Frontier in Brazil, global patterns and local impacts: A closer look to the Mato Grosso state at the Centre-West region[1]

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Abstract Expansion of the agricultural frontier is a controversial and much discussed topic in Brazil. It has been represented as a process of integrating areas that are distant or disconnected from the economic and demographic center of the country. It actually echoes changes made earlier to the role played in food chain production by colonization in the past, which also involved a deepening of environmental conflicts. One of the best examples is from the state of Mato Grosso. Initially settled by cattle ranchers, by the end of the 20th century it had moved towards grain production for export based on intensive land use, mechanized cropping and the genetic development of seeds; recently followed by an increase in livestock production and the implementation of

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regional industrial plants. This paper describes the characteristics of the frontier and shows how understanding it relates to global patterns of food production and consumption and the impacts they have locally on population and the environment.
KEYWORDS: frontier; Brazil; Mato Grosso; food chain; population-environment relations.

Frontera en Brasil, patrones globales e impactos locales: una mirada más cercana al estado de Mato Grosso en la región Centro-Oeste

Resumen La expansión de la frontera agrícola es un tema controvertido y debatido en Brasil. Se ha representado como el proceso de integración de áreas que estarían distantes o desconectadas de los centros económicos y demográficos del país. No obstante, se hace eco de los cambios en el papel de las antiguas colonias en la cadena de producción de alimentos y la profundización de los conflictos ambientales. Uno de los mejores ejemplos es el estado de Mato Grosso. Inicialmente colonizado por ganaderos, a fines del siglo XX avanzó hacia la producción de granos para la exportación basada en el uso intensivo de tierras, cultivos mecanizados y desarrollo genético de semillas, y en las dos últimas décadas por el aumento en la producción ganadera y la apertura de plantas industriales regionales. Por lo tanto, este documento describe las características de la frontera y cómo su comprensión se relaciona con patrones globales de producción y consumo de alimentos y los impactos locales sobre la población y el medio ambiente.
PALABRAS CLAVE: frontera, Brasil, Mato Grosso, cadenas alimentarias, relaciones población-ambiente.

Introduction

In Brazil the debate concerning the frontier has always involved issues concerning land and population dynamics and how they relate to agrarian production. For this reason, it is often described as the combination of an Agricultural Frontier and Areas of Expansion, leading to a study of territorial development that connects land-use and land-cover changes to population dynamics. For some years there has been criticism of the notion that the frontier only refers to an effort to integrate new areas into the capitalist logic of spatial organization and commodification (Martins, 1975; Schmink & Wood, 1992; Cleary, 1993), which is based on the creation of dualistic relations of core-periphery and scarcity-abundance. The approach that has been criticized assumes that the frontier is constantly moving towards more peripheral areas with a greater abundance of resources,

in order to supply the already settled and exploited core, and its immediate surroundings, where there are less resources.

A more recent theoretical approach to the frontier has been mainly concerned with the "frontier-making" process as proposed recently by Ioris (2018), where the transformation of capitalist production relations is explained through a narrative of possibilities of continued accumulation over time. This idea also agrees with the proposition of Lombardi and D'Antona (2017) that sees the frontier as a theoretical term deriving from empirical idea already employed in daily life, which is anchored in paradigms that make changes to land use and land cover, an integral part of understanding population dynamics. The idea of the frontier becomes a flexible tool for studying and understanding these relations (of population dynamics to changes in land use and land cover) both in terms of process and in specific time frames. This may explain why it was not until the second half of the 20th century that the frontier changed from being an empirical idea and was placed in a theoretical framework, which coincided with the development and consolidation of population and environment as a field of study.

Accordingly, this paper assumes that the consolidation of the frontier as a theoretical term, and development of the field of study concerning population and the environment, are products of each other, and transformations of central importance in the relationship between population and environment must therefore affect how we think of the frontier and how we approach it, just as much as a careful understanding of local patterns and their global aspects. Here we argue that changes in food chain production and their immediate effect on the pattern of urban-rural relations between the population and the environment, should be adopted as a theme in any studies now using the frontier as a theoretical framework.

This is the approach that has been central for most of the research in Brazil concerned with the understanding the dynamics of population and environment in areas such as Amazonia (mostly the Northern region of the country and part of the Centre-West) or the Cerrado[2] and Pantanal[3] areas in the Centre-West region. Always called "frontier areas" they convey the idea of unsettled (or poorly settled) territories where much of the land is covered by native vegetation and there are "possibilities for making a living" through the

[2] A dry climate with sparse vegetation, a savannah-like biome with local specificities that differentiate it from other savannah biomes.

[3] The largest wetland area, one of the officially recognized biomes of the country.

expansion of agricultural activities. As explained in the next section, these ideas of emptiness and a pristine location, empirically used, conveyed an idea that omitted to make any reference to the existing population or to practices related to land use, and fostered an early approach to the frontier as a "photographic" concept used to describe changes to a pattern of land use and land cover under capitalist expansion.

Over the decades this approach has been questioned, as studies started to show more and more complexities in the multileveled process that went to make up the "snapshot" that could be seen at the moment of the research. What now needed to be studied was how this process came to have so many conflicts over meanings, practices and dynamics. Research into the question received many contributions from a growing number of environmental scientists and demographers who had started to work together in a more interdisciplinary way and were able to demonstrate, by explaining changes to land use and cover, how population dynamics were affected while at the same time these influenced the environment.

To understand those conceptual changes and what they imply, this article uses the state of Mato Grosso as an example. Originally settled during the early periods of Portuguese colonization it has recently experienced a period of frontier expansion with an intensification of agribusiness that started in the 1990's, and has changed the place occupied by the region in the food production chain. This paper aims to address some particularities of the frontier in the state of Mato Grosso, emphasizing the importance of the structure of the food production chain and changes to it, and showing how it shaped not only rural areas but also, to an even greater extent, urban areas. The article further argues that this dynamic highlights the importance of thinking about population-environment relations as forming a holistic multileveled, connected, process of territorial development. The paper begins with an overview of some of the theoretical approaches to studying the frontier, followed by a description of some of the main features of the territorial development of Mato Grosso, focusing on the period that started in the 1970's, and proceeds to provide an analysis of how its dynamics and structure express a contemporary feature of the frontier. The article closes with some final remarks on how relevant or appropriate it is to continue to apply the term frontier to studies of population and environmental dynamics in Brazil.

The concept of frontier – contextual and theoretical developments

With regard to the theory behind these studies, the concept of a frontier has been applied to Brazil as part of a critical approach that sees the subject in terms of a multileveled pro-

cess of territorial development. For the past 50 years or so (mainly since the 1970s) the idea of a frontier has been used as a tool to help describe and detail population dynamics, with their flows, and to take into account changes to land use and land cover. The definition of what is meant by "frontier", the scope of its applicability, and the question of whether it is valuable as a tool for analysis – either as a concept or as a theoretical approach, or just as a broader empirical idea – have made it a very controversial subject, much discussed, that was constantly mentioned in many important works about the country and particularly those on Brazilian Amazonia (Becker, 1988; Cleary, 1993; Holanda, 2005; Ianni, 1979; Ioris, 2018; Little, 2001; Lombardi & D'Antona, 2017; Rindfuss *et al*., 2007).

There is no doubt that the origin of its construction as a concept can be traced back to Turner (1921) in his search for comprehending how the settlement process of the United States shaped the process of nation building, and gave it its character through expansion over a territorial, and government administrative, boundary. Studying its history, the term is seen to be associated with notions of emptiness, the unknown, conquest of the wilderness, boundaries, isolation, rurality, lawlessness and archaism, and these ideas have survived both empirically and theoretically until contemporary days. In their midst a narrative has been created in which some people and some environmental dynamics are made to be invisible and others are brought to the forefront.[4]

Hence, for a large part of the population of Brazil these days, the rural areas of many Centre-West and Northern region states are still regarded as a frontier, meaning a place far away from the "modern and developed areas", a place that is rooted in extractive and agricultural practices. However, in spite of being delimited and improved, the idea of a frontier is still only a notion inherited from the colonial period, of what lies beyond the limits of the already known, a term that puts the population and the environment in opposition to each other or puts them into a relation with each other (Lombardi & D'antona, 2017). It is a term inherited from colonial times for marking ideas of place and territory in Brazil. For this reason, the notion of frontier has survived in the imaginary of

[4] The argument refers to classical Frontier studies such as those by Schminck and Wood (1984, 1992), and Martins (1975, 2009); although Becker (1990), Santos (1993) and Velho (1981) debate the conditions of the colonists, pioneers and small family farmers, their work does not shade light on how the area had already been settled by the indigenous population, as argued by Almeida and Kater (2017) and Clements *et al.* (2015), or what happened to this population.

everyday life, and was taken up by researchers as a conceptual device that could be used to share an understanding of the elements that it is made up of.

However, if the relationship between population and environment, and the development of the territory are key elements of the frontier as a theoretical term, two other elements are: the relations involved in capitalist production (Ioris, 2018), and the agri-food system. Also, as argued by Ioris (2018), the frontier here is a point of reference whose core is constantly "in the making" due its flexible nature of being a term that can be used to capture and describe processes over time including the changes and alterations in relations between the population and the environment, within the relations involved in capitalist production. It is a point of reference for finding out who is implicated in local dynamics and in what way, while revealing that there are many scales on which they work. For this reason, it has been one of the most used tools for analysis of dynamics in areas like the Amazon or the Cerrado biomes, where environmental change is openly a major concern due the quick pace of change and the impact this has had on local dynamics and their relation to regional, national and international contexts and processes.

In Brazil, the frontier, as a term showing the contextual limits of a study, was used in the work of Holanda (2005) before virtually anyone else, to draw attention to the process of settlement during the colonial period that developed from an initial process of territorial expansion. Influenced by Turner's ideas, the author produced an analysis of the formation of the country by looking at the activities that illustrate the process of expanding the territory of the colonies, and at the relations (with all the conflicts and problems involved) between people and with the environment. As argued by Lombardi and D'Antona (2017) the elements of this first conceptual application of the frontier as a theoretical framework to work in are: a mobile population in a changing environment, although the scope and structure of the term have changed during the time studied as the relation between these elements has changed. The authors also argued that the whole conceptualization of the frontier is currently structured to reveal the multiscaled nature of the colonial enterprises, something that will have a permanent influence on the characterization of frontier areas, as the local impacts of extractive and agricultural activities are included, and the colonial enterprises become part of the global agri-food system with the corresponding relations of capitalist production.

Thus, for classical theories of the frontier, the term was taken to refer to "areas of expansion", and used in the study of the process of occupation and settlement of new

areas, whose directions and localities have been previously decided (expansion areas) by economic and political powerful actors, and that develop with the implementation of an agricultural and livestock production system that has expanded from already settled areas into new ones, reproducing a system already in operation. This aspect of the frontier was one that focused on the idea of emptiness, where new, small, pristine areas are settled, and are then expropriated soon afterwards by bigger farmers or else the area is abandoned due to a lack of infrastructure or capital. During this process the subsistence farm, rooted in the family workforce, turns to search for new places, that are more distant and cheaper, where they can start up again.

This process, which is a vicious circle,[5] would make the movement of the frontier unending as there will always be people in search of new places to recreate their means of livelihood after their land has been expropriated or lost as the result of debts or a lack of resources.[6] However, it was only with the major colonization projects of the 1970's that the notion of frontier developed into a complex and structured framework to be applied to Brazilian reality. While debating the aspects and consequences of the dynamics of the frontier, Velho (1981) and Ianni (1979) focused on the terrible logic that made it possible for those with more capital and structure to establish capitalist monoculture on cleared land already cultivated by small non-capitalized farmers who then had to leave their lands and, on many occasions, become rural workers. For Sawyer (1996) and Schmink and Wood (1992), for this pattern to work it requires there to be a mobile population divided into flows of more and less capitalized farmers who are attracted to areas described as pristine and empty. This fosters a great impact on changes to land use and cover in a short period of time.

Nevertheless, by focusing only on the conflict between the process of settlement by small farmers (with less access to funds and less infrastructure support) and large pro-

[5] It also paves the way for expansion of the agri-food system, allowing it to be reshaped in ways that are in accord with the organization of the production-consumption nexus on a global scale.

[6] One example of State action in nurturing the expansion of the frontier was the Integration and Colonization Project based on the construction of roads to integrate the countryside with the more "developed" coastal areas. Along the roads there would be areas of settlement, consisting of a series urban centres, surrounded by rural areas, composed of rural villages and large areas of agricultural production. Most of this structure is the origin of many of the municipalities of the Centre-West and Northern regions that exist today.

ducers (with a disproportionate amount of resources available to them), this more classical approach disregards the diversity of land use and population dynamics in the place, which continues to keep the traditional and indigenous populations in the shade, as it were. This perspective started to receive more attention in the first decades of the present century, particularly from the social sciences (Little, 2001; Martins, 2009; Corrado, 2013; Almeida & Kater, 2017; SOUZA, 2017) causing some researchers to announce the end of the frontier as a theoretical concept or framework as Cleary (1993) had proposed, arguing instead in favour of adopting the paradigms of development and studies of the multidimensionality of poverty. This change of perspective contributed to updating the approach that was being taken towards the study of capitalist expansion and changes in the agri-food system, by highlighting the features that made it still relevant to use the framework of the frontier.

From discussions on the multidimensionality of the poverty, and questioning the meaning of poverty, and whether the settlement project really is the pattern that determines land use, these critics of the classical theory made it possible to also instrumentalize the traditional and indigenous populations, and their struggles for the recognition of their lands, practices and identities, as an important part of the local dynamics. Traditional knowledge and sustainable practices may become the subject of one chapter in the history of the frontier where the battle is fought against a logic of place and time that comes from the outside and has made a great impact locally.

All the same, if the dynamics of rural territory have occupied most of the pages of both classical and more contemporary frontier studies in the first decades of the new century, in still more recent studies and in the design of policy it is the rural-urban complex that has puzzled researchers and policy makers. It is quite true that nowadays Brazil is a country with more than 85% of its population living in urban areas, and therefore problems and issues related to urbanization processes have assumed great importance. However, the country continues to be largely dependent on commodities to generate wealth. The tension between the persistence of rural areas and the expansion of urban areas makes it possible to introduce the concept of the frontier as a tool that will combine a historical perspective with a multileveled approach involving population-environmental relations, and movements, displacements and rapid changes to land use and cover.

Another argument to be considered is that once there are changes to the agri-food systems and the way capitalist relations are established in them, there will be changes to

the characteristics of the frontier.[7] Study of the frontier now has to include changes in the relationship between rural and urban areas, and the spatial distribution of the production chain. As an example, taken from Mato Grosso, the frontier may refer to where there has been a change from pasture, to smaller confinement sheds connected to slaughter houses and food processing factories. Production may still be mainly based on meat related products but the space used and the logistics of production have changed.

This also applies to population dynamics. Instead of being a rural population occupied in rural jobs, it has become a mobile population that can live in the city, with easy access to services that can transport the population between the meat factory and the calves breeding farm. This dynamic has changed the way people live and has pushed the rural population into urban areas, as big properties that need less rural workers are consolidated and there are more urban jobs, and rural jobs for urban dwellers, as tractor drivers and animal feeders.[8] One example of the current state of the frontier can be found in the dynamics of Mato Grosso that will be described and analyzed in the next section.

Process of settlement and land use and land cover change of Mato Grosso state in the Centre-West Brazil

The state of Mato Grosso is the third largest state in Brazil and currently occupies an area of 903,202.446 km^2, which is inhabited by 3,344,544 persons,[9] mostly urban dwellers (82%), with a GDP in 2015 of 107,418 billion reals.[10] However, in spite of a fast rate of development and a constant tendency in recent decades towards urbanization, it has environmental importance as it contains ecotones between the Amazonian and Cerrado biomes in the Northern part of the state, also the most important wetland area of

[7] The argument here is to connect the idea of the particular landscapes and dynamics that the food regimes are tangled up in, to their development, as proposed by Philip McMichael (2016).

[8] For the region and especially for the state of Mato Grosso, this information confirms the argument of Becker (1988, 1990) that the settlement process that generated the whole concept of a frontier was concerned with the expansion of agricultural and pasture areas, but by urban dwellers. It is, as she says, an urban frontier with rural production. Thus, as argued by McMichael, it is important to understand not just the overall aspect of food regimes but the whole landscape and dynamics that shape them locally and globally.

[9] According to the 2017 population projection made by the IBGE (cidades.ibge.gov.br).

[10] On July 31st 2018, USD $1 = BRL $3.75.

the country (Pantanal) which continues through Mato Grosso do Sul, the neighbouring state, as well as one of the biggest and oldest indigenous territories (Parque Indígena do Xingu), and the springhead of the River Xingu, which is one of the biggest rivers of the country, and several federal protected areas, such as the National Parks of Chapada dos Guimarães, and Juruena.

As well as being greatly dependent on its environmental treasures and a high rate of urbanization, the economy of the state has a strong basis in agribusiness. Soya grown in the state represented 22% of Brazilian soya production in 1996, growing to 30% in 2006, and then went down to 27% in 2016, as seen in Table 1, and this product played an important role in giving Brazil a place in the world agri-food system. It should be noted that for the period of 1996 to 2016, Mato Grosso's participation in the national production of soya is impressive but from a regional perspective it is even more so, as it accounted for over half the production of soya in the region at that time. As distinct from the production of soya, the amount of maize grown in the state changed more dramatically than the amount of soya, increasing from 5.1% to 24% of all national production and from 23% to 56% of all regional production. This change can also be seen in the graph in Figure 1 that shows the rates of growth for soya and maize production during the period. The data suggest that while soya continues to be an important product for state and regional agribusiness, maize has become a central product too, which might be connected to changes in the structure of the agri-food system in Mato Grosso, as will be discussed below.

At any rate, the amounts of soya and maize produced (expressed in tonnes harvested) give a picture of how the intensification of agriculture continued to be the main choice for agricultural land use in Mato Grosso, following the national tendency of intensification of rural production, which can be understood from the correlation of data in Table 1 and Figure 1 to data in Table 2 on land use distribution for the same period. From Table 2 it is possible to see that the most representative changes in land use are: an increase in the area occupied by seasonal crops (5.7 percent in the period from 1996/97 to 2006/07, and 5.27 in the period from 2006/07 to 2017), and small increases in planted forestry (that might represent the planting of eucalyptus trees), of 0.79 percent, and in agroforestry an increase of 1.1 percent during the same period, followed by a decrease both in the area of natural forest (4.5 percent in the first period and 2.11 percent in the second) and in areas that were degraded or not suitable for agriculture (4.68 percent and 0.08 percent respectively).

TABLE 1. State participation in the country's total grain production (tons)

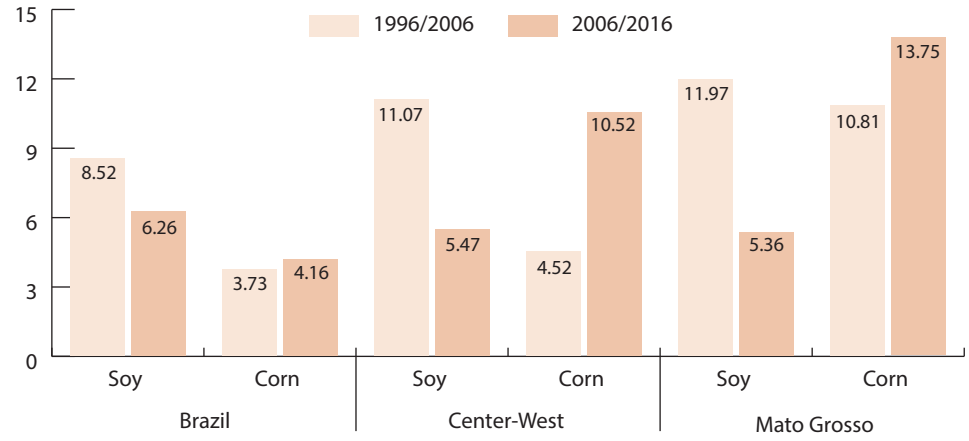
Brazil, Grande Região e UF	Product	1996	2006	2016
Brazil	Soy	23.155.274	52.464.640	96.296.714
	Corn	29.589.791	42.662.578	64.143.414
Center-West	Soy	9.066.370	25.911.228	44.140.654
	Corn	6.495.652	10.102.477	27.466.857
Mato Grosso	Soy	5.032.921	15.594.221	26.277.303
	Corn	1.514.658	4.228.423	15.339.785
Percentual (%) participation on country production				
Brazil, Grande Região e UF	Product	1996	2006	2016
Center-West	Soy	39%	49%	46%
	Corn	22%	24%	43%
Mato Grosso	Soy	22%	30%	27%
	Corn	5,1%	10%	24%
Percentual (%) participation on region's production				
Brazil, Grande Região e UF	Product	1996	2006	2016
Mato Grosso	Soy	56%	60%	60%
	Corn	23%	42%	56%

Source: Municipal Agricultural Survey obtain at Sidra/IBGE (https://sidra.ibge.gov.br/home/lspa/brasil) for 2016 and IBGE Municipal Agriculture Survey publication for 1996 and 2006.

This could indicate a negative impact of recent changes, made in 2012, to the Forest Code, that altered the logic of rewards for ecological services to compensate for damage to the environment, by maintaining a minimal area of preservation within rural properties. From the point of view of land use, this would indicate a tendency towards the recovery of degraded and unsuitable areas while still proceeding with the conversion of forest into agriculture areas. For pasture, although there was an increase of 5.64 % in the first period, there was a decrease of 2.51 % in the following period, which also signals a change from breeding cattle to breeding pork and chicken, as will be argued ahead. At any rate all the data show changes in the agri-food system, and intensification (Van Wey *et al.*, 2013).

Thus, the figures quoted represent some of the outcomes of the frontier expansion that took place in the Centre-West region after the collapse of the colonization projects of the 1970's. The expansion is characterized particularly by investment during the 1990's in technology to adapt soya beans to the savannah soil of the Cerrado, as a project to turn the region into the grain cellar of the country by using an area regarded as one with poor

FIGURE 1. Soy and corn growth rate for 1996/2006 and 2006/2016 period



soil and a lack of agricultural possibilities. This choice was closely connected to green revolution expectations and propaganda, in other words it followed a global tendency to bring mechanization and technology into rural production as one possible answer to the problem of ending rural poverty. The narrative was very much based on the use of technology to help change a place by creating the conditions that would turn a large area of poor soil area into productive land, thereby contributing to the development of the country and helping it to get a place in the agri-food system by meeting the global demand for a specific grain, here represented by soya and later by maize (Hecht, 2005; Hogan, Cunha, Carmo, 2002; Carmo; Dagnino; Caparroz; Lombardi, 2012; Carmo *et al.*, 2018).

The frontier expansion was a State project in partnership with farmers, particularly those with capital backing, to get access to all this technology, which was developed mainly by the Brazilian Agricultural Research Corporation, Embrapa (Empresa Brasileira de Pesquisa Agropecuária). It demanded large sums of money, much of them borrowed through government credit given by the Brazilian Development Bank, BNDES (Banco Nacional de Desenvolvimento Econômico e Social). Also, the use of technology implied in the goal of making this transition and creating the country's grain cellar within a short period of time meant allowing the intensification of agriculture. The project was very successful, and the state of Mato Grosso gained the status of principal producer of grains, first with soya and recently with maize (Van Wey *et al.*, 2013; Lombardi and Carmo, 2012; Carmo *et al.*, 2018).

Together with grain production, the first two decades of the present century were marked by a huge increase in poultry and pig farming, although there was a small reduction in cattle and the implementation of large industrial plants to complete the whole food chain production of the meat industry (fresh and frozen). It is therefore worth mentioning that although settlement of the state was originally based on large cattle farms and the search for gems and gold, it was only from the 1990's onwards that the move into agribusiness commodity production turned the sate into one of great importance to national production.

However, to understand why Mato Grosso is a good case for thinking about the frontier and its relevance through providing a conceptual framework for the understanding of territorial development and population dynamics, it is important to go back a little and describe the history of the settlement of the state. The origins of Mato Grosso are in the frontier expansion of the Portuguese empire during the colonization process which started for the most part in the 17th century, in a campaign to spread out into the countryside known as "bandeiras"[11] described in detail by Holanda (2005). Most of the "activities" that people taking part in the "bandeiras" engaged in, were related to the cultivation of small plots for subsistence along with cattle ranch farms (a major activity in the state until the colonization projects of the 1970's and onwards), the search for gems and gold, and the entrapment of members of the indigenous population either to supply the workforce of the coastal settled areas on the coast with slaves or to set up Christian Missions that would foster the conversion of the natives into a Catholic population and "integrate" them into the colonial population. So the colonial process of "frontier expansion" was one marked by violence and conflict, with serious consequences for the indigenous people, who lost much of their territory and were exposed to epidemics that killed many people (Martins, 2009; Almeida & Kater, 2017). Although the common colonists were responsible for adopting a violent approach towards the indigenous population, theirs was also an enterprise marked by the lack of a legal system and with little interest shown in their wellbeing by the government, which exposed them to dangers, many times costing them their own lives.

Thus, the Cerrado and Amazon regions that had been occupied by indigenous populations for hundreds of years, as argued by Livi-Bacci (2002), Almeida and Kater (2018)

[11] A direct translation is "flags" and the campaign was named after the flags and insignia carried by the Portuguese colonists who advanced through the territory in search of gems and gold.

Table 2. Rural land use distribution (%). 2006 and 2017 agropecuary census

		Crops			Pasture	
Brazil, region, state		Permants	Temporaries	Flower cultivation	Natural	Planted - degraded
Brazil	2006/2007	3,52	14,59	0,03	17,37	2,98
	2017	2,28	15,78	0,04	13,38	3,37
Center-West	2006/2007	0,69	11,07	0,01	13,23	3,22
	2017	0,47	16,10	0,02	10,22	2,63
Mato Grosso	1996/97	0,30	6,70	12,60	30,80	42,70
	2006/2007	0,83	12,39	0,01	9,14	3,36
			12,4		36,44	38,2
	2017	0,19	17,65	0,02	7,37	2,85
			17,67		33,93	36,09

Source: SIDRA/IBGE - 2006 Agropecuary Census and data for Mato Grosso for the 1996/97 Agropecuary Census from Hogan, Cunha

and Clements *et al.* (2018), changed their demographic and environmental landscapes. Although studies of the frontier have emphasized the "pioneer" perspective (Schmink; Wood, 1984; Holanda, 2005), it is important to remember that on the other side of the frontier were the indigenous groups, especially when the first moment of economic expansion, in the 1800's and 1900's, is being considered. Further, the current racial/ethnic distribution of the population in Mato Grosso still echoes the many processes of frontier expansion that there have been since the colonial period and reflects the complex land issues that characterize the region (Carmo *et al.,* 2018; Corrado, 2013; Mondardo, 2017), which be seen in data shown in Table 3.

From figures in Table 3 it is possible to visualize an important participation by the indigenous and "mixed race" population in Mato Grosso and a smaller participation by the white population, if compared with figures for the nation as a whole. Nevertheless, even when there was a relatively small participation by the indigenous population, overall the distribution shows a diverse population, a diversity that has lasted through the whole period, and this is a tendency that was not consolidated for the country as a whole, though it has been developed more recently through recognition of the traditional population and the fight against discrimination. Hence while diversity is an ongoing tendency for Brazil, for the Centre-West and the state of Mato Grosso, it is a constant descriptor

	Forest area				
Planted - good condition	Protected and legal reserve	Other natural areas	Planted forest	Agroflores-try areas	Lakes, dams and watery areas + constructed areas + degra-ded areas + not suitable for agriculture
27,76	15,20	10,80	1,36	2,48	3,91
28,54	21,52	5,08	2,42	3,98	3,73
39,93	21,73	6,57	0,24	0,81	2,50
37,52	25,22	2,75	1,17	1,56	2,33
0,10	6,80				
33,08	28,06	10,14	0,14	0,75	2,12
0,89					
31,08	31,65	4,44	0,36	1,63	2,04
1,99					

and Carmo (2002).

of the characteristics of the population, PNAD (Pesquisa Nacional por Amostra de Domicílio).

One possible influence on the constant diversity found in describing population characteristics in Mato Grosso may be its continued status as a "frontier" area, meaning a place where people who have many different origins live. As an example, while during the 1970's and 1980's the most important migration flows were from the South of Brazil (especially white groups, consistent with the influence of European colonization on this part of the country), more recently an increase in the participation of black and "mixed race" populations could be a result of migration flows in the last decade, or last two decades, characterized by migration from the Northeast region (Carmo, Dagnino, Caparroz &Lombardi, 2012; Carmo *et al.* 2018). Thus, different areas defined as being part of the frontier received different groups of migrants, which changes the population composition in diverse ways, as attested by Cunha (2013) in his work on migration tendencies in the Amazonian and Cerrado region in the period from 1995 to 2010.

This constantly mobile population, which is another characteristic of the frontier used as a conceptual framework, reveals a conflict between two different logics applied to the relations between population and environment. In effect, the advance of capitalism – in its search for new areas to expand its production into, or to incorporate into the logic

TABLE 3. Color/Race percentual (%) distribution of the population on country, regional and state level

Country, region, state	White			Black			Yellow/ Asian		
	2000	*2010*	*2015*	*2000*	*2010*	*2015*	*2000*	*2010*	*2015*
Brazil	53.7	47.7	45.2	6.21	7.61	8.86	0.45	1.09	0.47
Center-West	49.7	41.8	39.4	4.62	6.69	7.84	0.40	1.46	0.55
Mato Grosso	44.1	37.5	33.2	5.64	7.57	8.22	0.40	1.14	0.34

	Mixed Race/ Parda			Indigenous		
	2000	*2010*	*2015*	*2000*	*2010*	*2015*
Brazil	38.5	43.1	45.06	0.43	0.43	0.39
Center-West	*43.7*	*49.1*	*52*	*0.90*	*0.93*	*0.22*
Mato Grosso	*47.9*	*52.4*	*58*	*1.17*	*1.40*	*0.24*

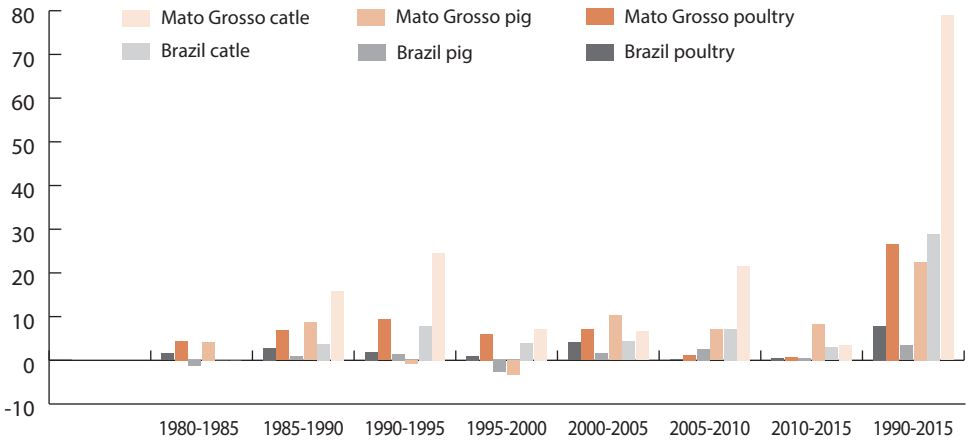
Source: SIDRA/IBGE (sidra.ibge.gov.br) - 2000 and 2010 Demographic Census and 2015 National Survey of Domestic Units.

of its agri-food system – is going to attract a workforce in need of work and searching for better living conditions, that then casts out groups previously settled in the area. This hypothesis of changes in the racial/ethnic composition of the population being, in part, explained by changes in migration patterns, may be echoed in figures for the economically active population in the area, whose migratory status is shown in Table 4.

For Brazil, it is important to bear in mind that the migrants (people who live in municipalities or states different to those they were born in) are a significant group. Considering the total population of the country above 10 years old, in the year 2005, 45.9% of them were living in municipalities different from the ones they were born in. This category can be divided into those who moved within, and those who moved out of the state, and the first group is smaller which suggests there was a tendency to short distance migration by some, even if most migration was over larger distances. In 2015 this number decreased to 42.2%, which might indicate a tendency to less migration movements in the period, in spite of an increase in absolute numbers, from 70.6 million to 74.9 million people. Nevertheless the people who did not move (born and currently living in the same municipality) form the largest group in the country (54.02% for 2005 and 57.8% for 2015).

For the Centre-West Region and in the state of Mato Grosso, the distribution is reversed, with the group of people living in a different municipality to the one they were born in bigger than the group of those born and still living in the same municipality. This

FIGURE 2. Livestock - percentual growth of the number of animals for Brazil and the state of Mato Grosso



group reaches a figure of 62.3% of the total population of the region and 68.2% of the state population in 2005, decreasing to 58.3% and 66.9%, respectively, in 2015. Additionally, reflecting the history of constant flows within the region, the percentage of those not born in the municipality they currently live in and also not born in the state where they current live (representing an out of the state migration) comes to more than half of the total number of migrants in the region and in the state (42.34 % of the population of the region and 49.73% of the population of the state in 2005; and 38.13% and 44.1%, respectively for 2015). The figures confirm an uninterrupted tendency towards constant long distance migration. This information combined with those for the distribution of the population by characteristics of colour/race in Table 3 reinforces the classical characterization of the frontier as an area with a continuous flow of population, which in turn is expressed in a more diverse population.

Also, analysis of Table 4 shows the percentage of the population over 10 years old who are economically active (EAP),[12] and this might shed light on understanding how this pattern of a migrant population influences the workforce of the state. For the three levels presented here (country, region, and state) the EAP represents around 60% of the total population over 10 years old, with a tendency to decrease, which corroborates the

[12] The definition is: persons who have a job or who have looked for a job in the last 30 days before the date of the survey.

TABLE 4. Total (number of persons and %) and Economically Active (%) population of 10 years old and above accordi

Brazil, region, state	Place of birth in relation to region and state where is current living
Brazil	Total
	natural of the municipality
	not natural of the municipality
	not natural of the municipality but natural of the state
	neither natural of the municipality or the state
Centre-West	Total
	natural of the municipality
	not natural of the municipality
	not natural of the municipality but natural of the state
	neither natural of the municipality or the state
Mato Grosso	Total
	natural of the municipality
	not natural of the municipality
	not natural of the municipality but natural of the state
	neither natural of the municipality or the state

*Thousands of people

Source: SIDRA/IBGE (sidra.ibge.gov.br) - 2005 and 2015 National Survey of Domestic Units.

demographic transition experienced in the country. Nonetheless, if 48.3% of the economically active population of the Mato Grosso were migrants in 2005, 36.55% of them were out of the state migrants, which means that the majority of migrants were longer distance migrants, a tendency that was sustained in the next period, even with a decrease in the total number of EAP migrants, to 43%, and of out of the state EAP migrants, to 29.08%.

The pattern for Mato Grosso follows the regional pattern for both periods, demonstrating the importance of out of the state migration, and migration to the region as a whole, plus a persistent tendency to attract migrants. Finally, it must be emphasized how this pattern has had an impact on the constitution of the local workforce, as more than half of this workforce have migrated into the state or within municipalities at some point, which characterizes the workforce as mobile. Probably the mobility of the workforce and the types of jobs offered are directly related, as the state might attract people looking for certain jobs that are scarce in their own state or municipality so they look to the region, or

ing to place of birth and place where currently living (state and municipality)

2005			2015		
persons*	%	% economically active	persons*	%	% economically active
153.733	100,00	62,89	177.657	100	59,4
83.049	54,02	32,94	102.689	57,8	33,59
70.677	45,97	29,95	74.967	42,2	25,81
41.758	27,16	17,54	44.532	25,07	15,11
28.919	18,81	12,41	30.436	17,13	10,7
10.838	100,00	64,26	13.340	100	62,09
4.082	37,66	22,08	5.555	41,64	24,36
6.756	62,33	42,18	7.785	58,36	37,74
2.167	20,00	13,35	2.698	20,23	13,03
4.588	42,34	28,83	5.087	38,13	24,71
2.330	100,00	65,69	2.766	100	61,64
740	31,76	17,35	914	33,04	18,55
1.590	68,24	48,34	1.852	66,96	43,09
431	18,51	11,79	632	22,86	14,01
1.159	49,73	36,55	1.220	44,1	29,08

to Mato Grosso. Just to characterize one aspect of these jobs and to argue in favour of current descriptions of the frontier as having an important urban component and offering various jobs in the whole spectrum of the agri-food chain of production (meaning rural and urban jobs), some more figures are presented here, on job classification: the data from the PNAD in 1995 show that 34.34% of the jobs in Mato Grosso where classified as "agriculture" or "rural" jobs, a percentage that fell to 31.0 in 2015 – a figure that differs slightly from the figure for the country as a whole where these jobs accounted for 26.07% of the total in 2005 and 14.12% of the total in 2015. It can also be deduced from the data collected for other states of Brazil that the mechanization of rural areas and the extinction of jobs classified as "rural" or "agriculture" has happened at a quicker pace in other parts than in Mato Grosso where the agri-food system has a major influence in the dynamics of the whole state.

Thus the development of the frontier is expressed in a growing urban population and a shrinking rural population This becomes clear looking at the data in Table 5, which

TABLE 5. Population (total, urban and rural) and growth rate(1970/2015)

Brazil, region, state	1970		1980		1991
	persons	%	persons	%	persons
Brasil	93,134,846	100	119,011,052	100	146,825,475
				2.48	
Center- West	5,072,530	100	7,545,769	100	9,427,601
				4.05	
Mato Grosso	1,597,009	100	1,138,918	100	2,027,231
				3.32	

Brazil, region, state	1970		1980		1991
	persons	%	persons	%	persons
Brazil	52,097,260	0.59	80,437,327	0.68	110,990,990
				4.44	
Center- West	2,438,952	0.48	5,114,489	0.68	7,663,122
				7.69	
Mato Grosso	683,857	0.43	655,141	0.57	1,485,110
				0.43	

Brazil, region, state	1970		1980		1991
	persons	%	persons	%	persons
Brazil	41,037,586	0.44	38,573,725	0.32	35,834,485
				0.62	
Center- West	2,633,578	0.52	2.431.280	0.32	1.764.479
				0.80	
Mato Grosso	913,152	0.57	483,777	0.42	542,121
				6.16	

Source: Data from SIDRA/IBGE (https://sidra.ibge.gov.br/home/lspa/brasil) - Demographic Census of 1970, 1980, 2000 and 2010 and

presents growth rates and the percentage of rural and urban population at national, regional and state levels. However, before analysing the figures themselves it is worth mentioning the fact that during the last 50 years Brazil has gone through two very important transitions. These are, the demographic transitions with their effects, and urbanization, involving an intense process of spatial redistribution of the population (Cunha and Vignoli, 2009). The demographic transition was marked by a very rapid decrease in the

Total						
	2000		2010		2015	
%	persons	%	persons	%	persons	%
100	169,799,170	100	190,755,799	100	204,860,000	100
1.93		1.63		1.17		0.72
100	11,636,728	100	14,058,094	100	15,489,000	100
2.04		2.37		1.91		1.39
100	2,504,353	100	3,035,122	100	3,274,000	100
5.38		2.38		1.94		1.09
Urban						
	2000		2010		2015	
%	persons	%	persons	%	persons	%
0.76	137,953,959	0.81	160,925,792	0.84	173,566,000	0.85
2.97		2.45		1.55		1.09
0.81	10,092,976	0.86	12,482,963	0.89	13,911,000	0.90
3.74		3.11		2.15		1.56
0.73	1,987,726	0.79	2,482,801	0.82	2,675,000	0.82
7.72		3.29		2.25		1.07
Rural						
	2000		2010		2015	
%	persons	%	persons	%	persons	%
0.24	31,845,211	0.19	29,830,007	0.16	31,294,000	0.15
0.67		1.30		0.65		0.69
0.19	1.543.752	0.13	1.575.131	0.11	1.578.000	0.10
2.87		1.47		0.20		0.026
0.27	516,627	0.21	552,321	0.18	599,000	0.18
1.04		0.53		0.67		1.17

l 2015 National Survey of Domestic Units. Calculations made by the authors.

Total Fertility Rate (TFT). In the 1960's the Brazilian TFT was 6 children per woman. In the 2010's the TFT stood at 1.8 children per woman, which meant a TFT below the replacement level, indicating the end of population growth in the 2040's (Potter *et al.*, 2010; Rios-Neto *et al.*, 2018).

This process is reflected in the fast reduction of the rate of growth of the population, observed in Table 5. The total population growth rate has been decreasing at different pa-

ces in each region of Brazil, but there is a general tendency for the decrease to have been relatively slow in urban areas, while the rural population has reached negative growth rates both nationally and regionally, with some reversion to small growth rates for the last period of 2000-2015. Nevertheless, data point towards a constant tendency for the population to concentrate in urban areas, which corresponds to the tendency towards mechanization and land concentration in rural areas all over the country. From another perspective, the negative growth rate for the rural and urban population of Mato Grosso in the period from 1970 to 1980 can be explained by what was called "the moving frontier", produced by the development of the colonization project in the states of the Amazon region, as it redirected the flow of migrants from the Centre-West to this new frontier (Santos, 1993; Sawyer, 1996).

The next period, on the contrary, reflects the implementation of a technological frontier with the cultivation of soya, which formed the basis for development of agribusiness in the region, mainly in Mato Grosso. This meant the return of migrants who would have some capital but where not being successful on the new Amazonian frontier, and attracted new migrants from the southern states of the country where land tenure was already problematic but where many of the workforce and farmers had the know-how and the will to promote agribusiness activity in a favourable scenario (Santos, 1993; Becker, 1998; Hogan, Cunha, Carmo, 2002). The process of mechanization and intensification of agriculture (meaning also land concentration) in the region also reflects an increase in the rate of growth of the urban population in Mato Grosso and the Centre-West region, where most people were employed in the service sector or in agricultural functions that do not require residence in rural areas. Finally, the recent reversion in the tendency for the total numbers of the rural population of Mato Grosso to decrease, is a new process, even though the overall tendency for the rural population in Mato Grosso from 1970 to 2015 was one in which the total was reduced by one third.

If, then, during the colonial enterprise the frontier entailed the extraction of metals and the expansion of land ownership through the settlement of colonists, it went on to develop in response to the need to convert forested areas into agricultural and pasture areas for commodity production, as seen in the "expansion to the west" campaign of the 1930's and 1940's, and the colonization projects of the 1970's and 1980's. The simple commodification of production failed as soon as new "cheap", "empty" and "pristine" land was made "available" in Amazonia, and the traditional "agricultural frontier" would then move towards another region. This would force the frontier to change from being

the place where commodities were produced to referring to the location of an agroindustry, just as large cattle farms had come to be characterized by the need to transform land into areas for commodity production, with an intensification of the system that was directly connect to the local food chain. The intensification came through the incorporation of technology with a particular logic of production that meant the adaptation of seeds, the creation of pesticides and the monitoring of climate and other conditions to minimize agricultural losses and maximize volumes of production, with, more recently, the installation of industrial plants (Van Wey *et al.*, 2013).

That movement of the frontier to Amazonia left behind it a space that provided opportunities for the evolution of the frontier along with the capitalist enterprise developing in the Centre-West, as lessons from the green revolution were brought in and technology applied in an area with a relatively sparse population and with many plots of land still covered by the Cerrado now "available" for being turned into productive land, to use agribusiness language. In this respect Mato Grosso was the first of the states in the region to grasp the opportunity to invest in agribusiness as state business. As such, it is also a state that followed the logic of capitalist production by moving from grain production to also incorporating industrial plants and getting the livestock agribusiness to develop in the same place.

Up until the early 2000's the production of commodities and their processing were still geographically dispersed, which created areas of specialization along the food chain not only in Latin America but globally. This produced a landscape where our study case figures as one of the main producers of grains to supply the country's needs (including exportation), while other areas processed it into animal food, oil, or other products. However, in the second decade of the new century, with the increased costs of dislocation of the commodity along the chain, there was more investment in concentrating the whole chain of commodity production into a smaller area. This changed the regional landscape, impacting not only the dynamics of Mato Grosso as an agricultural frontier but turning it into a livestock and grain producing frontier. This scenario can be analysed in more detail by turning back to Table 1 and 2 and Figure 1, but adding information on livestock (Figure 2) and the growth in the number of slaughtered animals (Table 6).

Data on land use also show an increase in the area used for the production of grains, the main seasonal crops of the state. Connecting Table 1 and 2 it is possible to demonstrate how maize has played an important role in this increase. This is because even though the production of soya in Mato Grosso has continued to be an important part of Brazil's

TABLE 6. Growth rate and total number of slaughetered animals on the 2006/2016 period

		Growth rate			Number of animals (thousands)		
Region, state	Product	2006/2011	2011/2016	2006/2016	2006	2011	2016
Brazil	Cattle	1,04	0,60	0,22	30.374	28.824	29.702
	Pig	6,69	3,95	5,31	25.222	34.873	42.320
	Poultry	6,06	2,08	4,05	3.939.620	5.287.703	5.860.317
Center-West	Cattle	1,70	0,44	0,63	11.395	10.461	10.694
	Pig	13,46	2,36	7,76	2.828	5.316	5.973
	Poultry	11,08	4,55	7,77	398.468	673.970	842.100
Mato Grosso	Cattle	1,31	0,45	0,43	4.780	4.475	4.577
	Pig	18,68	2,39	10,23	888	2.091	2.353
	Poultry	17,87	3,00	10,18	92.032	209.353	242.748

Source: Sidra/ibge (https://sidra.ibge.gov.br/home/lspa/brasil) Trimestral Survey on Slaughetered Animals for the period of 2006/2017.

total soya production (ranging from 22% in 1996 to 30% in 2006 and more recently 27% percent of national production, followed by an increase in total volume), it was maize that increased from a modest 1.5 million tonnes produced in 1996 to a volume of more than 15 tonnes in 2016, with an average annual growth of 13.75% over the decade. Comparing soya to maize it is also possible to see that although soya production represents a little over half of the region's production (56% in 1996, 60% in 2006 and 60% in 2016), maize has come from representing a quarter of all production in the Centre-West region to representing over half of this production (23% in 1996, 42% in 2006 and 56% in 2016), also reaching 24% of all Brazil's production, a great change from the 5.1% of 1996. Nonetheless it is relevant to point out that this growth indicates a tendency that is directly related to an increase in the number of poultry and pork farms, and animals slaughtered in the region, and changes to the structure of the agri-food industry within the region.

On another matter, if the figures in Table 2 are put alongside the data for livestock growth in Figure 2, it can be seen that as the area for pasture decreased, farms for raising cattle and poultry and pig farms show a large increase during the decade. This means that it was not so necessary to use large plots of land for pasture (as livestock requires) and the new investments in poultry and pig farming on a large scale involved the construction of large barns occupying less space and maximizing production. For this reason, even as the area dedicated to pasture decreased, the need to have more maize to produce animal food, increased. In addition, this intense production of meat (beef, pig, chicken)

is described with impressive numbers in Table 6 which gives data for the growth and total number of slaughtered animals in recent decades (bearing in mind that the period 2007-2009 was the one in which most of the industrial plants to process meat in the state were set up). Comparing Table 6 to Figures 1 and 2 it becomes clear that the increase in the number of animals raised in the Centre-West was soon followed by the creation of a food chain structure which could generate the final product, from animal food (with the main component maize) at the start, to the frozen or fresh meat, mainly for exportation but also for national consumption, at the end.

This change and continued investment in agribusiness as a representation of the profile of the frontier in Mato Grosso can be seen in the figures for exports from the state. In 2015 these amounted to 13 billion dollars, representing 6.8% of the total exports of the country. Also, for the period 2010-2015 most of the exports from the state were primary products and of these soya accounted consistently for almost 70% of all exports from the state, mostly as seed (whole or crushed) followed by maize, beef and cotton. As a major player in the agri-food system, Mato Grosso concentrates as much of the chain within its territory as possible, twisting and adapting it to attend to the demands of global markets, operating through the displacement of people and persistently maintaining land use for agribusiness purposes, leaving a small space for the traditional and indigenous population of the state as part of the propaganda that claims it is a place that respects diversity.

Final remarks: reflexions on the agri-food system, territorial development, and the dynamics of the population

In the previous pages we have presented aspects of the theoretical development of the frontier as a framework for study, and commented on discussions of the term – including the approach it implies and its scope. In addition, we have described some features of the state of Mato Grosso and shown how its settlement corresponds to the conceptual development of the frontier approach and subsequent changes to it. Furthermore, although the frontier is used to provide a framework for studies focusing on an extensive area of the country (from the Southern states to the Centre-West and North), this article argues that characteristics of Mato Grosso in particular express some features that can help us to understand changes to the relation between population and environment, and see why the frontier must always be "in the making" (Ioris, 2018).

A central element of the frontier is the changes in production, not necessarily of products that modify the character of the state from being a rural to being a rural-urban

complex, with implications not only for land cover but also for population dynamics. As explained by Lombardi and D'Antona (2017), the idealization of the frontier as an area on the border of the unknown or unsettled, is slowly being replaced by the notion of an area that has recently been incorporated into capitalist logic, as applied to social practices, attitudes and global demands of production, through what for the most recent period of history can be translated as the "use of technology". All the same, conflicts with the previously settled population and over their livelihoods continue to be one of the central questions in understanding local dynamics, as more diverse forms of earning a living and population-environment relations are constantly being opposed to the capitalist logic of production that imposes a dynamic of land use based on choosing from a couple of products demanded by the global agri-food system, and means producing locally to fuel a global market.

In the case of the state of Mato Grosso studied here, this represented the transformation of an area settled by an indigenous population into a cattle ranching area over more than a century, which turned the state into one of the country's biggest grain cellars, through the incorporation of technology and the expansion of soya and maize cultivation, and more recently pig and poultry farms and the food industry. This example shows how the colonial enterprise of mineral extraction and the production of commodities changed over the centuries into the establishment of a global agri-food system that has developed more complex chains over time and now includes technology. All the same, producers and consumers continue to be geographically dispersed over the globe, and products are chosen on the basis of their capacity to be produced on a large scale in very different places, to supply the market with food and to fuel global demands.

Thus, as a final point, it is important to insist on the fact that the frontier is still very much alive, either as an empirical idea or else to provide a theoretical framework, and it is useful for revealing the impacts on local dynamics, of the global agri-food systems. Throughout the depiction of the dynamics in Mato Grosso it became clear that the frontier used as a framework for studies is continuously "in the making" as it is influenced directly by the logic of capitalism and its relations of production, which also has an impact on variables for the relation between population and environment. Which means that although impacts can be found and measured on a local scale it is impossible to disconnect them from global patterns.

A distinctive characteristic, that seems to be persistent, is the intimate relation between the way the global agri-food system is structured, and: 1. a tendency for differ-

ent levels of technological inputs to be aggregated; 2. the commodification of nature; 3. constant movement of the population; 4. a quick pace of changes in all the scenarios of the frontier. This has produced local tensions, mainly related to disputes over land, that are connected to deliberate legal insecurity, where economic power creates mechanisms to pressure small farmers, the traditional, and the indigenous population, to move out through violence or economic means (or both). For Mato Grosso and Brazil this structure of the frontier and the production of commodities associated with it has generated wealth through government taxes, turning the local conflicts into narratives of "necessary problems" easily accepted by parts of society living in other regions of the country.

Thus, the development of the frontier as a framework for study engages with the history and evolution of a global agri-food system with all its contradictions and idiosyncrasies. Again, our study case, Mato Grosso, expresses the connection in a clear way, seen in its transformation from a soya frontier to a poultry/pig frontier, with the mechanization of crops and the building of industrial plants to process the meat into a "ready to consume" product, with praise from the government for the importance, to the generation the wealth in the country, of the commodity. Complementing this scenario, is the constant movement of the population to push for the changes demanded by the relations of capitalist production, first to occupy land and transform the "empty", "pristine" areas into oceans of grain and pasture, and later to produce flows of industrial workers.

Another aspect of the economy in Mato Grosso is that the state produces commodities locally to be consumed globally. Even the implementation of the whole food chain production within Mato Grosso (from animal feed to the frozen meat in a package) is thought to reduce costs of production, but the technology applied actually allows the final product to travel long distances and reach consumers as far away as China, Holland, or Thailand (Seplan, 2014, 2016a, 2016b). The frontier continues to be a way to provide a structure for duality without being limited to centre-periphery or scarcity-abundance dichotomies but including a producers-consumers pair that is continuous with the organization of the world according to global patterns. Local impacts are rooted in still increasing urbanization as the rural areas are mechanized and need less people for production. This dynamic concentrates people in urban areas whose widening borders are constantly pushing rural production forward. The urban population demand services while the rural areas turn into larger and larger plots of empty land controlled by technological tools.

At the same time, industrial plants running for 24 hours a day need workers, mainly with a low level of qualification, to transform the raw soya or the slaughtered animals into

packages of flour, oil, and meat. Technology has a huge role in all of this as it controls the whole process from weather forecasting to providing genetically modified seeds to grain producers, and the construction of automated industrial plants. The frontier, therefore, is constantly "in the making", and the use of technology as a parameter to structure the agri-food system can be seen to have captured different modes of production and designed others, which is also echoed in constant changes to labour relations. What has not changed is the fact that this system is always requiring areas of land to be available to be twisted and turned into a technological plot of monoculture, livestock, and extractivism and using surrounding land for processing (industrial plants and urban areas).

Thus, the frontier continues to offer a good framework for thinking about relations between the population and the environment, mediated through the multileveled process that they are involved in, with the permanent characteristics of being constantly "in the making" and on the move, in order to be able to observe global patterns with local dynamics. This framework is necessarily designed particularly to question and reveal the problem of the capitalist approach to relations of production and consumption, and to offer a critical overview (what are the costs, what are the conflicts) of something that at a first glance might have sounded like a good outcome, the production of a champion for the agri-food system, as has been the case of the state of Mato Grosso in Brazil ◊

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