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ROLES AND CHALLENGES OF BRAZILIAN SMALL HOLDING AGRICULTURE

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ABSTRACT

Rural poverty is to a great extent concentrated amongst smallholders' farmers and landless workers. Almost half of the holdings in Brazil (around 48%) are smaller than 10 hectares, but have only 2.4% of the total area. Based on this characterization, this paper aims at a critical review of roles, perspectives and challenges of small holding agriculture in Brazil, highlighting in particular the role of public policies and technological innovation in meeting current challenges to secure poverty reduction and sustainable growth. Though the paper draws exclusively from the Brazilian experience, some of the issues raised reflect also the reality of other Latin American countries.
Key words: Brazil, food security, rural livelihood, rural poverty, small holding

RESUMEN

La pobreza rural está concentrada en gran medida entre los pequeños agricultores y los trabajadores sin tierra. Casi la mitad de las propiedades rurales en Brasil (alrededor del 48%) tienen un área inferior a las 10 hectáreas, al tiempo que este tipo de explotaciones apenas abarca el 2,4% de la superficie agrícola total. En este escenario, el presente artículo pretende realizar una investigación crítica con respecto al papel, a las perspectivas y a los desafíos de la pequeña agricultura en Brasil, con énfasis en el papel que tienen tanto las políticas públicas como la innovación tecnológica para enfrentar la pobreza rural. Si bien el estudio se basa exclusivamente en la experiencia brasileña, algunas de las cuestiones en él planteadas reflejan también la realidad de otros países latinoamericanos.
Palabras clave: Brasil, medios de vida rural, pequeña propiedad rural, pobreza rural, seguridad alimentaria

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RÉSUMÉ

La pauvreté rurale est dans une large mesure concentrée chez les agriculteurs des petites exploitations et les travailleurs sans terre. Près de la moitié des exploitations au Brésil (environ 48%) sont inférieures à 10 hectares, mais ces propriétés représentent seulement 2,4% de la superficie totale. Le propos de ce document est de réaliser un examen critique du rôle des perspectives et des défis de la petite agriculture au Brésil, en soulignant en particulier le rôle des politiques publiques et de l'innovation technologique pour relever les défis actuels pour assurer la réduction de la pauvreté et une croissance durable. Bien que le document se fonde exclusivement à partir de l'expérience brésilienne, quelques-unes des questions soulevées renvoient aussi à la réalité d'autres pays d'Amérique Latine.
Mots-clé : Brésil, moyens de subsistance en milieu rural, pauvreté rurale, petite exploitation, sécurité alimentaire

RESUMO

A pobreza rural está em grande medida concentrada entre os pequenos agricultores e trabalhadores sem-terra. Quase metade dos estabelecimentos agropecuários no Brasil (cerca de 48%) possuem área menor que 10 hectares, embora ocupem apenas 2,4% da área agrícola brasileira. Neste contexto, este trabalho tem por objetivo principal empreender uma análise crítica dos papeis, perspectivas e desafios da pequena agricultura no Brasil. O trabalho ainda destaca o papel das políticas públicas e da inovação tecnológica para enfrentar os atuais desafios para assegurar a redução da pobreza e promover o desenvolvimento sustentável da pequena atividade agrícola. Embora o trabalho trate exclusivamente da experiência brasileira, algumas das questões levantadas refletem também a realidade de outros países latino-americanos.
Palavras-chave: Brasil, pequena agricultura, pobreza rural, subsistência rural, segurança alimentar

1. INTRODUCTION

Lowder, Skoet & Raney (2016) estimated 570 million farms in the World; 4% or 22.8 million farms are located in Latin America and Caribbean (LAC)[3]. However, Berdegué & Fuentealba (2014) estimated that in LAC approximately 15 million are smallholders, and live, work and farm in about 400 million hectares. In spite of the small size, they produce considerable amount of food and non-food agricultural products for their own subsistence and/or for local, national and international markets. Nevertheless, and in spite of overall social, economic and political improvements in LAC over the last four decades, poverty and inequality are still striking features of LAC rural areas. According to ECLAC (2018), in 2016 there were still 196 million people in poverty (74 million in the early 1980s) and 64 million in extreme poverty (unable to meet basic food needs; 62 million in 1980s); in rural there were 28 million people in extreme poverty, and 62 million people in poverty.

Rural poverty is to a great extent concentrated amongst smallholders' farmers and landless workers. And what is worse and worrying, Berdegué & Fuentealba (2014) sustain that smallholder's welfare have deteriorated over the past 20 years or so. The increase in the poverty gap of smallholders is even more perturbing if one considers the improvements in provision of public services and in particular the «reduction in the gaps in services such as education of households members over 15 years of age and access to electricity, between households headed by 'self-employed in agriculture' and those headed by 'employers in agriculture» (Modrego, Charnay, Jara, Contreras & Rodríguez, 2006).

The use of 2 hectares as the key parameter to define smallholder agriculture may be deeply misleading as holding size by itself does not capture additional features that may be important to be considered, such as the quality of resources, organization and social relations of production and market linkages. In some contexts 2 hectares may even be «too big» as far as the modal size of

[3] The Latin America and Caribbean (LAC) include the 19 countries south of the Mexico-USA border, including two Caribbean countries – Dominican Republic and Cuba.

smallholdings is concerned. This is the case of many regions in both China and India, where average size of farms are less than 1 hectare. But 2 hectares may be too small as far as the provision of adequate land support for the survival of a family in above poverty conditions. This is certainly true in most semiarid regions of LAC and some areas of tropical forest ecosystems, where sustainable exploitation and family livelihood would require larger plots.

Although the 2 size definition is largely used by international organizations such as IFAD (International Fund for Agricultural Development), World Bank and FAO (Food and Agriculture Organization), Berdegué & Fuentealba (2014, p. 1) consider that *«the '2 hectares' definition is a measure of our ignorance and not of our understanding of smallholder farming, nor of what is needed for well-designed strategies and policies.»* We cannot but agree with them! Thus, in this paper we do not attempt to use a precise definition of small holding agriculture. We will follow Berdegué & Fuentealba (2014, p. 2) and consider smallholder or family-based agriculture indistinctively *«as a social and economic sector made up of farms that are operated by farm families, using largely their own labour.»*

In Brazil the use of farms' size for policy purposes has been largely replaced by family and non-family-based agriculture. Regardless of the concept one may adopt to define it, the universe of smallholders – family farmers is a very complex, diversified and rich one, whether from the economic, social, political or cultural viewpoints. It includes from very poor family farmers holding tiny plots, almost landless, to well to do farmers; there are well established landowners, landowners with fragile land ownership titles and tenants and sharecroppers whose access to land is conditioned by different institutional arrangements regarding land ownership and usage rights and claims. Technology and production systems range from rather primitive cut and burn shifting cultivation used by smallholders in the rain forest regions – known as '*roça*' in Brazil– to diversified productions systems using up-to-date technology; from subsistence farming to contract farming, from market isolated and insulated groups to smallholders producing high quality food and non-food products fully integrated to the world markets; it includes producers trading in local street markets (*feiras,* in Portuguese) with local intermediaries and pray of local money lenders to arrangements with agro-industry companies operating worldwide, which provide both financial and technical support.

Berdegué & Fuentealba (2014), following De Janvry and Saudoulet (2000), draw attention to a very relevant dimension, often overlooked in the analysis of smallholder agriculture: The context, or the «characteristics of its proximate environment, socioeconomic as well as biophysical». In fact, the 'context' is another dimension of the diversification and differentiation amongst smallholder farmer. What a contrast between smallholders struggling to survive in the rain forest environment, hundreds of miles from the nearest regional relevant urban center, isolated even from nearby markets during the rain season, and those living in the periphery of metropolitan areas, with facilitated access to markets and productive and financial services? Both the performance and prospects of smallholders are highly conditioned by the context, particularly by the overall dynamism of the local/regional economy and society as well as by the business opportunities offered and viable in the different contexts. Very small farmers can become viable and prosperous farmers in a dynamic local economy and larger farmers may run an unsustainable business in an isolated and stagnant territory.

In this context, this paper aims at a critical review of roles, perspectives and challenges of small holding agriculture in Brazil, highlighting in particular the role of public policies and technological innovation in meeting current challenges to secure poverty reduction and sustainable growth. Though the paper draws exclusively from the Brazilian experience, some of the issues raised reflect also the reality of other LAC countries. Lessons and policy implications for other emerging economies will also be raised at the end of the paper.

2. ROLES OF BRAZILIAN SMALLHOLDING AGRICULTURE

The purpose of this section is to describe the roles and to assess the performance of smallholder in Brazilian economy from three perspectives: i) agricultural production; ii) employment and occupation; and, iii) livelihood. The bulk of the analysis is based on data from the 2006 and 2017 Census of Agriculture.

ROLE 1: AGRARIAN STRUCTURE AND AGRICULTURAL PRODUCTION

The Brazilian Agricultura Census (IBGE, 2018)[4] registered around 5.07 million agricultural holdings in 2017, which occupy 350 million hectares (Table Nº 1) allocated to: temporary crops (55.2 million); pastures (158.6 million: 111.8 million planted pastures and 46.8 million ha of natural pastures); permanent crops (8 million); native forests (93 million) and planted forests (8.5 million). The distribution of area is unequal among the farmers, a direct result of the high concentration of land ownership in Brazil. Agricultural holdings smaller than 2 hectares represent 21% of total landholding and occupy only 0.25% (1.07 million hectares) of the total area; those with up to 5 hectares represent 37.3% of total holdings and 1% (3.4 million hectares) of total area. The half of the holdings in Brazil (around 50.2%) are smaller than 10 hectares, but they have only 2.3% of the total area. At the other extreme, those holdings with more than 100 hectares represent only 9% of total establishment, but they detain 79.5% of farming area. There are only 16,680 holdings larger than 2,500 hectares; together they count 0.33% of the total holdings, but they have 32.8% of the total area (IBGE, 2018).

The living conditions of smallholders are also much differentiated amongst the regions. There were about 2.32 million holdings in the Northeast Region, which represent 46% of total, but they occupy only 20% of the Brazilian farming area. Almost 800,000 holdings in the Northeast Region are smaller than 2 hectares, and 53% of total holdings in this region (1.23 million) have less than 5 hectares. The holdings with up to 10 hectares (almost 1.5 million) represent 65% of the total and occupy only 5.4% of farming area. In the upper limit, the holdings larger than 100 hectares represent only 4.6% of the total, but they occupy 67% of the farming area in the Northeast (IBGE, 2018).

It is worthwhile noting the high concentration of smallholdings (*minifundia*) in the Brazilian Semiarid. The *minifundio* is technically defined as a holding whose size does not allow the subsistence of a family. The Agricultural Census 2017 (IBGE, 2018) registered around 1.66 million of the farms in Brazilian Semiarid, occupying almost 45 million hectares. From these, around 480,000 are smaller than 2 hectares, account for just over 29% of the total holdings and occupy only 0.9% of farming area in the semiarid. Other 339,357 holdings, 20.4% of the total, they have an area more than 2 and smaller than 5 hectares, and they occupy only 2.2 of the regional farming areas. It means that 820,000 holdings are *minifundia* units, because in most sub regions of the semiarid 5 hectares is insufficient to maintain sustainable economic units, broadly speaking (*lato sensu*). Indeed, the level of income generated by the smallholdings is lower than the poverty line defined by Brazilian Government, which is set at very low level to ensure the focus of social policies on the poorest. The most dramatic thing is the finding from Helfand & Pereira (2011) that the removal of the restriction of land size and technological level in the semiarid would have low impact on the income level of smallholdings, insufficient to raise them out of income poverty. Nevertheless, in 2006 the holdings smaller than 5 hectares occupy only 3% of the semiarid farming area, they contributed to 31% of the total value of agricultural production[5] (IBGE, 2006).

Another feature of smallholding sector in Brazil is land tenure insecurity. In 2017, around 72% of the holders of plots smaller than 2 hectares declared to be the legitimate owner of the plot, whereas 28% are settlers without ownership title, tenants, sharecroppers or squatters (IBGE, 2018). Amongst farmers holding up to 10 hectares, the percentage of owners is higher but tenure insecurity is still high. The vast majority of landownership titles hold by small farmers was acquired by heritage, and there are evidences that a high proportion of these titles fail to comply with current land legislation. This has at least two consequences: On the one hand, irregular titles cannot be used as collateral and even entrepreneurial small farmers face difficulties to raise funding outside governmental programs,

[4] The last Brazilian Agricultural Census was realized in 2006 by IBGE (*Instituto Brasileiro de Geografia e Estatística*). Then, when this manuscript was prepared, the Agricultural Census 2006 was the most updated data available. In 2017 the IBGE started a new Brazilian Agricultural Census, but only the preliminary data were available. Thus, the manuscript uses data from Brazilian Agricultural Census 2006 and 2017 (when available).

[5] The data of the Agricultural Census 2017 are still preliminary, and do not include monetary values of the production.

Table 1. Number of farming property and area of farming property by groups of total area, 2017

Number of holding							
Region	**Total**	**More than 0 to less than 2 Ha**	**More than 2 to less than 5 Ha**	**More than 5 to less than 10 Ha**	**More than 10 to less than 100 Ha**	**More than 100 Ha**	**Producer without area**
Brazil	**5,072,152**	**1,075,921**	**817,425**	**650,432**	**1,979,915**	**471,001**	**76,671**
North	580,446	95,689	61,325	44,546	270,151	99,762	8,924
Northeast	2,322,495	791,255	440,430	278,476	644,768	106,247	61,037
Southeast	969,258	104,638	166,715	151,050	441,069	101,766	3,671
South	853,232	68,322	124,612	147,861	444,638	65,373	2,386
Midw est	346,721	16,017	24,343	28,499	179,289	97,853	653
Area of holding							
Region	**Total**	**More than 0 to less than 2 Ha**	**More than 2 to less than 5 Ha**	**More than 5 to less than 10 Ha**	**More than 10 to less than 100 Ha**	**More than 100 Ha**	**Producer without area**
Brazil	**350,253,329**	**870,833**	**2,551,607**	**4,566,674**	**63,783,346**	**278,480,870**	**-**
North	66,158,738	65,701	188,071	303,641	10,995,427	54,605,899	-
Northeast	70,643,038	648,575	1,312,282	1,877,459	19,396,965	47,407,756	-
Southeast	59,977,282	86,342	549,655	1,101,446	14,255,527	43,984,313	-
South	42,863,521	57,757	418,670	1,067,298	12,340,833	28,978,962	-
Midw est	110,610,750	12,458	82,927	216,830	6,794,594	103,503,941	-

Source: Prepared by authors, based on IBGE (2018)

which though important can be also rather restrictive; on the other hand, land without regular land ownership title tends to be undervalued in market transactions. This is particularly relevant in the periphery of growing urban centres, where urban dwellers purchase plots from small farmers for bargain prices and seek to regularize it afterwards.

In 2006, the gross value of Brazilian agricultural production (GVAP) was of R$ 143.8 billion, which was distributed in (IBGE, 2006): Livestock (R$ 30.5 billion); crop production (R$ 110 billion); and agroindustry (R$ 3.2 billion). Smallholdings with area smaller than 2 hectares generated R$ 4.7 billion (3.3% of the total), although they represent 20.3 of total holdings. Holdings in the range up to 10 hectares produced R$ 21.8 billion or 15.2% of the total (R$ 143.8 billion) in less than 2.4% of total agricultural area registered by the Agricultural Census 2006 (IBGE, 2006).

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In order to provide a reference to the level of income generated by smallholdings, the GVAP *per capita* was estimated for ranges of holdings sizes. It is a rough estimation, which simply divides the GVAP by the 16.6 million people employed in the agricultural sector in 2006 (IBGE, 2006) – in 2017 there were 15 million (IBGE, 2018). On the one hand, this figure strongly underestimates the *per capita* income of holdings because it does not include children and old persons who also live in the holding[6] nor deduct the expenses incurred to generate the gross value of production. On the other hand, it tends to underestimate the capacity of smallholdings to provide family subsistence as far as it underestimates the production for family consumption, whose value may be important and it is difficult to accounting. Still, it is a worthwhile exercise.

For all holdings the estimated monthly *per capita* gross value of production was R$ 719, equivalent a one Brazilian minimum wage in 2006 (IpeaData, 2018). There are significant differences in the regional average for all the groups of the farming area. In the North and Northeast regions, for example, the value was R$ 186, whereas in the Midwest, South and Southeast the values were R$ 836, R$ 813, and R$ 644, respectively (IBGE, 2006). The comparison of *per capita* gross value of production with the poverty line (½ of the minimum wage, R$ 175) and extreme poverty (¼ of the minimum wage, R$ 87.5) (IETS, 2018) confirms that people employed in the holdings with less than 2 hectares fall in the extreme poverty status. Even in the groups smaller than 100 hectares people employed in the North and Northeast regions were in poverty situation, while the national average was close to R$ 400 (IBGE, 2006).

The participation of smallholdings in production was significant in 2006[7] (Hoffmann, 2015; IBGE, 2006): Those with less than 2 hectares responded for 20% of the manioc production; 16% of green bean; 14.2% of black-eyed bean; 7.4% of colour bean; 4.7% of cow milk and 4.3% of paddy rice. Considering holdings with less than 10 hectares, the participation is considerably higher: 51.6% manioc; 48.7% green bean; 47% black-eyed bean; 30% black bean; 30% chicken (number of chicken); 25.7% cow milk; and 25.7% colour bean (Table Nº 2). The share of smallholding is relevant for all these basic food crops, even more in the light of severe land restriction land and massive poverty amongst smallholder farmers.

Small farmers do use their resources intensively; there is no question about that. But it should be no doubts that the low level of capital and technology applied to production jeopardizes their performance. In general they use traditional techniques that may have been sustainable in the past but no longer correspond to the conditions prevailing in the smallholding sector nowadays. On the one hand, the yield of the land associated with traditional techniques do not allow the generation of enough product and income to feed and maintain the families which are therefore compelled to seek complementary and alternatives means of surviving, from migration to seasonal off farm occupations. One should not forget that the general increase of social productivity of labour implies a devaluation of the work of lower productivity producers, as it is the case of smallholding agriculture. And hence the income generated from the sale of products of small producers decreases in real terms and tends to cover an increasingly smaller portion of their needs.

ROLE 2: EMPLOYMENT AND OCCUPATION

Though Brazil is nowadays an urban society, with more than 85% of its population living in urban areas, agriculture and rural territories are still a very important source of occupation and livelihood as well as a populous place of residence (IBGE, 2010a). In fact, around 30 million people live in rural areas or 15.6% of total Brazilian population (IBGE, 2010a). In 2017, around 15 million people were occupied in the 5.07 million agricultural holdings in Brazil: 11 million people had some kinship tie with the producer and 4 million did not (IBGE, 2018). This figure probably overestimates the actual labour absorption capacity, as it does not individualize part time and full time occupations or sub occupation, which grasses in the agricultural sector. Notwithstanding, it is a significant number of people, equivalent to one person for every 23.3 hectares allocated to agricultural use.

[6] In Brazil the most of aged people receive a retirement of the one Brazilian minimum wage a month, and this income is one of the main responsible for reducing of the rural poverty, and the «viability» of smallholding.

[7] Data from the 2017 Agricultural Census are still preliminary and do not include information on production by area group.

Table 2. Share in the Brazilian agricultural production by group of area (hectare), 2006

Products	Total	0 < 2	2 < 5	5 < 10	10 < 100	> 100
Rice (paddy)	100%	4.3%	2.6%	1.9%	26.1%	64.5%
Black Bean	100%	4.1%	12.2%	13.7%	53.6%	15.8%
Color Bean	100%	7.4%	9.7%	8.6%	32.2%	41.4%
Black-eyed Bean	100%	14.2%	20.5%	12.3%	37.1%	14.5%
Green Bean	100%	15.9%	18.5%	14.3%	34.1%	16.1%
Manioc	100%	20.0%	18.8%	12.9%	37.2%	10.3%
Maize	100%	2.4%	4.8%	6.7%	35.9%	50.0%
Soybean	100%	0.0%	0.5%	1.2%	16.2%	82.0%
Wheat	100%	0.0%	0.4%	1.2%	26.2%	72.2%
Milk	100%	4.7%	10.5%	10.5%	43.8%	23.6%
Chicken (number of chicken)	100%	4.1%	12.4%	13.4%	52.2%	16.1%

Source: Prepared by authors, based on Censo Agropecuário 2006 (IBGE, 2006, 2018)
Note: Data from the 2017 Agricultural Census are still preliminary and do not include information on production by area group

The largest share of people employed in agricultural sector is in the Northeast, around 6.4 million people (one person employed for each 11 hectares). Out of this, 5 million have kinship ties with the head of the holding and 1.37 million did not have; 3.2 million people were employed in the Southeast region, 1.9 million with kinship ties), and 2.3 million (1.8 million have kinship tie) in the South (IBGE, 2018). The main difference among the three regions is that in the Southeast the percentage of occupied persons which had kinship tie with the holding head is smaller than in other regions, around 58%, while in the South and Northeast the percentage of people with kinship relations goes up to 78% each one of them (IBGE, 2018). This confirms that in the South and Northeast regions family agriculture is very relevant as a source of occupation to family members.

Holdings smaller than 2 hectares absorb 2.5 million people in various occupations, an average of 2.3 people per farm; about 90% have family ties with the farmer (IBGE, 2018) and are engaged as Family labour without payment. Neder (2008) showed that the number of hours worked during the week by the group of «unpaid workers of family holdings» decreased from 32 worked hours in 1995 to 27.9 in 2006. In the same period it is noticeable an increase in the relative share of this group in the total employed persons in agriculture. *«Almost 30% of occupational effort measured in terms of total hours worked is concentrated in non-remunerated occupations»* (Neder, 2008, p. 55). It can also be observed an increase in both the relative participation of workers engaged in production for self-consumption and in the hours worked by this group. The increase in unpaid work as well as in self-consumption occupations reflects the lack of better occupational alternatives and partly explains the high reproduction of rural poverty and the growing reliance of small holding on income transfer (Grisa, Schneider & Conterato, 2013).

Small-scale agriculture has indeed an important role in the occupation of the population in rural areas. As mentioned above, the number of people employed is high. However, with regard to income generation, the situation is completely different: The income level is low and a significant proportion of persons employed in smallholdings are poor and do not generate agricultural income higher than the poverty line. Moreover, labour relations are fragile, family workers lack the legal protection of wageworkers; they have no guaranteed labour rights and live therefore in a situation of great insecurity.

The low productivity and low gross value *per capita* generated by smallholdings are related to low availability of assets in general: Very small plots of arable land, in many cases already overexploited, low technological level, low level of human and physical capital, depreciation of traditional knowledge to face current challenges, insufficient productive infrastructure and poor public support. All these factors results in productive systems that though use intensively the available resources, fail to generate sufficient income to lift families above the poverty line. They therefore live within the vicious circle of poverty, and the possibilities of breaking it through agricultural production seem increasingly restricted to fewer and fewer a number of small farmers.

Data from the 2017 Brazilian Agricultural Census (IBGE, 2018) showed that 28% of the persons who the holdings are illiterate (never attended school 15%, and literacy class 13%), unable to read or write, and that other 49% had completed elementary school. It means that around 77% of Brazilian agricultural holdings are headed by people with extremely low level of education, which probably results in low learning ability and with negative effects on the adoption of new technologies. Thus, any attempt to raise productivity of smallholding agriculture shall have to face seriously the basic education deficit amongst poor farmers: estimates that 59% of those responsible for the management of holdings with less than 2 hectares have low illiterate (completed elementary school 17%; and never attended school 21%). Then, they are unable to read or write more complex texts. In the Northeast the reality is more dramatic (IBGE, 2018); low illiterate people head around 62% of all holdings, and in the range of up to 2 hectares low illiteracy reaches 62% of the holdings heads.

On the other hand, in the South, Southeast and Midwest, the situation is quite different from that observed in the Northeast. The South records the lowest percentage of illiterate people running the farm, only 4%; in the Midwest the percentage is 8% and, in the Southeast, almost 9% (IBGE, 2018). However, in these regions the percentage of holdings run by people that have only complete elementary education is fairly high: 25% in the Midwest; 32% in the Southeast and % 40% in the South (IBGE, 2018).

ROLE 3: RURAL LIVELIHOOD

Livelihood comprises the capabilities, assets – including both material and social resources – and activities required for a means of living (DFID, 2001). In rural areas Livelihood has three basic dimensions: i) food security; ii) entrepreneurship development; iii) improved access to resources and market (CYSD, 2018). In short, a person's livelihood refers to the *«means of securing the necessities of life»*. For example, a small farmer's livelihood depends on the availability and accessibility of land, amongst other resources. To some extent the essence of the livelihood concepts leads to the importance of the context, which was remarked by Berdegué & Fuentealba (2014).

It is not possible to analyse here the different territorial contexts in which they are inserted into the different types of smallholdings (Aquino *et al.,* 2015; Berdegué *et al.,* 2011; Favareto, 2010). We will only present some important indicators that characterize the context and living conditions of smallholdings, including poverty indicators, conditions of production, food security, technical assistance and access to land and credit.

The food security and socio-economic indicators published by 2006 Agricultural Census and 2010 Demography Census can help to characterize some of the factors that influence the standard of living in rural areas (IBGE, 2006, 2010a). According to study realized by IBGE (2010b), in 2004, 35% of Brazilian households were living in some degree of food insecurity and in 2009; this percentage fell to 30.2%, representing 65.6 million people living in 17.7 million households. According to these estimates, in 2009 there were nearly 40.1 million people in 11 million households living in low food insecure situation; 14.3 million people in 3.8 million households living in moderate food insecurity situation and over 11 million people suffering from severe food insecurity. Interestingly, the percentage of households in situations of low food insecurity remained stable between 2004 and 2009 (18% of total), while moderate and severe food insecurity status declined, respectively, from 10% and 7% to 6.5% and 5%. In the rural sector, quite paradoxically, the proportion of food insecure households (35.1%) is higher than in the urban sector (29.4%). Likewise, in the North and Northeast, the poorest regions of Brazil, the percentages of households in food insecure (40.3% and 46.1%, respectively) are significantly higher than in the Southeast and South (23.3 % and 18.7% respectively).

Data from 2009 Family Budget Research confirms the reduction of food insecurity in the last decade. The research has asked to household head the following question: «*Which of the following statements better describe the quantity of food consumed by your family? It is always enough, sometimes is not enough and usually is not enough.*» Between 2003 and 2009 the percentage of «*it is always enough» increased from 51% to 62% and 38% to 50% in urban and rural areas, respectively, and the percentages of «sometimes is not enough*» and «*usually not enough*» fell considerably in both rural and urban zones. This is a subjective type of research, which can't be taken as an objective indicator of day to day nutritional deficit, especially amongst those households in which food quantity is «*sometimes not enough*», However, 10% and 14% of households in urban and rural areas declare that food shortage is a usual situation.

Some argue that theses researches increase food insecurity in rural areas because they do not take accurately account the production for self-consumption. According of Grisa *et al.* (2013, p.4), «*family farms produce their own food and therefore guarantees the direct and easy access to food [...]*». Thus, the production for self-consumption reduces the exposure of the rural families the fluctuations of food markets, which more recently has been characterized by intense variability in prices. Also, the production for self-consumption would guarantee, in many situations, the quality of food consumed by families farming.

These are more in the field of possibilities than an actual representation of the reality. On the one hand, a large number of smallholdings are located in areas with high climatic risk. Only in the Semiarid North-eastern there are 1.4 million the smallholdings in areas subject to intense desertification process (MMA, 2018); an estimated 11.5 million people live in smallholdings (IBGE, 2010a) that generate agricultural income below the poverty line. The Semiarid region is naturally characterized by high hydric insecurity. The popular sense (common sense) – that is not far from scientific observation – says that in every 5 years, only one is good, one is more or less, in one the drought in mild and in two droughts is severe. And in spite of efforts to reduce the water insecurity – especially through irrigation – the fact is that the scope of these policies was quite limited. And not even the problem of shortage of drinking water, in rural and urban areas, has been resolved.

This is not just a localized problem in Semiarid. Waquil's research about the new faces of rural poverty in the South region highlights precisely the effect of climate change and increased frequency of droughts and/or floods on the food security of the smallholdings in the South (Waquil, 2013). According this author, the reduction of food security is a main factor responsible by the fragility of the small holdings in the South region, as far as it requires family members to search off farm alternatives for income generation that have negative effects on labour-intensive agricultural production systems adopted in the region by family farmers.

Depletion of natural resources of the small holding has also negative impact upon food security. In the Northeast region, the desertification process is a real fact that has been strongly underestimated and therefore overlooked by public policy; in the North region, the decrease of average size of holdings has reduced the sustainability of the traditional production system, known as *roça* and *coivara*, because the producer is forced to return to areas that have been already cultivated before the recovery of the forest, which is essential for the restoration of fertility. The result is the rapid decrease of land productivity, with negative effects on production and on food security.

Finally, migration and different strategies for survival have also effects on production to self-consumption. On the one hand, occupations outside the holdings open opportunities to generate additional income, with positive effect on food security. On the other hand, it reduces the availability of family labour to work on the smallholding. Two different paths have led this process. The first one is that the poorest farmers, with less availability of land, give priority to income generation outside the holdings, which become more a residential place than a production unit. In many areas family members continue to produce some items for self-consumption, as a complementary source of food purchased in local markets. The second one can be observed in more complex production systems, capital-intensive and more integrated at the market. The available family labour is allocated to support the main production of the small farming, reducing the production to self-consumption. In both cases smallholdings become more dependent of the market to feed their members.

The self-consumption still is important for the small farming. According to estimates made by Grisa *et al.* (2013), around 3.8 million out of 5.1 million holdings have allocated a share of production to self-consumption. Around 1.4 million holdings with self-consumption have less than 5 hectares, and 1.86 million less than 10 hectares. In Brazil, there are 2.48 million holdings with less than 10 hectares, and 75% of them reported production to self-consumption. The authors show that around 473,000 family farmers live exclusively from production to self-consumption. According to Grisa *et al.* (2013), the production to self-consumption in small farming (area smaller than 5 hectares) represented around 26% of gross production values of this group. Therefore, the production to self-consumption is important, especially to the poorest. However, even if imperfectly, we must indicate that the gross production value incorporates an estimate from self-consumption production. This means that even taking into account the relevant share of the self-consumption of the small farmers are poor and live in food insecurity.

Another set of variables that may reflect the livelihood concept is the characteristics of agricultural practices adopted by small producers, particularly access to technical assistance and rural extension services advice. In 2017 only 20% (1 million of producers) out of 5.07 million holdings received some kind of technical assistance (IBGE, 2018). Amongst those smaller than 2 hectares only 64,790 holdings out of 1 million received technical assistance; in the range from 2 to 5 hectares only 108,682 out of 817,425 and in the range from 5 to 10 hectares only 133,594 from 650,432. Therefore, the majority of the small farmers did not receive any technical assistance, around 4 million (IBGE, 2018). They are completely helpless regarding technical assistance and the introduction of improved agricultural techniques that could increase productivity and well-being of the family.

An optimistic view could emphasize that 1 million holdings received technical assistance, including almost 307,000 with less than 10 hectares. These numbers are undoubtedly significant, but insufficient to sustain optimism regarding the future of smallholdings. The low quality of the technical services, especially for the small farming, is well recognized. A large number of producers received only one or two annual fast visits of the technical assistance services, often out of season and without any relevant interaction with other policy instruments that could enabling to put into practice the recommendations received during the visit. In this context, the technical assistance service provided to smallholders is formally and inappropriate for the small farming, because most of them need a continued assistance from rural extension rather than occasional technical assistance visits.

The type of traction force used can exemplify the precariousness of agricultural occupation and production systems adopted by the small farming. The Agricultural Census' 2006[8] data show that approximately 700,000 holdings with an area smaller than 2 hectares use only manual force (human force) with auxiliary tools, such as hatchet, hoe, sickle and machete (IBGE, 2006). Not even the animal traction force is used. Among the holdings with less than 10 hectares, around 1.3 million (54%) do not use any kind of traction force, only human force. And this takes place irrespective to the increasing scarcity of family labour.

[9] The data of the Agricultural Census 2017 are still preliminary, and do not include agricultural auxiliary tools' data.

3. INSTRUMENTS AND PUBLIC POLICIES: SOME BRAZILIAN INITIATIVES

Brazil has been a laboratory for public policies in many areas, such as health, social inclusion, support for family farmers, food security, among others. Unfortunately, it lacked autonomous and objective assessments about the impacts these policies and on their operation. We present the following some brief considerations about some initiatives designed to encourage family farming and small agricultural production in general.

Braga (2012) conducted a detailed survey of the main rural development policies and found that a vast array of initiatives to promote family farming have been implemented during the last two decades. The adoption of these policies represents a significant step forward and reflects a political redefinition of the status of this group, which was finally incorporated into public policy agenda as a relevant actor. However, the same assessment shows that the policies addressed the different needs of small farmers in isolated and fragmented fashion, as disconnected issues that can be overcome through topic short-term interventions. Moreover, it reveals that there was poor or no coordination among different levels of government, neither consistency nor persistence in the pursuit of targets. She also concludes that rural poverty combat and rural development strategies have not taken into account the multidimensionality of the issues surrounding the small farmer. Another conclusion is that there is a major gap between implementation and evaluation of both policies impacts and effectiveness.

Assessments of the Brazilian agrarian reform results are contradictory and present strongly divergent views, numbers and conclusions, reproducing the ideological and political polarization that involve the all intense debate on agrarian issue. Leite, Heredia, Medeiros, Palmeira, & Cintrão (2004), for example, emphasize the positive impacts that many settlements had on local economies. The authors emphasize the improvement in standard of living of the settlers and that, despite the difficulties, after few years most of them are integrated into the local economy and society. Graziano Neto (2004), on the other hand, points out to the limited results in terms of increased production and living conditions of the settlers. Buainain, Alves, Silveira, & Navarro (2014) highlight the large concentration of settlements in the North and Northeast regions,

particularly in environmental fragile areas with poor infrastructure supply. In fact, official data show 447,000 settlements in the North region and 369,000 in the Northeast region, just over 70% out of total 1.1 million of the families settled officially recognized by INCRA *[Instituto Nacional de Colonização e Reforma Agrária]* (Brasil, 2005). Social organisations traditionally linked to the Lula administration, which were highly critical of the government actions of the Cardoso, government in recent years resumed criticisms against the government, accused of negligence with the issue, cutting resources and paralysing the implantation of new settlements.

These different interpretations reflect different views of the so called agrarian question: on the one side, those who consider that massive land redistribution is still necessary to ensure long term social and economic sustainability; on the other side those which emphasize that the need of massive land reform has been surpassed by the transformation of traditional *latifundia* into modern and sustainable family and corporate agricultural business, and that land redistribution should be used to promote access to land in a rather selective fashion. Once again, though expropriation and redistribution have not been massive enough to impact on landownership distribution patterns, it is weird to sustain the shyness theses compared to the 80 million hectares expropriated.

Irrespective to the rather positive view presented by Leite *et al.* (2004), there are some evidences that may authorize strong doubts regarding the effectiveness of agrarian reform as means to foster smallholding / family farm agriculture in Brazil. In addition to what has been called the productive failure, it is possible to mention the recreation of *minifundio* holdings within land reform settlements, the already mentioned concentration in fragile territories in the North (60 million hectares) and Northeast (9 million, mostly in semiarid areas), high rate of abandonment (up to 30% in average) following the cessation of installation grants during the initial phase of the settlements operations.

Buainain (2006) has argued that the current land reform strategy, driven by social conflicts, has not become a consistent and coordinated intervention and therefore has not been capable to cope with the conflicts themselves neither to provide solutions to the obstacles faced by the majority of smallholders as far as access to land is concerned. In short, in his view Brazilian agrarian reform is neither a viable answer to the landless nor to the *minifundio* issues. While the landless may have alternatives ¯# some even better than becoming a small farmer ¯# in the context of a growing economy, the *minifundio* is currently one of the main sources of rural poverty, and at least a portion of the very smallholder farmer could be prevented to become either landless in the near future or urban poor without adequate conditions to comply with the requirements of urban labour markets.

Land is certainly a main constraint faced by Brazilian smallholders, but so far this constraint has been looked at mostly as a matter of physical size and addressed by an agrarian reform that paradoxically focus only on landless families and does not tackle the *minifundio* problem. The institutional dimensional of the land constraint, in particular fragile landownership titles and possession - is almost entirely overlooked by public policies. And the same may be said to the promotion of alternative strategies to release land size restrictions through the introduction of land saving and higher land productivity techniques. Most of the rural credit directed to small holding / family farm agriculture is oriented to cover current expenses and not to investments and productive restructuring with could «enlarge» the small holdings without increasing its size ¯# which is not as trivial as has been demonstrated by recent experience of agrarian reform.

The main public program in support of family agriculture and rural development is the PRONAF - National Program for Strengthening Family Farming, implemented under the direct responsibility of the Ministry of Agrarian Development (MAD) (Alves, Souza, & Oliveira, 2006; Casa Civil, 2018; Gazolla & Schneider, 2013). PRONAF's main objective is to foster production and promote the increase of agricultural income of family farmers and agrarian reform settlers through provision of credit to individual farmers or group of farmers organized in associations or cooperatives. Over time the beneficiary group was extended to include rural households involved in non-agricultural activities; new and innovative funding mechanisms have also been added to cope with different regional contexts and beneficiaries' socioeconomic profiles. Irrespective to its ambitions, PRONAF remains, in essence, a rural credit program focused on small farming, especially operational credit.

The expansion of PRONAF raised the level of default, which incidentally is a general and traditional problem among Brazilian farmers. The delays are due to poor harvests and falling prices associated to weather and market instabilities. But it is also due to the opportunistic attitude of farmers' pressure groups that have enough political power as to impose massive renegotiation of rural debt and the extension of the benefit to all indebted farmers regardless their payment capacity.

One of the most serious problems faced by small producers is high risk associated with climate, market conditions and family health. Despite the adoption of traditional risk management strategies, small producers are generally unprotected and are strongly and negatively affected by adverse events. A bad harvest may be enough to undo years of effort, a disease may consume all family assets accumulated over years of hard working and sacrifice, a slight drop of prices may small farmers to the dilemma of defaulting or cutting down household consumption, which may be already too low. The family and community safety nets are important, but not sufficient to avoid and reduce significantly the negative effects of these events. Here innovations may also play a central role. On the one hand, institutional innovation which enable the introduction of protection mechanisms such as insurance, and on the other the introduction of management techniques, new seeds, farming techniques and practices that are more resistant to climatic variations and allow the reduction in the cost of production and therefore the exposure to market prices fluctuations are very helpful and relevant.

There is no doubt that finance small farmers and facilitate access to credit sources are relevant measures to promote local development and combat rural poverty. However, access to credit alone does neither change production capacity nor the poverty condition of the small rural producers. It is necessary to intervene directly in the technology base to increase total productivity of the resources, which are rather limited as shown above.

It should be noted that most credit goes to fund current expenses and just a limited amount to fund investments required to overcome the structural deficits of resources of the small family farms. As is known, during the crisis season's small farmers are forced to consume the capital they have managed to accumulate during the good years, in particular animals. Moreover, technology by itself is not enough without money resources and proper technical assistance and extension. In most cases the increase in productivity requires innovation, or changes from traditional practices and known by the farmer.

4. RESTRICTIONS, PERSPECTIVES AND CHALLENGES AND CONCLUSIONS

The intrinsic structural features of smallholding family farming sector impose several restrictions to the incorporation of technologies progress at the same pace observed in other sectors of agriculture. Restrictions may be grouped in three types according to the nature of the factors: i) scale, dispersion and isolation; ii) economic and financial factors; and, iii) socioeconomic personal and family profile.

The size hinders the incorporation of cost effective technology. Many technologies, particularly mechanical ones, are indeed indivisible as from a certain limit. The reduction of scale, even within the operational limits, reduces both efficiency and cost-effectiveness of the equipment. Overcoming this obstacle requires organizational innovation, formation of networks of producers, what is not a trivial deed, even for small producers with a history of cooperation. The dispersion and isolation also require more than physical technology solutions organization and infrastructure investments. The introduction of the requirement for milk cooling provides an excellent example. As most of the small producers would not be able to comply with such requirement, it was predicted to be the final stroke for the remaining family farms diary producers. However, the opposite has occurred: Family farmers organized themselves into cooperatives or associations; governments funded the installation of refrigerated collectors of milk at strategic points in rural areas, which are administered by their own associations of producers; PRONAF financed investments at the plot level (animals and installation) and the result was the recovery of traditional dairy basins, which were in crisis. In its turn, that has attracted investments from private companies, who also co-finance the production of small producers. This example indicates that even more complexes challenges may be successfully faced by coordinated actions of very different nature: Technology is not a panacea and technology by itself is seldom a solution to any problem.

Family farmers face problems associated with the economic and institutional environment in which they operate. In all regions, small farmers have limited access to credit, particularly for investments, and to technical assistance. Part of family producers, particularly in South and Southeast regions, explores production systems that are intensive in purchased inputs, and therefore need working capital to fund the operational costs and to maintain the flow of production. Family farmers need of working capital to operate more efficiently, cost-effective and sustainable, and the lack of appropriate credit lines impose additional restrictions on family farming operations. The poorest need further investments to increase capacity and remove structural obstacles, and face even greater restrictions to access credit. There is an unbalance between the cost of technology and the overall payment capacity of smallholders. The viability of many investments requires long term funding which is not usually and easily available to small farmers. Again, access to technology and innovation are intrinsically linked to other factors, in particular to inadequate financing schemes and technical assistance.

The universe of family farmers is extremely diversified, and the differentiation reflects local conditions such as weather, access to markets, infrastructure and the context mentioned in the Introduction. Differentiation is also a result and reflects the conditions of the farmers themselves, such as farm size, level of accumulation to cultural heritage, technical and vocational training and the level of education. Agricultural farmers are not only profoundly different amongst themselves, but they also face different sets of restrictions. The analysis of production systems carried out by Buainain (2007) revealed that farmers have a strong capacity to adapt to a number of constraints faced; they showed that these farmers tend to explore intensively the available resources in different environments. Finally, the analysis unveils a strong rationale in the systems adopted by small farmers. Rationality in the sense that the systems reflect quite directly their situation and the constraints faced, and that, given the restrictions, they usually extract close to the maximum from the available resources, under the conditions that the resources are made available and the means available for them to the use the resources. It is within this perspective that must be understood, for example, that smallholders in many areas still allocate a high share of effort and production for family consumption. Rather than reflect any kind of 'backwardness' this decision is more likely a result of wisdom.

What are the production options for a small farmer located hundreds of miles from the nearest dynamic market, isolated part of the year due to lack of road, with no electricity supply and technical assistance? What alternatives he actually has to use the resources? How can he adopt the so-called modern technology and rely on unavailable technical assistance services? What will he do when the equipment breaks down during the period in which it is more intensively used? How can allocate resources on inputs with no guarantee of being able to sell the output at prices that compensate for the expenses? Finally, the analysis shows that most of the systems have a very strong internal logic, and that this logic is built on objective factors as well, not just in alleged subjective and backward behavioural factors usually attributed to family farmers, such as risk aversion or conservatism and resistance to change.

But rationality does not imply that the systems are sustainable and or competitive. The analysis of the *roça* system common in the North, based on rotating temporary crops in small plots of burned forest, is becoming unsustainable because the fallow period is too short to allow for the restoration of the forest, what leads to rapid loss soil fertility. In other cases, the difficulty is due to socioeconomic conditions. Systems based on permanent crops that take several years to go into production require continuous expenses and investment, which are beyond the reach of most small producers. Most are not able to care of the cultivation as recommended and at the end the outcome to not correspond to expected parameters and the sustainability of the system itself is negatively affected. In some cases, the systems are put under pressure by institutional changes such as the requirement for milk cooling in the plot, which is inconsistent with the scale of the most family farmers.

From the standpoint of the internal logic of the productive systems the small producers face several bottlenecks: Need for continuing investments; working capital requirement; scarcity of family labour; difficulties to catch up with the process of innovation; managerial deficit; coordination of production networks; information asymmetry and little knowledge / experience of markets; land availability; genetic resources / quality

level inadequate to meet the new demands of the market, among others. These restrictions, more than the lack of the so-called appropriate technology, explain the difficulties faced by smallholdings to innovate. The viability of smallholding agriculture depends upon the increase in both efficiency and total productivity of factors, in particular of land and labour.

Given the main characteristics of the Brazilian family farming, the incorporation of relatively simple technologies can have significant impact on productivity. As shown by Guanziroli, Buainain & Di Sabbato (2012), access to electricity and the use of mechanization of processes could lead to overcoming the traditional agriculture of the «ax, hoe, sickle,» with significant positive effects. Technical assistance and extension services are crucial to the process of innovation among small farmers in general. In most cases, introduction of the technology is just the beginning of the innovation process, whose consolidation and sustainability requires the continuous improvement of the producer and the family, and this is only feasible with technical and financial support. It is estimated that only 20% of family farms in Brazil have access to technical assistance (IBGE, 2018). As noted above, only 2% of producers with areas smaller than 2 hectares received technical assistance on a regular basis; in the range from 2 to 5 hectares, this percentage reaches 5.8% and amongst those from 50 to 100 hectares 9.8% had access to technical assistance. Finally, it is estimated that 31% of family farms using only manual force (manpower) for the development of production (Guanziroli *et al.*, 2012; IBGE, 2006).

Batalha, Buainain, & Souza Filho, (2005) draw attention to the importance of the innovation agent. For them, the low technological level of the Brazilian family agriculture is not due only ¯# and not even mainly¯# to the lack of technology but is explained by many factors which have been mentioned in this paper. Even when technology is available often it does not become innovation because of the lack what they call the «innovation stakeholder», the agent who is responsible for selling the idea, the technology, the package, and for the diffusion of the technology among small producers. The major seed companies, for example, maintain a network of well-paid skilled professionals doing fieldwork with its clients; agricultural machinery industries are usually responsible for the assembly of the funding schemes used by the clients their products; so do the major producers of fertilizers and the large trade companies. For the small farmers the innovation agents have been mainly the public sector, the NGOs and the international organizations (IO), whose importance cannot be reduced. Nevertheless, whereas the innovation stakeholders operating with the larger farmers are driven by economic incentives, public agencies, NGOs and IO are mainly driven by moral commitments, which stem from good intentions and policy guidelines that change with governments, employees and availability of resources to finance the aid programs of NGOs and IO.

The work of this «innovation agent» is crucial to understand the «technological success» of vertically integrated small producers, whom have achieved higher levels of technical development, productivity and income. In most cases these innovation stakeholders operate as coordinators of a set of actions required to enable the innovation process, from the supply of technology package itself to technical assistance, funding and access to markets.

It is common to think that family labour is abundant, and that small producers can count on «an unlimited supply of labour.» This common sense is far from being true. Labour may be an abundant resource regarding the availability of capital, but even the majority of poor farmers do not have such elastic supply of labour, as family members have fled in search of occupation elsewhere. And family labour restriction is even more stringent for those smallholder farmers that have attained better production and living conditions and explore more capital-intensive and labour-intensive systems. In their case, family members leave either to seek better education, to establish their own business and or to engage in higher paid and qualified job in rural and or urban areas. Amongst the factors that explain the growing shortage of family labour, it is worthwhile mention the following: increased complexity of those production systems which are more integrated into the more dynamic value chains; increasingly relevance of management activities even amongst smallholders farmers, particularly in those more market oriented; greater importance of education even among the rural poor; formation of new housing by rural youngers who seek out new opportunities through migration.

In fact, there is a noticeable reduction of labour available to work in the family household. Both in the more developed and in poorer rural areas, for different reasons, it is clear that a process of 'emptying' is going on; it is also clear the reduction in occupations directly related to agricultural work, with the expansion of non-agricultural occupations. Among the more prosperous small farmers, the priority assigned to education of the children competes with agricultural work, and among the poorest, is the requirement for survival that pushes the children and youngster out of the family plot, either as a day labourer or as a migrant to other rural areas or to urban centres.

In Europe and in the USA this shortage of family labour was overcome through the introduction of labour saving technologies and through the incorporation of cheap work force provided by international migration. In Brazil, as mentioned, only a very small number of small producers have benefited from the introduction of new technologies since mid-70s. It is now time to revert this situation. As mentioned above, the main bottlenecks are not the lack of so called adequate technology. There is no secret on how to produce small tractors or other modern agricultural equipment adequate to small producers scale, for instance. The real issues here is how to create and feed a market for these technologies, how to transform small producers' needs into demand and how to transform this potential demand into supply flows with sufficient scope to reach small producers. Successful innovations require more than the supply of the good and the sale of the service; it requires the creation and functioning of networks which can be rather complex even for very simple innovations to sustain the supply flows in accordance to the demand, to provide technical assistance, to supply spare parts, provide repair services and so on. On the other hand, it also requires the organization of producers to reduce transaction costs, which in many areas could be unbearable high due to the isolation and geographical dispersion of smallholders.

Buainain (2007) argues that increasing shortage of family labour may bring competitiveness difficulties to well to do family farmers ¾particularly those which explore more intensive and integrated production systems. According to them, the great advantage of the family farm is precisely the lower cost of management and supervision of family labour, and to the extent that the basis of family labour is reduced, it is likely that the accruing benefits will also are reduced. That is why in many rural areas in Brazil the adoption of labour saving technologies is crucial for the future of family farming. This would allow the intensification of production without overexploiting the labour force, as it has always happened amongst the poor, the increase of the productivity of family labour and the harmonization of working needs with new social requirements such as education, health care and participation in the community life.

Finally, Brazilian agriculture is a particular case because of its regional heterogeneity. The production systems present a set of specificities, such as soil quality, access and use of technology, access to markets, soil and climate aspects, technical assistance, among others. It should be noted that the Northeast region is an extreme case due to the generalized condition of rural poverty of the producers, especially among the small ones. Thus, the great challenge of the Brazilian government is to provide conditions for the development of the small agriculturist in poverty, such as access to credit, technology, technical assistance and markets.

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