Law of Lands (*Lei das Terras*, 1850). The purpose of this law was to regulate the way in which free land could be appropriated privately, but it did not create any mechanism to grant access for small producers and migrants. Instead, the purchase of land was the only mechanism to acquire free public land (*terras devolutas*) in order to discourage freed slaves from accessing land (Dias *et al*. 2001). In this system, migrants were confined to becoming employees (*colonos*) on the big farms, and not proprietors of land.

The GINI index for the ownership of land in three key states of Brazil is shown in Figure 4. The index is calculated only for land owners, and excludes other arrangements such as renters, partners and occupants. In Mato Grosso (MT) state, for example, the GINI index fell from 0.907 in 1975 to 0.865 in 2006, a slight reduction in a still very high value. The same process happened 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 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, confirms that the reduction in inequality happened through an increase in the number of larger properties, 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 1 000 ha increased by 9% in the period 1970 to 2006, the average area of farms larger than 1 000 ha decreased by 13% in the same period.8

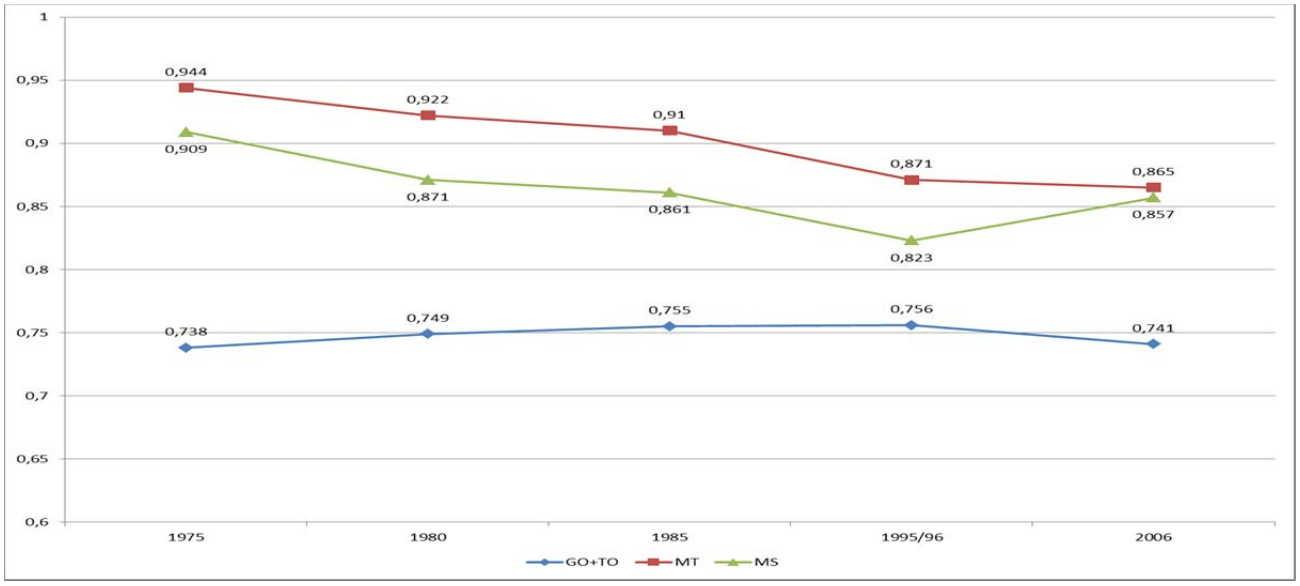

Figure 4: GINI index of the distribution of land ownership in selected frontier states, 1975 to 2006

Source: Hoffmann and Ney (2010)

Agricultural development in the Brazilian frontier therefore started with big farms, rather than through any process of consolidation from below, as ranches that used to be even larger but with low productivity were transformed into cultivated properties by agricultural producers coming from Southeast and Southern Brazil, who in many cases sold their properties at high prices in the traditionally settled regions and used the money to buy relatively cheap land in the frontier. Rezende (2003) showed that the price of land for crops was around seven times higher in São Paulo state (Southeast Brazil), five times higher in Parana state, and four times higher in Rio Grande do Sul state (South Brazil) than in the states of Mato Grosso do Sul and Mato Grosso (frontier) between 1977 and 1989.

The reasons behind the relatively small number of small properties in the Brazilian Centre-West frontier are manifold. Rezende (2003) argued that the weather in the cerrado frontier has a markedly dry seasonal period, with the result that small producers lack the means for subsistence during important parts of the year. However, there are more small farms in the northeast of Brazil, an area that also has a dry season and is subject to severe periodic droughts. The small number of small properties in the Centre-West is probably related more to the dynamics of colonisation, which started in the coastal areas, than to the weather. This same factor, together with an adequate topography, would also favour the mechanisation of activities by large farmers, since the absence of small farms means a scarcity of labour for the larger farms. Secondly, Rezende (2003) called attention to the need for "building" the soil in the frontier to counter the high soil acidity, something that small farmers were unable to afford. This was also at the heart of the low prices of land in the frontier in the 1970s and the 1980s.

[8] Farms with an area of less than 10 ha showed a 5% decrease, and farms with an area of 10 to 100 ha showed an 8% decrease in average area in the same period.

In addition, the introduction of new varieties of pastures (mainly Brachiaria) that were well adapted to the poor natural fertility and high acidity of the cerrado soils stimulated investment in planted pastures in the early 1970s. This process was supported by the introduction of subsidised credit lines in order to stimulate the modernisation of Brazilian agriculture. This issue is addressed next.

3. The subsidised rural credit policies of Brazil

The provision of rural credit was seen as a key element of support for the modernisation of the Brazilian agricultural sector in the 1970s. Based on subsidies for the use of modern agricultural inputs, the rural credit policy served two main purposes: to modernise agriculture by stimulating the adoption of modern inputs, and to provide a captive market for the Brazilian agricultural input and tractor industries, regarded by the government then as part of the "national security" strategy.[9] According to Araújo and Meyer (1979), the main objectives of the rural credit policy were to:

- Provide external funds to finance a significant share of the operational costs;
- Stimulate capital formation;
- 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 in place for industrialisation and price stabilisation purposes, notably price and exchange rate policies.

Despite being listed as one of the objectives of the rural credit policy, credit to small producers never achieved a significant share of total rural credit during the frontier occupation period (Table 2). Of the farms that declared any type of expenses in the production process in the 1970 Agricultural Census, only 5.4% were small. These shares did not change much over the next decade, as shown in the last three columns of Table 2.

The reasons for the unequal distribution of rural credit in Brazil are well known. First, it is costly for financial institutions to manage small loans. Second, larger producers have better collateral, and third, larger 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 shaping the structure of occupation of the frontier, it is important to understand that the real basis of the rural credit policy in Brazil during the frontier expansion was the strong subsidies that it embodied. The way the subsidy was transferred was mainly through the inflation process: the contracts were denominated in nominal terms, in a period of rapidly growing inflation. Some further information on subsidies for rural credit in Brazil in the period of frontier expansion can be seen in Table 3.

[9] There is an extensive literature analysing the rural credit policy in Brazil. For more detail, see Araújo and Meyer (1979), Oliveira and Montezano (1982), and Sayad (1978), among others.

Table 2: The distribution of credit, 1970 to 1980

Groups of total area (ha)	Share of farms with rural credit			Share of total rural credit		
	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)

Table 3: Inflation, real interest rates and subsidy rate for rural credit in Brazil, 1974-1982

Year	Annual rate of inflation	Real interest rates on 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)

Real interest rates on agricultural loans were negative for most of this period. The value of subsidies embedded in rural credit peaked at 17.49% of total agricultural GDP at factor costs in 1980.[10] It is clear, then, that even if the rural credit programme was not the only factor behind the skewed structure of land holdings, it at least reinforced history and did not create any counterforce to the natural pattern of expansion based on large properties. Besides, the credit was directed toward the use of modern inputs (fertilisers, pesticides and machinery); 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 in the frontier region apart from livestock, was also introduced as a modern commodity. The reduced supply of labour in the frontier areas, the distribution of rural credit and the existence of strong economies of size in soybean production[11] were forces contributing to the consolidation of the large agricultural properties as the standard. 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 are also important, such as the negotiating power of producers buying inputs in bulk. Conte and Ferreira Filho (2006) showed that the optimal scale (minimum average cost) for soybeans in the Centre-West appears in a farm size of 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 still was room for further reductions in production costs through an increase in the area farmed. The authors also call attention to the contrast with the South and Southeast regions of Brazil, where most of the producers were also operating in the range of

[10] The subsidies for rural credit in Brazil were drastically reduced in the wake of the 1984 financial crisis, when the country had to resort to the IMF to fund its external debt payments.

[11] More recently the same phenomenon was observed in cotton production in the Brazilian cerrado.

strong economies of scale and therefore would be able to reduce costs if they could increase the area, a difficult task in this traditional region.[12]

4. The present configuration of small agriculture in Brazil

The consolidation of the large properties in the Brazilian frontier, then, was the result of a wide range of factors. In this section we investigate in more depth the consequences for the smaller properties of this pattern of expansion. 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, risk diversification trajectory than the larger properties. They generally produced a more diversified portfolio of mostly food products. In this regard, Tables 4 – 7 provide more information on the evolution of the output portfolio of the smallest farmers compared to those who farm between 100 and 1000 hectares.

Table 4: Shares in total value of production of small and medium farms, 1970

	Rice	**Sugarcane**	**Beans**	**Corn**	**Soybean**	**Cassava**	**Cotton**	**Livestock**	**Milk**	**Peanuts**
	< 10 ha									
Goiás[1]	0,41	0,01	0,13	0,12	0,00	0,03	0,06	0,18	0,07	0,00
Mato Grosso[2]	0,33	0,01	0,06	0,08	0,02	0,06	0,15	0,11	0,05	0,13
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts
	100 – 1 000 ha									
Goiás	0,33	0,01	0,07	0,09	0,01	0,01	0,08	0,32	0,09	0,00
Mato Grosso	0,24	0,01	0,03	0,06	0,01	0,04	0,04	0,45	0,12	0,01

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

Table 5: Shares in total value of production of small and medium farms, 1980

	Rice	**Sugarcane**	**Beans**	**Corn**	**Soybean**	**Cassava**	**Cotton**	**Livestock**	**Milk**	**Peanuts**
	< 10 ha									
Goiás	0,35	0,00	0,23	0,23	0,00	0,02	0,00	0,09	0,06	0,00
Mato Grosso	0,44	0,00	0,32	0,14	0,00	0,06	0,00	0,03	0,01	0,01
Mato Grosso do Sul	0,18	0,00	0,33	0,12	0,14	0,13	0,00	0,07	0,03	0,00
	100 – 1 000 ha									
	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts
Region										
Goiás	0,18	0,01	0,07	0,09	0,01	0,01	0,08	0,32	0,09	0,00
Mato Grosso	0,52	0,00	0,04	0,03	0,04	0,01	0,00	0,31	0,05	0,00
Mato Grosso do Sul	0,09	0,00	0,01	0,02	0,31	0,01	0,00	0,50	0,05	0,00

Source: Brazilian Agricultural Census 1980. IBGE.

[12] In the traditional Southern and Southeast regions the properties are smaller and land is more expensive, making it harder to increase the size of the operation.

Table 6: Shares in total value of production of small and medium farms, 1995

	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts
	< 10 ha									
Goiás	0,05	0,00	0,23	0,23	0,00	0,02	0,00	0,09	0,06	0,00
Mato Grosso	0,10	0,01	0,05	0,12	0,05	0,15	0,04	0,15	0,34	0,00
Mato Grosso do Sul	0,02	0,01	0,02	0,05	0,05	0,55	0,11	0,09	0,11	0,00
Tocantins	0,37	0,01	0,00	0,09	0,00	0,17	0,00	0,26	0,10	0,00
	100 – 1 000 ha									
Region										
Goiás	0,02	0,02	0,02	0,17	0,17	0,00	0,03	0,35	0,20	0,00
Mato Grosso	0,05	0,12	0,00	0,08	0,39	0,01	0,02	0,28	0,06	0,00
Mato Grosso do Sul	0,02	0,02	0,00	0,10	0,24	0,01	0,01	0,55	0,05	0,00
Tocantins	0,11	0,00	0,00	0,04	0,00	0,02	0,00	0,72	0,11	0,00

Source: Brazilian Agricultural Census 1995-1996, IBGE

Table 7: Shares in total value of production of small and medium farms, 2006

	Rice	Sugarcane	Beans	Corn	Soybean	Cassava	Cotton	Livestock	Milk	Peanuts
	< 10 ha									
Goiás	0,02	0,01	0,00	0,10	0,00	0,04	0,00	0,18	0,64	0,00
Mato Grosso	0,05	0,03	0,02	0,10	0,00	0,24	0,00	0,18	0,37	0,00
Mato Grosso do Sul	0,03	0,03	0,03	0,14	0,05	0,33	0,00	0,12	0,27	0,00
Tocantins	0,19	0,00	0,03	0,12	0,00	0,13	0,00	0,23	0,30	0,00
	100 – 1 000 ha									
Goiás	0,01	0,03	0,01	0,10	0,37	0,00	0,02	0,35	0,14	0,00
Mato Grosso	0,01	0,09	0,00	0,11	0,38	0,01	0,02	0,35	0,05	0,00
Mato Grosso do Sul	0,01	0,04	0,00	0,12	0,35	0,00	0,01	0,44	0,03	0,00
Tocantins	0,06	0,00	0,00	0,04	0,16	0,01	0,00	0,61	0,12	0,00

Source: Brazilian Agricultural Census 2006. IBGE.

The composition of production did not differ much between the selected area strata (small and medium/large farms) in 1970[13] (Table 4). Rice, beans, livestock and milk accounted for the bulk of the value of production in both farms sizes, with some regional differentiation. However, cotton production, which was important to the smaller properties in 1970, at around 15% of the total value of production in Mato Grosso state, gradually disappeared after the introduction to Brazil of the boll weevil[14] in the 1980s.[15] Also note that livestock (for beef production) was more important than milk in the 1970s on the smaller properties, and that rice, beans and corn were more important on the smaller properties than the larger properties.

This particular feature, namely the relative specialisation of smaller properties in food products rather than export crops (soybeans and sugar cane) is still an important characteristic of small-scale

[13] In 1970 the states of Mato Grosso do Sul and Tocantins were part of Mato Grosso and Goias respectively. For this reason the censuses only show the aggregated results.
[14] The boll weevil (*Anthonomus grandis*) is a beetle that feeds on cotton buds and flowers.
[15] Cotton is presently being produced almost entirely on properties larger than 1 000 ha in the Centre-West and Northeast regions of Brazil.

production in Brazil (e.g. Guanziroli & Cardim, 2000)[16], who also show that "family agriculture"[17] is responsible for a significant share of food production in Brazil, and identify "market niches" in which family producers are the main producers. Note 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 farm production for the smaller farms than for the larger ones, which tend to specialise more in soybeans and livestock (beef).[18] This was also confirmed by Guanziroli (2013), who analysed the main products of family agriculture in Brazil. In the Centre-West region, the main products in 2006 were milk, cassava, bananas, tomatoes, chayote, firewood and watermelon. Cassava, milk and bananas are important for small producers in every region of Brazil except in the South, where the climate is not suitable.[19]

Small agriculture became an explicit focus of economic policies in Brazil in 1996 with the creation of the Programa Nacional da Agricultura Familiar (National Programme of Family Agriculture - PRONAF), a rural credit programme directed at small producers. According to Conti and Roitman (2011), the goal of the programme is to "promote sustainable development of the rural agricultural segment constituted of family producers, in order to allow an increase in their production capacities, employment generation and income improvement".[20] The PRONAF programme 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 20% of the annual mandatory budget of the general rural credit system (Conti & Roitman, 2011).

The number of PRONAF loans has increased markedly since 1999, following the general trend of increase in total rural credit available to agriculture. The share of the programme oscillated during the decade, but has been more stable recently, with loans amounting to about 15% of total rural credit.[21] The most important modalities of PRONAF are the loans for agricultural inputs, followed by investment in livestock, which includes the purchase of animals for reproduction and herd improvement.

5. Food security measures and support for small agriculture[22]

It is clear from Figure 5 that the amount of credit allocated to small farmers in Brazil started to increase more rapidly from 2002. This is due to the launch by the federal government in that year of the Zero Hunger Programme, a programme that aimed to conciliate issues of food security with social and economic development, and brought a new impetus to support for small-scale agriculture. This programme 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 for the Fight against Hunger) was created, later substituted by the present Ministério de Desenvolvimento Social e Combate a Fome (Ministry of Social Development and the Fight against Hunger – MDS) and the Ministério de Desenvolvimento Agrário (Ministry of Agrarian Development – MDA).

[16] These authors used a different concept for farm type classification, namely "family agriculture", which differs from the concept used in this text.
[17] The concept of "family agriculture" is not exactly the same as small-scale production, even though there is similarity between them. The term "family agriculture" is used here interchangeably with "small production".
[18] Sugar cane does not appear as a relevant activity in the frontier region, since the states in southeast Brazil, mainly São Paulo, are the main producers. However, production is increasing in the Centre-West.
[19] In this region grapes appear instead.
[20] Decree 1946 of 28 June 1996.
[21] In 2012, total rural credit in Brazil amounted to R$114.7 billion, or about US$49.8 billion.
[22] This chapter is based largely on Ferreira Filho and Vian (2013, forthcoming).

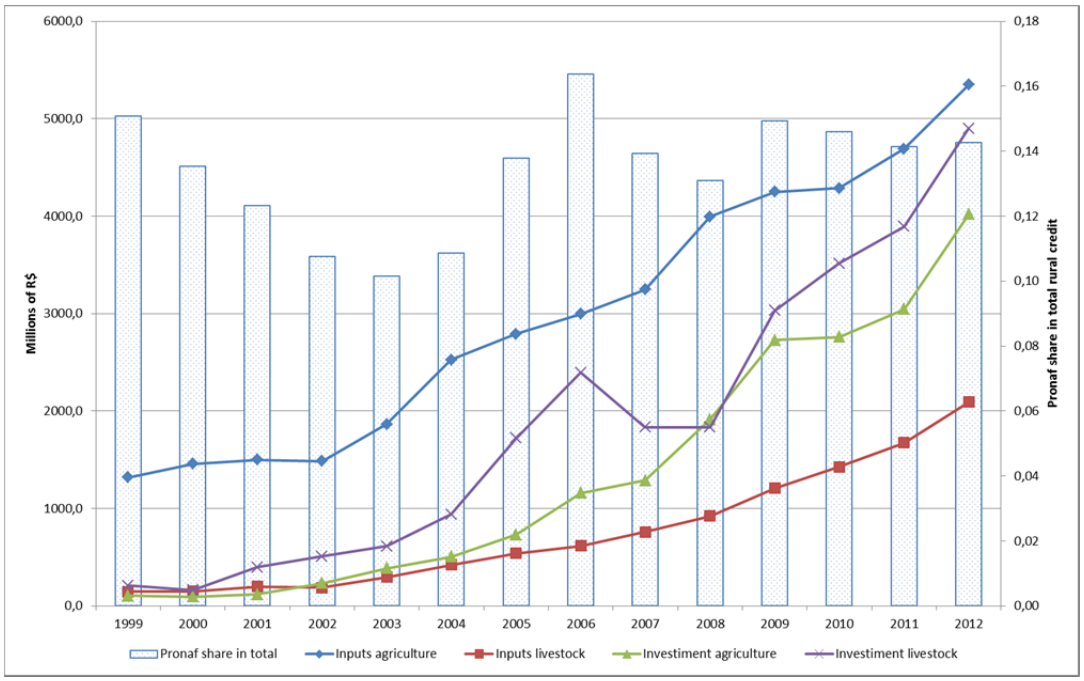

Figure 5: Rural credit in Brazil and evolution of PRONAF share in total, 1999 to 2012
Source: Ministério do Desenvolvimento Agrário. Total rural credit: Central Bank of Brazil (various years).

On 2 July 2003, the Programa de Aquisição de Alimentos – PAA (Food Acquisition Programme) was created 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 access to food, and to incentivise family agriculture. Thus, it operates as a minimum price policy as well as a support policy. Under the programme, agricultural products are bought from family producers through a simplified process and distributed to households in need, or stored for future sales. The PAA comprises the marketing of many different food types in each region, and is targeted at households who face food insecurity, such as the participants in the agrarian reform programme, indigenous communities, families affected by large public investments such as dams for electricity generation, and other endangered families.

Brazil's food security programmes recognise the important role of small producers in food production. The objective is to reduce the transaction costs and guarantee access to markets by small producers.[23] The evolution of the value of purchases in the PAA programme, as well as the number of producers assisted by the programme, can be seen in
Figure 6. Spending has increased markedly since 2003, reaching R$839.2 million in 2012. Despite this success, it still reaches only a fraction of the 2.5 million small-scale producers in the country.

There actually is a great deal of variation in the universe of small producers in Brazil. Guanziroli (2013) assessed this heterogeneous universe using the concept of family agriculture and classified family producers according to their annual monetary income, while trying to identify markets suitable for small producers.

[23] One of those programmes, for example, purchases food directly from small producers for further distribution in the meals programmes in public schools.

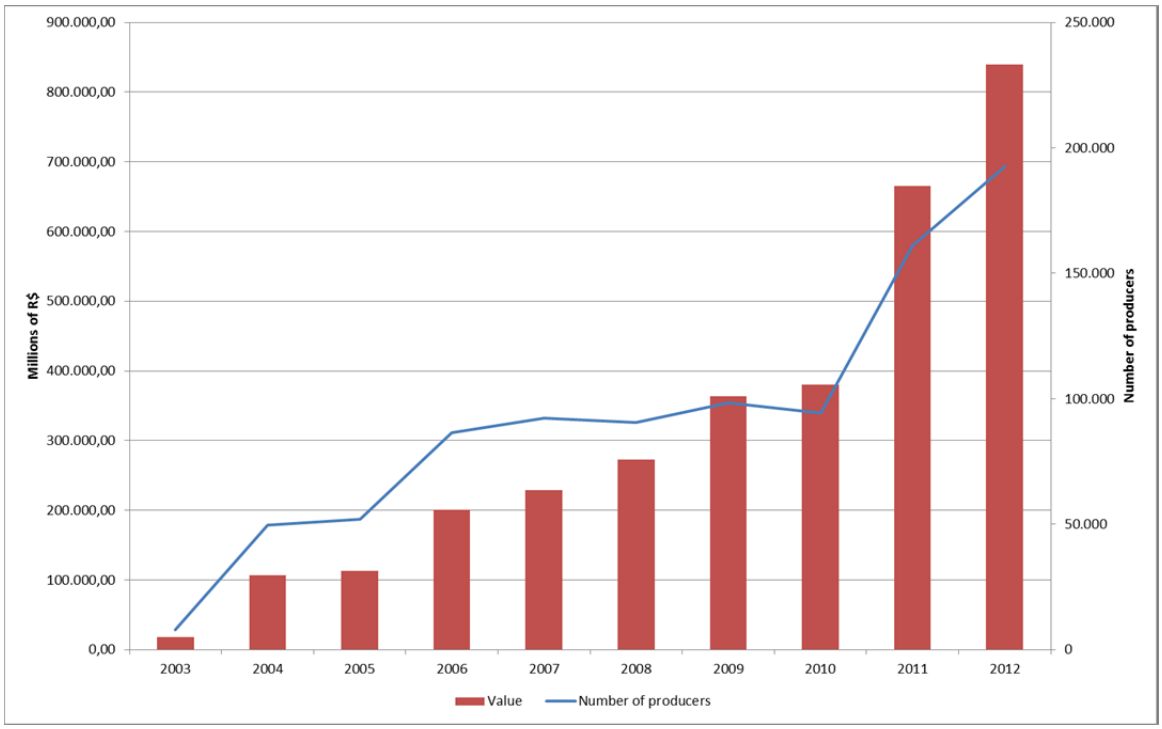

Figure 6: The value of PAA purchases and the number of producers assisted, 2003 to 2012
Source: Secretaria de Avaliação e Gestão da Informação; PAA data.

The extent to which current policies can succeed in boosting small-scale production remains to be seen. Buainain and Garcia (2013) analysed the possibility of different ranges of small producers to engage in markets and become incorporated in the commercial sector. They concluded that all of these producers would be below the poverty line according to the official poverty criteria.[24] They also point out that "…these producers have structural deficits in basically all variables relevant to explain income levels. Most of them do not have enough land, have low capital endowment, low human capital, low organisational level, and show a significant technological gap … apart from generally being located in restricted regional contexts…" (Buainain & Garcia, 2013). The authors conclude that only a small share of these producers could survive as farmers and generate enough income from agriculture to afford a reasonable standard of living.

6. Final remarks

The evolution of agriculture in the Brazilian Centre-West frontier, starting in the 1970s, was a movement of breaking up large private cattle ranches on natural pasturage into smaller, although still large, farms with planted pasture and dryland crop production. 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 characterises Brazil. The small producers that developed in parallel with the large properties tended to concentrate on the production of food rather than export commodities. Furthermore, the number of small farms in the frontier is relatively small when compared with the traditional regions of Northeast and South Brazil. Despite this, the number of workers on these small properties fell faster in the Centre-West than in the traditional regions, and this can be linked to the increase in the importance of livestock production in the frontier, which typically is less labour intensive than agriculture.

[24] Less than half the minimum wage of per capita income.

In the historical context, the small properties started to receive special policy attention in the 1990s, first with explicit inclusion in the rural credit policy (the PRONAF programme), and later in the food security programme (the PAA). These efforts aim to support small producers, alleviate rural poverty and, at the same time, increase food security. At this point, however, the chances of success of these small farms seem to be restricted to a small share of the 2.5 million small producers[25] in Brazil – those able to be included in modernisation processes via policy stimulus. For the largest number of the small producers, however, the future is uncertain, and efforts to support them seem to be more complex. This is a valid effort, however, that should be accompanied by educational policies to prepare the next generations for a different life.

This raises important points for consideration. Brazil has attracted a lot of international attention recently, for a variety of reasons. In agriculture, especially, the successful experience of occupation of the Brazilian cerrado is widely recognised 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 with the creation of EMBRAPA offices in Africa, with the explicit aim of "helping, promoting and fomenting social development and economic development through technology transfer and knowledge and sharing of experiences in the field of agriculture research".[26] The Brazilian experience with policies for small agriculture as a goal of economic development, however, is limited and recent. The extent to which biological and process innovations – EMBRAPA's field of expertise – are the determinant factors for the success of small-scale producers is not entirely clear, and other structural factors have to be taken into account when dealing with development in this arena.

Finally, another important point to consider when dealing with the Brazilian experience of the occupation of the cerrado 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 Centre-West region in the period from 1970 to 1980 came from the South and Southeast regions. The agrarian structure in those settlers' regions of origin encouraged this out-migration (e.g. the fractioning of 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 in the form of subsidised rural credit), boosted migration. These migrants did not find any particular barrier related to language or culture and, as producers, they were used to a more modern pattern of agriculture in their regions of origin and had already adapted to the use of improved seeds, lime for soil acidity correction, and other modern agricultural inputs. This is certainly one of the most important factors to explain the rapid increase in agricultural production in the Brazilian cerrado. 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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[25] With farm areas of less than 10 ha.

[26] http://www.embrapa.br/a_embrapa/labex/africa/Escritorio_Africa/ (Author's free translation.)

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