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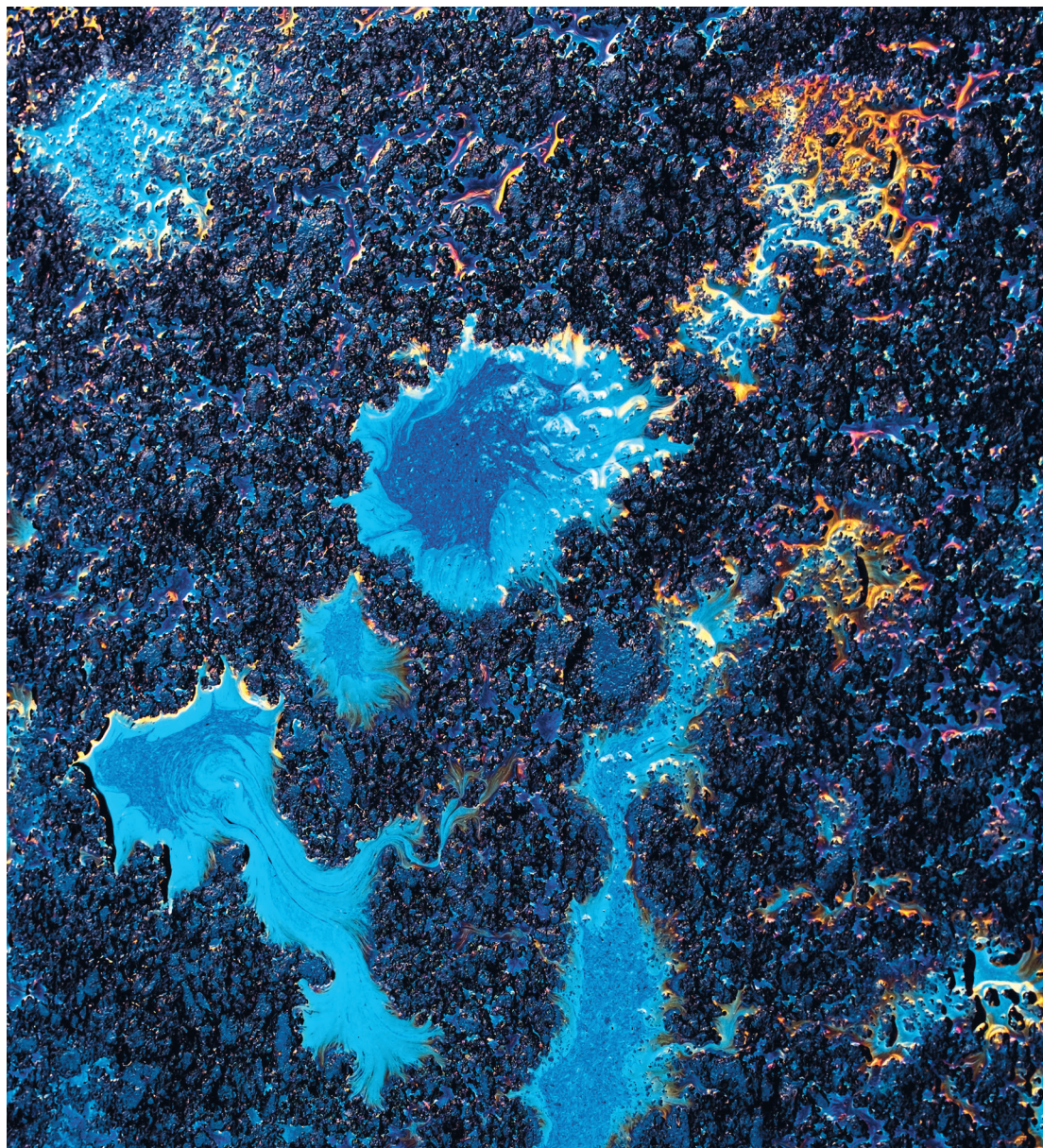
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## ► Pétropolitiques aux Suds

Sous la direction de Fatiha Talahite, Brenda Rousset Yépez  
et Imène Laourari



# Unequal coexistence in the Northeastern Cerrado

The rise of entrepreneurial agriculture in the face  
of family farming in Correntina (Bahia State, Brazil)

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## **ABSTRACT**

The municipality of Correntina (Bahia State, Brazil) was long populated by family farmers raising crops in the valleys and transhumant cattle on the plateaus. Since the 1970s, entrepreneurial agriculture has gradually taken over these plateaus. This article aims to study, from a coexistence-based perspective, the links between these two agrarian worlds (opportunity for wage labor, competition for land and irrigation water) which strongly influence agriculture in the valleys. Despite equivalent economic productivity per hectare, due to capital intensification for some and labor intensification for others, a gap in terms of agricultural income now separates the farms on the plateau from those in the valleys.

## **KEYWORDS**

entrepreneurial agriculture, coexistence, monopolization, MATOPIBA, Brazil

## Introduction

While spearheading globalized entrepreneurial agriculture (Guibert *et al.*, 2015), Brazil also became known in the 2000s for its leadership in supporting family farming<sup>1</sup> and alternative modes of production, such as agroecology (Niederle *et al.*, 2019). With the recent changes in government and the withdrawal of policies favorable to small family farms, many are left wondering about the future of an agriculture that does not qualify for government aid nor fall under the category of entrepreneurial agriculture.

While competition between entrepreneurial agriculture and family farming is a heavily studied topic in Brazil, such studies tend to project only a generic image of the main types of agriculture in the region, with few interested in the way in which very distinct farming systems coexist and evolve on a territorial scale (Grisa, 2021; Sencébé *et al.*, 2020; Bühler *et al.*, 2016; Mançano Fernandes & Mendes Pereira, 2016).

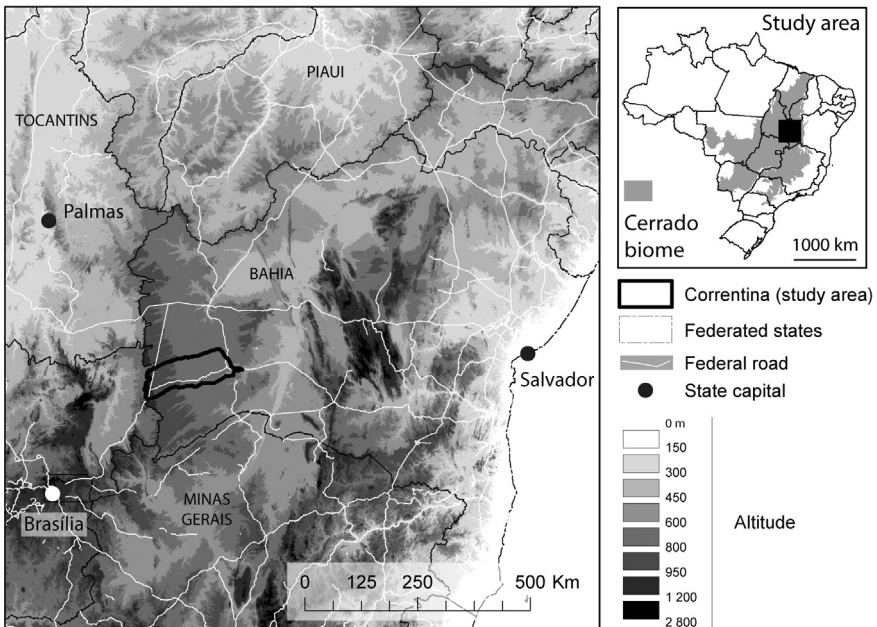
Indeed, there is abundant literature on the conflicts and discord between agricultural models. Some of these studies focus on major processes that generally play out on regionally or nationally, such as competition for access to markets, unequal support from public policy, or tolerance of violence and illegal activities. Other studies are organized as monographs that examine a group of small-scale family farmers that are sometimes victims of exclusion and sometimes bearers of alternatives. In addition to their often strictly binary approach, these studies rarely situate these agricultures in their productive context (soil and climate conditions, types of production, or markets, for example). They do not deal in detail with the technical and economic logic of the different types of agriculture coexisting in the area, nor with the complex productive interactions that can be established between them.

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1. Here, we distinguish family farming, where the owner works on his farm, from patronal farming, where the owner works on his farm and employs laborers, and investor farming, where the owner of the land does not work on the farm but invests capital in it and employs workers. Due to the amount of capital invested in patronal and investor farming in the studied region, we consider them part of entrepreneurial agriculture.



Based on a comparative agriculture and agrarian diagnosis approach (Cochet, 2015; Cochet *et al.*, 2007; Cochet & Devienne, 2006), which has been tried and tested in many geographical contexts, this article looks at the ways in which entrepreneurial agriculture and family farming coexist in a small agricultural region and over a period of time, with the aim of understanding these two agricultures and the links between them in all their diversity and complexity.

**Figure 1: Study Area**



Source: Pierre Gautreau, 2022.

The study focuses on the municipality of Correntina (Fig. 1), located in the heart of the MATOPIBA,<sup>2</sup> the main agricultural frontier of the 21st century in Brazil, which began advancing in the 1970s due to the development of an entrepreneurial agriculture centered on the cultivation of vast plateaus

2. An acronym formed from the initials of the names of the states of Maranhão, Tocantins, Piauí, and Bahia, MATOPIBA refers to the area of the Cerrado, that straddles these four states and where the main agricultural frontier of the beginning of this century unfolded, most notably in Southern Piauí and Western Bahia (Araújo *et al.*, 2019; Bragança, 2018).

where savannah initially predominated. These plateaus are interrupted by the affluents of the São Francisco River, where long-time family farms were organized around the complementary use of cultivated valleys and plateaus as multi-use community spaces (Souza, 2017; Sousa Sobrinho, 2012). Changes in land use on the plateau have been accompanied by changes in access to resources and land tenure, in the process disrupting the landscapes and biological diversity of these savannah ecosystems and profoundly altering the livelihoods of family farms in the valleys (Favareto *et al.*, 2019; Pitta & Vega, 2017; Rigonato, 2017). The spatial distribution of entrepreneurial versus family farming is typical of the plateau/valley contrast in the agricultural frontiers of the Northeastern Cerrado, and this case study could, as such, contribute to a broader analysis of how coexistence plays out on the agricultural frontiers heading toward consolidation.

A coexistence approach allows us to move away from a bipolar and antagonistic vision of the agricultures present in a territory and to question the modalities of their co-presence and their possible interactions, whether they be competitions, synergies, hybridization, or innovation (Gasselin *et al.*, 2021, 2020). This topic, which is still emerging, is absent from the Brazilian and South American scientific debate, except for a few rare works that deal with the capacity of conventional agriculture to coexist with other land uses, such as conservation areas (Lemes *et al.*, 2020; Silva *et al.*, 2019) or with other agricultural models within professional organizations and public policies (Sencébé *et al.*, 2020), or in Argentina with different forms of agriculture related to entrepreneurial agriculture or small-scale family farming (Albaladejo, 2020). The work presented here differs in its local, dynamic approach and its emphasis on agro-economic analysis. Taking the approach of a coexistence conceived as dynamic and unstable, we mobilize it to observe the plurality of trajectories of agricultural systems (Gasselin & Hostiou, 2020). This is not based on local agricultures' resemblance to large, pre-established agricultural models, but rather on an in-depth study of the agrarian dynamics at work in the municipality over the past half-century, the parties involved, and their environment. The study of agrarian dynamics in this small region is based on fieldwork over a six-month period (Rajaud, 2019; Vigroux, 2019) involving 50 historical surveys with elderly farmers and 60 in-depth technical and economic surveys with active farmers in the region, representing

both entrepreneurial agriculture and family farming. These surveys were conducted based on purposive sampling complemented by interviews with stakeholders in the municipality of Correntina.<sup>3</sup>

In its first two parts, this article discusses the two phases of the installation and development of large-scale, motorized-mechanized farms over the last 50 years in the municipality of Correntina. It also shows the consequences of these farms on pre-existing family farms, emphasizing the diversity of the trajectories followed within these two agrarian worlds to better reveal the contrasts and complexities within them, which, in the third part of the article, are analyzed from an economic perspective.

## **1. The Early Emergence of Modernized Agriculture in the Northeastern Cerrado**

Agricultural history in the Northeastern Cerrado produced a polyculture-poly-breeding style of family farming in the valleys, while the plateaus were colonized by large, investor silvicultural farms and patronal farmers in the 1970s. However, the installation of this agriculture on the plateaus had certain effects on the family farming of the valleys.

### **1.1. Pre-Existing in the Valleys, a Polyculture-Poly-Breeding Agriculture**

The agriculture of the Northeastern Cerrado is inherited from the colonial agrarian system of the 18th century, based on large estates bequeathed by the Portuguese crown, specializing at the time in the breeding of draught animals, which grazed the Cerrado vegetation and were sold first to sugarcane estates, and later to gold mines (Alcântara & Germani, 2010). Also prominent in the system were farms with mixed Indigenous and African origins and European crops, animals, and technics (Carney, 2020; Nogueira, 2017; Sluyter & Duvall, 2016). These farms relied on the work of herdsmen, who came from the eastern area home to sugarcane slave plantations and were remunerated

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3. Interviews were conducted with INCRA (National Institute of Colonization and Agrarian Reform), the Secretariats of Agriculture and Rural Development and Environment and Water Resources, the Rural Workers' Union, the CPT (Pastoral Land Commission), and AIBA (Bahia Association of Farmers and Irrigators).

in kind (e.g., calves, plots of land) (Barreto, 2012; Plessmann de Carvalho, 2008). Even with the advent of the Brazilian Empire (1822) and the establishment of the *Lei da Terra* (“Land Law”) of 1850, farmers in this region did not possess titles of “ownership” (*posse*) and occupied public lands owned by the State (Sabourin *et al.*, 1995; Caron & Sabourin, 2001).

In the first half of the 20th century, local agriculture, which was strictly manual, was based on the combined use of different agroecological stories. The valleys had some lowlands suitable for the cultivation of rice, maize, beans, and sugarcane during the rainy season. Since the 1920s, farmers built irrigation canals to divert water from rivers, providing them with irrigated land they could cultivate continuously. The upper lands had rainfed soil on which four years of cultivation (beans, maize, and manioc, and then cotton) were followed by a temporary pasture of four to five years, and then by four to five years of natural woodland regrowth. At that point, cattle herds raised for milk and meat grazed these pastures in the dry season, supplemented by crop residues. Then, in the rainy season, they migrated onto the wooded savannahs of the upper slopes and plateau, which, unfit for cultivation due to the soil’s acidity, were public lands for collective use and for hunting and gathering. These rangelands were maintained by burning once every few years to preserve their quality and to accommodate transhumance in the rainy season, which is essential for replenishing the standing grass stocks on temporary pastures in the valleys in preparation for the dry season.

The many landless migrants from the east of Bahia State provided a large, very low-cost labor pool to farm the land. Access to land, and especially to irrigated land, dictated the pace of accumulation and the progressive capitalization of livestock. At that time, large landowners owned 50 to 100 hectares (ha) of arable land for herds of 10 to 20 cows, and at the same time had parts of their irrigated plots exploited indirectly by sharecroppers without livestock (1 to 2 ha per sharecropper household). Small owners with direct tenancy had one or two cows and access to the irrigated stories.

From the 1940s on, the division of farmlands among smallholders led to the foundation of villages higher up the valleys on then uninhabited public land. Next to the rivers, they developed drained lowlands to be cultivated all year (flooded rice in the rainy season and mixed corn and beans during dry



season). At the same time, the development of irrigation canals in the lower valley continued, and the network reached its maximum extension in the 1950s. From the 1970s-1980s, the division of farmlands led the descendants of the largest landowners to exploit all their irrigated land directly, forcing the former sharecroppers to leave the region or to move to the upper valleys. The introduction of the animal-drawn plough and the collection of animal excrement through night corralling from the 1980s onwards significantly increased labor productivity and compensated for the reduction in land area per laborer with each generation. Ploughing made it possible to put an end to natural woodland regrowth in the rainfed zone, in favor of a rotation based on three years of cultivation followed by seven years of temporary pasture.

### **1.2. From the 1970s on, Installation of a Large, Motorized Agriculture on the Plateaus**

The 1970s saw the emergence of a new agriculture in the region, which settled on plateaus previously used mainly on a seasonal basis by transhumant livestock. In the context of soaring commodity prices in the 1970s, the Brazilian state implemented proactive policies during the military dictatorship, with the support of foreign financial backers, to convert the central Brazilian plateaus into vast areas dedicated to field crops and livestock (Coelho, 2001; Warnken, 1999). These measures began with PADAP<sup>4</sup> in 1973 in the state of Minas Gerais, followed by POLOCENTRO<sup>5</sup> in 1975, which extended the measures to the states of Goiás, Mato Grosso and Mato Grosso do Sul, followed by PRODECER<sup>6</sup> in 1978 and PRODECER II in 1985 (Bühler & Oliveira, 2013; Coelho, 2001; Pires, 2000), with financial support from Japan (San Martin & Paulo Pelegrini, 1984), which allowed the extension of the process to the western plateaus of Bahia State. These measures allowed the development of a highly mechanized agriculture on the plateau, producing an output that, for several reasons, would be destined for export. Among these reasons were low cost land on public lands, easy access to capital

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4. Programa de Assentamento Dirigido do Alto Paranaíba – Directed Installation Program of Alto Paranaíba.
  5. Programa de Desenvolvimento da Região Centro-Oeste – Cerrados Development Program.
  6. Programa de Cooperação Nipo-Brasileira para o Desenvolvimento dos Cerrados – Nipo-Brazilian Cooperation Program for the Development of the Cerrados.

(credit at very low and sometimes negative real rates) (Pereira Leite & Weisz Jr, 2014), the establishment of guaranteed prices for agricultural production as early as 1965, public agronomic research focused on the development of technical packages for grain crops adapted to the pedo-climatic conditions of these plateaus, and the establishment of infrastructure to open up this region of Brazil.

This scenario unfolded in the Correntina region from the 1970s onwards, resulting in a spectacularly rapid cultivation of the plateaus (Théry, 2012). The first installations were the result of investor silvicultural eucalyptus and pine tree farms on huge domains of 40,000 to 150,000 ha, bought with the smallest possible investments. The land was often purchased at very low prices, in troubled conditions, and at the expense of the valleys' inhabitants. Silvicultural species that could withstand the soils' acidity were also bought without the cost of amendment, and the land that was cleared and exploited made up a small part of these domains. The return on investment was fast and lucrative thanks to the sale in lots of part of these domains to young farmers from the southern states of Brazil, who migrated north due to land pressure from the division of family land in their homelands (Haesbaert, 1996).

As soon as they arrived, this second generation of farmers had the necessary equipment and capital to clear the land acquired on the plateaus and to install soybean and maize crops associated with cattle husbandry. Nevertheless, faced with the colossal costs of amendments and poor harvests in the early years, only the migrants who had kept a family network and farm in the south of the country managed to avoid bankruptcy and to stay on the land, and the others were forced to give up. These farmers preferred to settle in the western part of the plateau, where rainfall was highest and the terrain was particularly favorable to motorization. They developed patronal systems generally based on 1,000 ha of arable land, occupied by a soybean/maize/two-year temporary pasture rotation, associated with a calf-producing and -fattening husbandry of about 100 cows.<sup>7</sup> The investor silvicultural farms

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7. The association of livestock with field crops constitutes an insurance against risks because it is a safer production in view of climatic hazards. It also allows the valorization of crop residues consumed by the animals. Livestock farming is also of agronomic interest because the pasture allows the lengthening of the rotation and thus the better control of pathogens and pests threatening crops.

were maintained in the center of the plateau, where rainfall was too low for field crops.

### 1.3. Mixed Effects on Family Farming in the Valleys

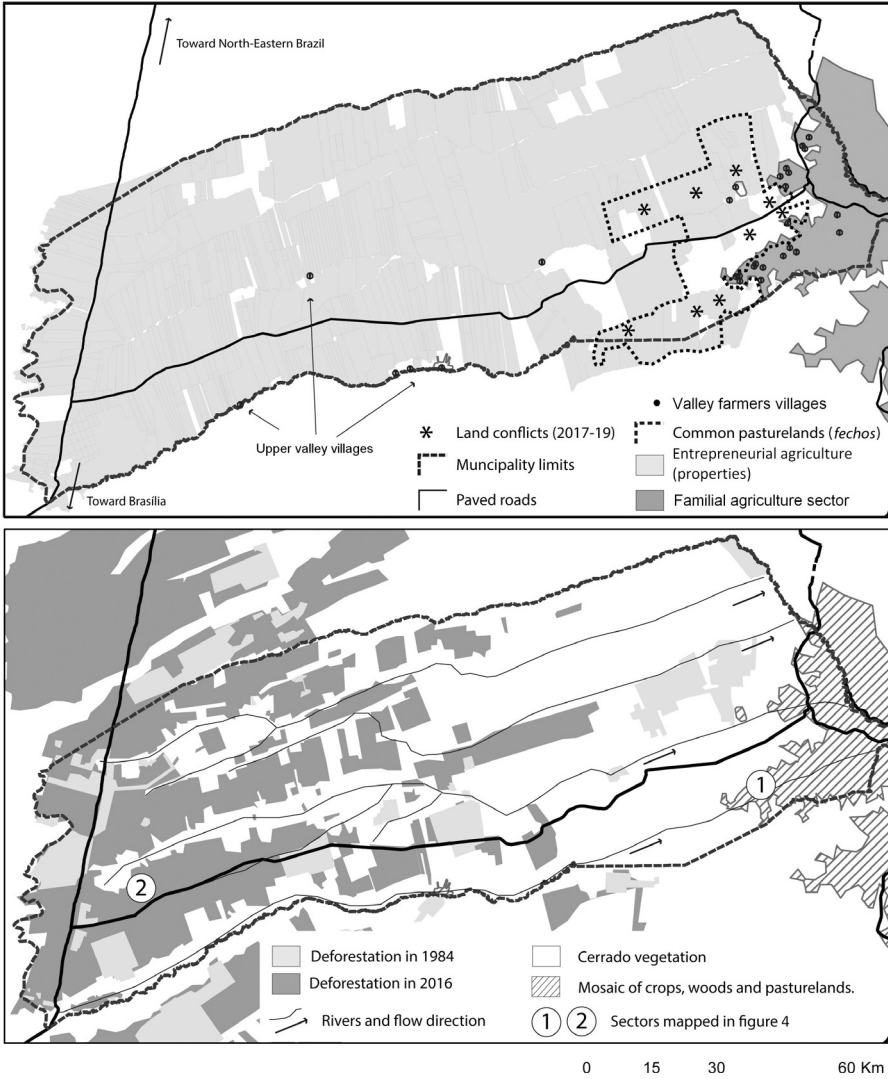
The majority of land-clearing work on the plateau was motorized and included manual tasks carried out by workers in the upper valley villages, who represented a low-cost pool of salaried workforce. After these clearings, however, these largely motorized farms needed a more qualified workforce, hired full-time or on a seasonal basis to operate the machines and look after the animals. For the valley populations, these low-skilled salaried jobs, although transitory because the land to be cleared gradually became scarce, played an important role in the domestic economy, making it possible to free up the capital necessary to gradually build up a small cattle herd. In parallel, villagers in the upper valleys were allowed to borrow their bosses' machinery in exchange for days of work, which permitted them to plant pastures on small areas of public land bordering their villages, and thus increase the availability of fodder for the dry season.

However, plateau agriculture was established in complete independence from the agricultural systems of the upper and lower valleys and poses serious constraints on local populations' access to resources. Actions such as land grabbing by investor silvicultural farms, land clearing, and legal or illegal ownership title acquisition (Maçano Fernandes *et al.*, 2019; Frederico & Almeida, 2019) jeopardize practices related to the collective use of rangelands and livestock movement and has since led farmers to protect their rangelands by fencing them off (Fig. 2). Although recognized by the Bahia State Constitution in 1989, the land rights of the *fechos de pasto*<sup>8</sup> remained unstable for a long time, hindering the outcome of any legal recourse.

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8. The *fechos de pasto* associations consist of valley livestock farmers who organized themselves to fence off their rangelands on the plateau to protect themselves from the monopolization of these spaces. Within the associations, farmers share the same fenced rangelands and collectively organize to carry out transhumance.

**Figure 2: Correntina Municipality. Main Features of Tenure and Land-Use Changes from 1980s**



Sources: surveys; INCRA, 2019.

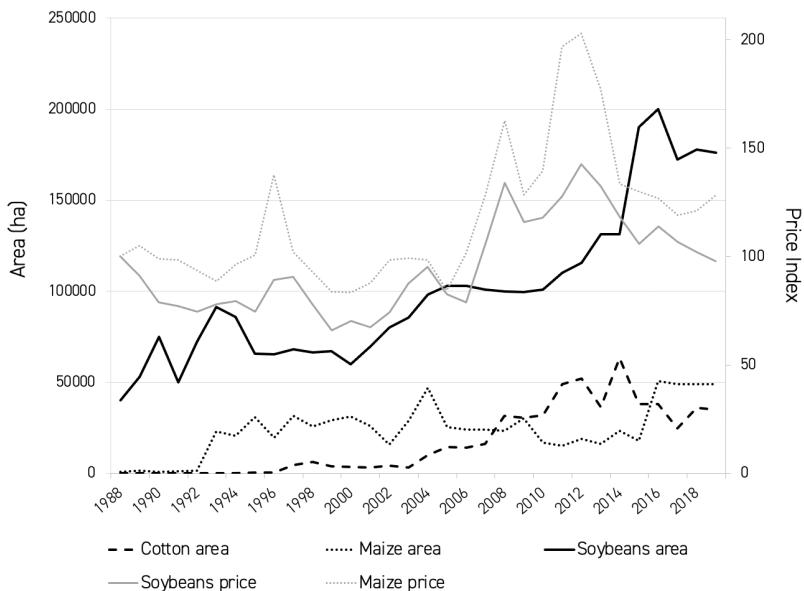
## 2. A Coexistence under Tension from the 2000s Onwards

Favorable agricultural prices in the 2000s led to a second wave of settlements by new farmers on the plateau, the purchase of land by foreign investors and the expansion of neighboring farms' property. For valley farmers, tensions over access to plateau land and water resources intensified and profoundly modified their agricultural practices. This resulted in diverse farming models on the plateau and in the valleys, with the plateaus following a logic of capital intensification and the valleys a logic of labor intensification.

### 2.1. The Rise of Entrepreneurial Agriculture on the Plateau: Behind the Soybean Boom, a Profound Differentiation by Capital

In the 2000s, an upturn in agricultural commodity prices marked the completion of the plateau's reinforced specialization in the production of grains and, in particular, soybeans, which now represents more than half of the crop rotation for most of the farms (Fig. 3).

**Figure 3: Evolution of Cultivated Areas (ha) in Field Crops in the Municipality of Correntina and Evolution of World Commodity Prices from 1988 to 2018**

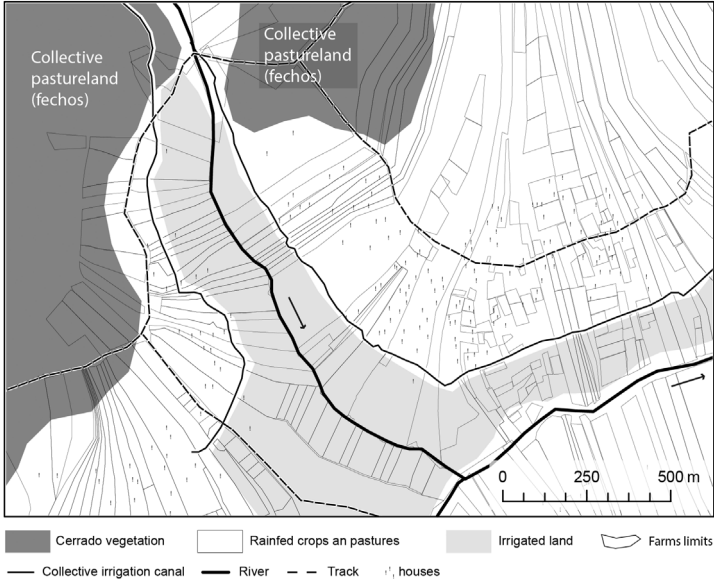


Source: in black: IBGE, 2019; in grey: in index, base 100 = 1988, and constant 2010 dollar; World Bank, 2019.

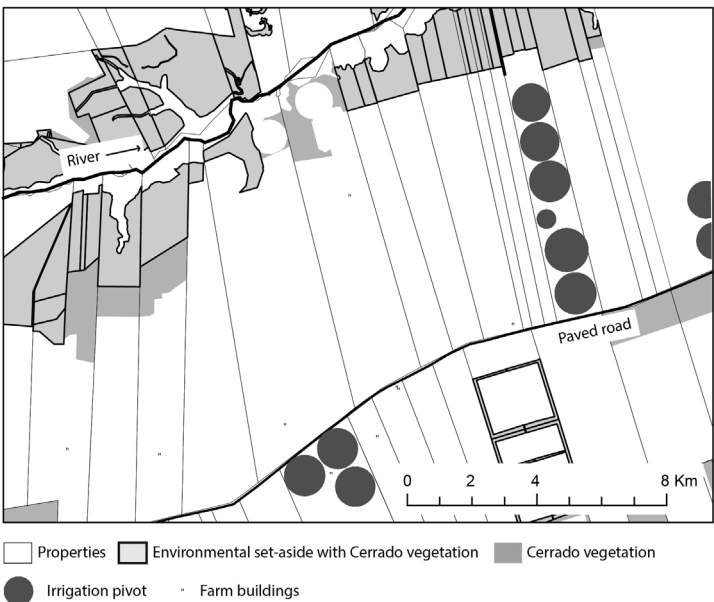


**Figure 4: Entrepreneurial Agriculture versus Family Farming: Tenure and Land-Use Occupation**

**Figure 4.a. Family Farming**



**Figure 4.b. Entrepreneurial Agriculture**



Sources: surveys; INEMA, 2019; INCRA, 2019.

To respond to the huge problems of weed and pest management, the increase in soybean cultivation has been accompanied by a new crop management sequence that, since the mid-1990s, has used genetically modified seeds that are herbicide-resistant or produce an insecticide, coupled with the massive use of synthetic inputs and reduced tillage (Garrett & Rausch, 2016; Oliveira & Hecht, 2016). This new technical itinerary, which is more expensive per hectare, makes it possible to increase the physical productivity of labor. The cultivated area per laborer also increases sharply with the progression of equipment levels, which, along with the crop management sequence, are very costly and thus make cash and investment capacity particularly decisive in the plateau farms' production choices. The ruined migrants sell their land to other neighboring patronal farms, which amplifies the concentration of land on the plateau. Due to favorable agricultural prices, investor silvicultural farms continue to sell land to farmers, thus fueling land clearing (Fig. 4), land concentration, and a new wave of settlements, this time led by farmers from the states of Paraná or Bahia and by foreign investors (Flexor & Pereira Leite, 2017).

## **2.2. Agriculture in Crisis in the Valleys: Tougher Competition for Resources**

In addition to competing for access to land and water resources, the farmers on the plateaus are now also in much more direct competition with the farmers in the valleys, but until now, coexistence between the protagonists of these two areas was without major clashes.

The family cattle farms in the valleys are currently heavily affected by the scarcity of collective land on the plateaus, which was previously used in the rainy season to free up pastures in the valleys and allow for the generation of standing grass stocks in preparation for the dry season. The *fecho de pasto* communities gained visibility following the enactment of Law 11 910/2013, which organizes the regularization of land for collective use by recently settled local populations and requires them to form associations. The farmers of the villages then register to secure access to these rangelands, as well as for hunting and gathering (ACCFC, 2017; Barreto, 2012; Alcântara & Germani, 2010). With the help of the Movement of People Affected by Dams (Movimento dos Atingidos por Barragens – MAB), they formed a social movement, organizing

well-attended demonstrations, and in 2017 carrying out raids on illegal water catchment areas. These uprisings were highly publicized, giving Correntina national prominence at the time (Porto-Gonçalves & Britto das Chagas, 2018).

Nevertheless, faced with this new context, family farmers of the valley are obliged to adapt their practices. Regardless of the dynamics at work on the plateau, in the valley villages, the cumulative inequalities inherited prior to the 1970s (see section 1.1.) have remained. Some descendants of wealthy families have been able to find job opportunities considered sufficiently remunerative in the city, which has helped to limit the division of family property for the children who took over, for whom the inheritance of their parents' cattle was also a determining initial capitalization. For descendants of families that have not had employment opportunities in the city, division of inheritance has been very high and has considerably increased the proportion of rural households with less than one hectare of land, whose surpluses are too small to hope to capitalize on cattle. The growth of entrepreneurial agriculture on the plateau has taken place at a time when many farming households in the valleys are already weakened by processes intrinsic to their own social group, which the plateau's development reinforces considerably.

From the end of the 2000s, clearings have been accompanied by another process leading to a drastic reduction in the use of rangelands by valley dwellers. Public condemnation of fire use, coupled with legislation prohibiting it in protected areas (Schmidt *et al.*, 2018; Souza, 2017), is gradually prompting herders to abandon this practice even though it is not illegal (Eloy *et al.*, 2016; Mistry & Bizerril, 2011). However, seasonal burning is essential to have young, palatable grass that is sufficiently nutritious for cattle in the rainy season. In the absence of controlled burning, the pastoral potential of the rangelands decreases sharply. Moreover, compliance with environmental standards for entrepreneurial farms on the plateau adds an unforeseen and paradoxical constraint to transhumant herding. Indeed, the Brazilian forestry code allows farmers to keep a “legal reserve” area outside their property, which they are legally obliged to defend (Bühler & Oliveira, 2018; Soares-Filho *et al.*, 2014). Taking advantage of the opacity of land transactions in the region and often using violence and intimidation, some large landowners on the plateau are now occupying village rangelands as their “legal reserve”. These reserves are

sometimes fenced off and protected by guards and are becoming inaccessible to herders, reducing the amount of pastoral land available to them (Sousa Sobrinho, 2012). The increasing reduction in the use of rangelands is equivalent to the loss of five months per year of forage resources and explains why valley farms that still have livestock have halved their stocking rate compared to the 1980s (0.5 cows/ha instead of one cow/ha) and have thus seen their income fall.

Since the 2010s, center-pivot irrigation with water drawn from the water table or directly from streams has expanded significantly. Farmers further down the valleys are simultaneously observing a generalized lowering of stream levels in the region (Silva *et al.*, 2019; Porto-Gonçalves & Britto das Chagas, 2018). The respective share of climatic factors and land use change in the plateaus remains subject to debate (Salvador & Brito, 2018; Salvador, 2014). The native Cerrado vegetation indeed allows for a gradual infiltration of water into the soils of the plateau (Oliveira *et al.*, 2005), and therefore the recharging of the water table and the feeding of streams in the valleys. It is highly likely that this infiltration has been reduced by the clearing of most of the plateau's surface and the associated soil compaction. Thus, many streams now have a reduced flow or are dry during the dry season, which has led to a major decline in irrigable areas in the valleys.

### **2.3. Capital Intensification on the Plateau, Labor Intensification in the Valleys**

Despite a common logic based on capital intensification, low crop diversity, and a highly homogenous crop management sequence, the plateau entrepreneurial farms have undergone profound differentiation over the past thirty years (Requier-Desjardins *et al.*, 2014). The farm's creation date is a key factor, which sheds light on both the potential of the cultivated land and the degree of accumulation, thus explaining investment capacities, the size of the exploited surface, and production orientations. Table 1 summarizes the farming systems present on the plateaus today, products of this differentiation.

**Table 1: Characteristics of the main current farming systems on the Plateau**

		Surface and livestock	Number and type of labourers	Type of farm	Installation	Traction capacity	Crop rotation
a	FSp1	7000 to 10000 ha (5% irrigated)	2 family labourers 25 to 50 salaried workers	Patronal	1980's	10 tractors 100 to 270 hp	65% soybean 20% maize 15% cotton
	FSp2	7000 to 10000 ha 2000 to 3000 cows	2 family labourers 30 à 60 salaried workers	Patronal	1980's	15 tractors 65 to 220 hp	50% soybean 15% maize 15% cotton 20% pasture
b	FSp3	2500 to 4000 ha (15% irrigated)	1 manager 10 à 20 salaried workers	Investor	Year 2000	9 tractors 70 to 225 hp	55% soybean 45% maize
	FSp4	1000 to 1500 ha	1 manager 2 à 3 salaried workers	Investor	Year 2000	3 tractors 120 to 210 hp	100% soybeans
	FSp5	800 to 1000 ha	1 family labourers 1 to 2 salaried workers	Patronal	Year 2000	3 tractors 70 to 170 hp	55% soybean 45% maize
	FSp6	300 to 400 ha	1 family labourers	Family	Year 2000	2 tractors 80 to 100 hp	100% soybean
c	FSp7	600 to 700 ha 600 to 700 cows	1 to 2 salaried workers	Investor	1980's	6 tractors 75 to 100 hp	100% pasture

Source: surveys.

Those farms formed in the 1980s and financially able to continue beyond their first years gradually expanded to reach between 7,000 and 10,000 ha by the end of the 2000s. They constitute a first group (“a” in Table 1). They maintain a patronal productive logic: agriculture is the principal activity of the bosses who perform management functions within their farms. They invest high amounts of capital and are thus part of entrepreneurial agriculture. They remain, until now, located in a single municipality. They are located on the best land, in the western part of the plateau, which benefits from the highest rainfall and offers the best yields, and are specialized in field crops, having abandoned livestock and temporary pastures. Some of them have invested in irrigation, a limited practice because the electricity required by the pumps is very expensive, and grow soybean, maize, and cotton (Farming System of the plateau – FSp1). Farms with some land in shallower soils still combine soybean and maize crops with pasture for a cattle farm of 2,000 to 3,000 cows (FSp2), now focused on the single activity of calf production, which requires less labor.



Farms set up in the 2000s are generally on land with less potential, in less favorable rainfall conditions, and on smaller surface areas (group “b”). Some of them operate on a model that we call investor farms where the owner works in another sector of activity and the farm is a simple capital investment, unlike patronal farming. Those best endowed with land and capital have specialized in soybean and maize on 2,500 to 4,000 ha and have invested in irrigation (FSp3); the others have specialized in soybean cultivation, which is more profitable than the initial livestock activity, on surfaces of 1,000 to 1,500 ha (FSp4). Some of these farms are still patronal, specializing in soybean and maize on 600 to 1,000 ha and have invested in irrigation (FSp5). Among these more recent installations are the only *family* farms (i.e., not using any hired labor) on the plateau (FSp6) that have 1000 ha in the process of being cleared and currently cultivate 300 to 400 ha of soybeans in pure culture, and remain very limited in their income.

To the east of the plateau, where rainfall is insufficient for grain cultivation, there are small urban investors from the state of Bahia who bought land in the 1980s to develop calf production farms of 600 to 700 cows on 600 to 700 ha of pasture (FSp7).

Finally, assets arrived on some parts of the plateau and in neighboring municipalities, partly from outside and sometimes foreign agriculture, making large-scale investments in land as well as equipment (Frederico & Bühler, 2015; Bühler & Oliveira, 2013; Martine, 1991). They form farms that are integrated into vast agricultural complexes with multiple locations, together totaling several tens of thousands of hectares. These agricultural complexes are often investor-owned, though some remain patronal in form, and in function, each elementary unit is similar to some of the other farming systems mentioned above (FSp1, FSp3, FSp7). As for the investor silvicultural farms that have been maintained, they now only cover 25,000 to 45,000 ha due to the progressive sale of their land holdings.

Today, vast farms of tens of thousands of hectares co-exist on the plateaus, but also some with only a few hundred hectares, all mainly based on capital intensification. The diversity and profitability of crops increase with farms' investment capacity and do not predict the mode of production:

some patronal farms have a much greater investment capacity and cultivate an area superior to that of medium-sized investors. The size of the farm and its strength in terms of cash and investment are therefore crucial regarding economic strategies and the effects of competition on the plateaus: the very large farms, whether they are patronal or investor-owned, exert strong land pressure on the surrounding farms, betting on the effects of scale and crops with higher value-added, but they are more capital-intensive. The introduction of cotton is a sign of this, as its high profitability largely compensates for very high entry costs.

In contrast to the entrepreneurial agriculture of the plateau, access to capital is the main limiting factor for farms in the valleys, for which they try to compensate through labor intensification. Table 2 presents the valleys' current main farming systems.

**Table 2: Characteristics of the main farming systems in the Valleys (all strictly family-based)**

	Surface	Irrigable land	Livestock	Extra-agricultural activities
<b>FSv1</b>	30 to 35 ha	1 to 1,5 ha	15 to 20 cows	
<b>FSv2</b>	25 to 30 ha	1 ha	10 to 15 cows	
<b>FSv3</b>	10 to 15 ha	-	5 to 10 cows	
<b>FSv4</b>	3 to 8 ha	0,3 to 0,7 ha	1 to 2 cows	
<b>FSv5</b>	0,2 to 0,3 ha	600 to 900 m <sup>2</sup>	No cattle	Salaried farm worker

Source: surveys.

For many valley farmers, the reduction in irrigated cropland and the loss of rangelands no longer allow for the complementary use of all the agroecological stories that were once available. Rice cultivation is maintained only by those whose irrigation canals are fed by a stream that continues to flow sufficiently and who also have the necessary organic manure. The rice grown in the rainy season is rotated with a combination of maize and beans (a cropping system that generates about €3,000/ha/year); these farms are often the best endowed with land and capital (FSv1 in Table 2). When their canals dried up, some farmers stopped producing rice and engaged in calorie substitution by selling other crops to buy rice at low prices. They maintained

family self-consumption based on crops for which their *comparative disadvantage* is less: crops that are less demanding in terms of organic manure and water, such as beans, maize and cassava. Some of the comparatively wealthiest families acquired motor pumps, which is profitable through enabling fodder crops of sugarcane and irrigated crops of beans and maize in the off-season, in rotation with cassava (a cropping system that allows them to generate €1,600/ha/year), and are turning to the sale of cow's milk (FSv2). Other farmers fall back on the cultivation of cassava, sold as semolina, a cropping system that only allows them to generate €1000/ha/year (FSv3).

Farmers with small areas of land, but whose canals are still active, have started growing off-season vegetable crops, which are more labor-intensive but have a higher value-added (6€/m<sup>2</sup>/year) (FSv4). Without sufficient cash for market gardening, the poorest farmers have no other solution than to labor as seasonal workers on the plateau: this employment is no longer just transitory in the hope of buying a cow, but necessary to feed the family on a daily basis (FSv5).

The generalized destruction of the valleys' farming systems thus follows different paths depending on the resources initially available to the farming families. We find the typical triggers of family farming (division of inheritance and access to markets, financing, migration strategies) combined with exogenous destabilization largely caused by plateau agriculture, affect the physical environment in which farmers operate, as well as access to and the quality of natural resources. Without expelling the farmers, these factors lead to simplification and specialization of farming systems, which are forced into withdrawing into smaller areas, further contributing to farmers' impoverishment.

### **3. The Current Economic Gap Between Two Agrarian Worlds**

The diverse agricultural models in the valleys and on the plateau produce similar wealth per hectare. However, income differences between these two agrarian worlds are colossal due to unequal access to land and capital, and unbalanced sharing of the value-added to the detriment of the patronal and investor plateau's farms' salaried workforce.

### 3.1. Despite Radically Different Economic Logics, a Fairly Similar Wealth Created per Hectare

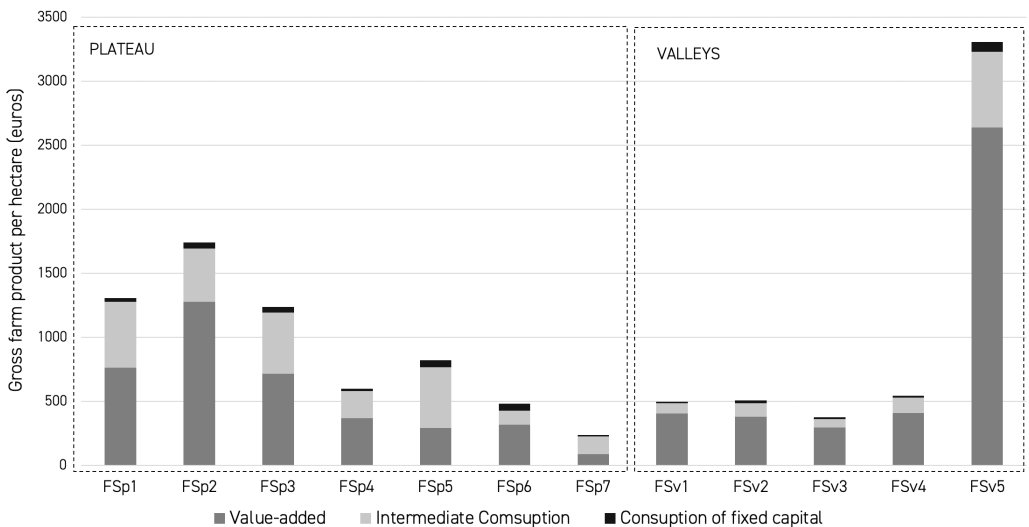
These two agricultural worlds, characterized by extremely contrasting access to resources, forms of intensification and functioning of production units, nevertheless generate wealth per hectare in more homogeneous ranges than the gap between them would suggest. Figure 7 presents the levels of gross farm product (production value) generated per hectare for different farming systems in the valleys and on the plateau. It proposes a breakdown of this gross farm product, which allows access to the net value-added (wealth created) per hectare once intermediate consumption (inputs) and consumption of fixed capital (average annual loss in value of equipment) have been deducted.

Despite its very limited access to land and capital, the strength of family farming lies in its ability to intensively mobilize its only non-limiting resource, family labor (Lamarche, 1992). This intensification of labor is the origin of a strong capacity to create wealth per unit area. If, overall, the gross farm products per hectare recorded by valley farmers are lower than those of entrepreneurial agriculture, production costs (inputs, equipment) are low. Having insufficient cash, family farming is not very dependent on inputs, which only represent 10 to 20% of the gross farm product, and on equipment. The farming systems in the valleys thus generate a net value-added of 300 to 400 euros/ha, which can rise to 2600 euros/ha for systems based on the development of market gardening, even if it is practiced on very small areas (FSv5). The diversity of production contributes to tempering the effect of interannual variations in agricultural prices on family income, while local outlets for farm products make it possible to free oneself to a large extent from variations in agricultural prices on world markets.

In contrast, entrepreneurial agriculture on the plateau, which has few capital constraints (equipment and cash), relies on high levels of consumption of fertilizers, plant protection products and fuel, as well as on very high levels of motorized equipment: intermediate consumption and fixed capital thus usually represent 30 to 40% of gross farm product and can reach 70% for certain farming systems. Thanks to the high availability of capital, which has enabled them to invest in irrigation or to combine field crops and herds

of several thousand head, as well as to the high potential of their land, the farms with several thousand hectares (FSp1, FSp2, FSp3), which represent less than 20% of farms on the plateau, record net value-added per hectare of 700 to 1250 euros. The other farming systems on the plateau, on the other hand, create generally less wealth per hectare than family farming in the valleys, with value-added per hectare of 250 to 380 euros, or even less than 100 euros for small Bahianese investors.

**Figure 5: Breakdown of Gross Farm Product per Hectare for Plateau and Valley Farms**



Source: surveys.

The deep economic contrasts observed between farming systems on the plateau extend to their sensitivity to the price of agricultural products. The farms with the most favorable production conditions (land potential, rainfall, access to irrigation, cash, etc.) have a wider range of crops that allow them to adapt their cropping plan according to agricultural commodity prices (FSp1), or to rely on their complementary livestock as an anti-risk strategy (FSp2): a 25% drop in soybean prices thus translates into a less than 20% drop in income. Conversely, the same price drop applied to farms on the plateau with less potential land, more subject to the vagaries of rainfall,



without irrigation, and often more specialized in soybean production (FSp5 and FSp6) results in a 40 to 75% drop in income.

### 3.2. Colossal Differences in Income Between Family Farmers of the Valley and Entrepreneurial Agriculture of the Plateau

The inequalities in access to resources between family farming in the valleys and entrepreneurial farming in the plateau are colossal. As some authors have already pointed out (Buainain *et al.*, 2018; Alves *et al.*, 2015), these huge income gaps are explained primarily by inequalities in access to capital and land. For example, according to our estimates, of the 1,200,000 ha in the municipality of Correntina, 80% of the land is currently in the hands of nearly 90 farms, all of which are part of the entrepreneurial agriculture of the plateau, while 7,000 family farms settled in the valleys occupy the remaining 20%.

Figures 5 and 6 show the farm incomes, expressed per family or employer, of the different farming systems in the valleys and on the plateau,<sup>9</sup> respectively. Despite quite similar economic productivity levels, our results show that the incomes of the largest farms on the plateau can be up to 600 times those of the poorest farm families in the valleys. Although less profound, the internal income gaps are also high within each of these two agrarian worlds. In the valleys, the poorest households (FSv5), settled on micro-areas, have a farm income per family laborer equivalent to the *Bolsa familia*<sup>10</sup> and almost fifteen times lower than that of the best endowed family farms with land and livestock (FSv1). The total income of these poor households is based primarily on salaried farm work (70%) and more marginally on social assistance (*Bolsa familia* 10%). Within entrepreneurial agriculture, the largest patronal farms (FSp1, FSp2), which represent less than 5% of the farms on the plateau, generate several millions of euros of income for each employer. This affluence is reflected in external signs of wealth (private jet, luxury goods, regular trips, etc.), which are disconnected from the reality of the

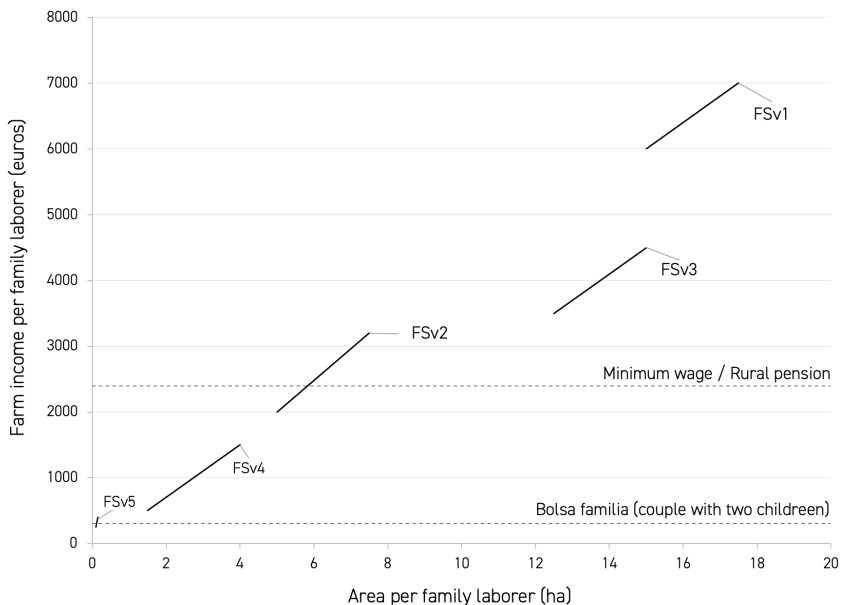
9. For the latter, investor farming systems are not presented in this figure, because their economic logic does not aim to remunerate the farmer's work in the form of agricultural income, but rather his capital in the form of a profit.

10. Brazilian social welfare program that provides financial aid to poor Brazilian families in the average amount of 310 euros per family laborer in 2019.

smaller farms on the plateau (FSp5 and FSp6), whose agricultural income per family laborer is still ten to forty times higher than the least disadvantaged households in the valleys (FSv1, FSv3).

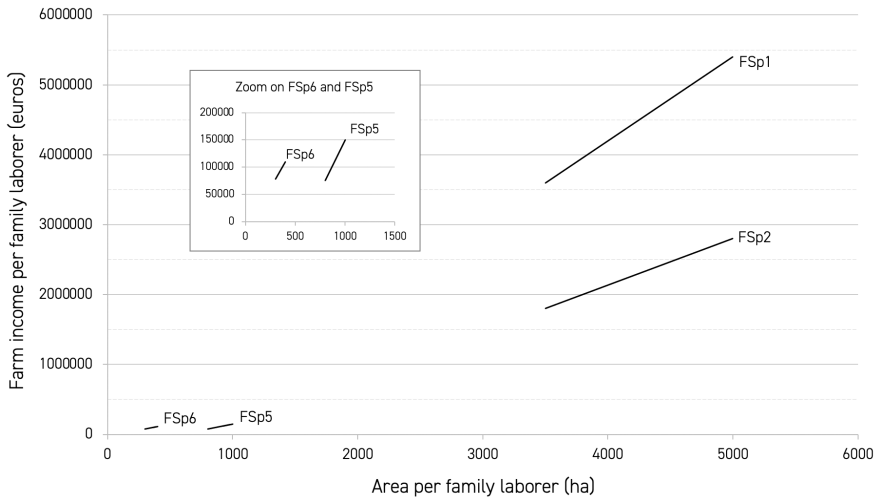
The investor farming systems implemented on the plateau also exhibit these strong inequalities and present, among themselves, the same deep contrasts: small Bahianese investors with 600 to 700 ha and 600 to 700 cows entrusted to herdsmen record an annual profit of 10,000 to 15,000 euros (FSp7), while the investor farms specializing in large-scale crops, based on 2,500 to 4,000 ha of high-potential land, with access to irrigation, record a profit of 1.2 to 2.7 million euros per year (FSp3). The internal rate of return is 11% (FSp7) and 39% (FSp3) respectively, while the real bank interest rates in Brazil do not exceed 8%. As far apart as their capital invested and their productive orientation are, these two forms of investment in the agricultural sector are more profitable than a bank investment.

**Figure 6: Family Farm Income of the Valley Farming Systems**



Sources: surveys; data: Minimum Wage and Rural Pension (Guia Trabalhista, 2020), Bolsa familia (CAIXA, 2020).

**Figure 7: Patronal Farm Income of the Plateau Farming Systems**



Source: surveys.

The high profitability of these entrepreneurial farms, whether patronal or investor-owned, can be explained by the current level of agricultural prices (which have recovered significantly over the last 15 years) and by an intense process of capturing the wealth generated by salaried labor. Our surveys reveal that, depending on the system, the patronal farmers or investors capture 50 to 80% of the net value-added created, while 10 to 25% covers repayment of interest on borrowed assets, 5 to 15% payment of property taxes, and only 5 to 10% goes to remunerating the salaried workforce, which carries out all the agricultural labor.

## Conclusion

Emblematic of the advance of the agricultural front on the plateaus of the Northeastern Cerrado, the agriculture of the municipality of Correntina appears today to be particularly complex, marked by the coexistence of two highly contrasting agricultures. The in-depth study of these two agrarian worlds through an approach rooted in coexistence avoids a simplistic, side-by-side comparison of two production models, and instead reveals an agricultural diversity that is greater than it would seem on the surface. Nevertheless,

competition between these two agricultures manifests at several levels, notably for access to land and irrigation water. In terms of wealth creation and employment per hectare, our results show that family farms measure up to the very large farms of the western plateaus that also benefit from more favorable natural conditions (soil and rainfall). They reveal that access to resources is ultimately the determining factor and weighs heavily on the trajectories of the different farming systems present in the valleys as well as on the plateaus. In this way, entrepreneurial agriculture has profoundly reduced small-scale family farms' access to rainy season rangelands, to the use of fire as a means of managing forage resources, and to hunting and gathering. It is also responsible for the drastic decline in the availability of irrigation water, which is seriously affecting the valleys. These elements are all at the root of an increasingly conflictual climate. Thus, though the family farms in the valleys that still have at least five hectares and a small herd of cattle receive agricultural incomes that are higher than the Brazilian minimum wage, some of the others, smallholder farmers without livestock, only survive by dedicating themselves to salaried farm work.

Beyond the economic question, these dynamics have affected the entire relationship with the environment. Various aspects have been modified and impoverished under duress: the acute knowledge of different environments, the breadth of action areas, and the interplay of agronomic complementarities, for instance. However, a new crisis, even larger and more serious, seems to be looming, which does not only concern competition in access to resources (land, water). The destruction of a large part of the native Cerrado vegetation, the low diversity of crops on the plateau, and the erosion of their varietal diversity (linked to the generalized use of genetically modified seeds), are in fact accompanied by a battle that until now has been exclusively based on the widespread use of synthetic products. Faced with the adaptation of pathogens and crop pests (and with production methods that favor their selection and development), the use of synthetic chemicals is no longer sufficient on the plateaus, where entrepreneurial farms throughout the western part of the state of Bahia, now impose a three-month cropping break with prior removal of all crop residues. At the same time, these pests are beginning to spread to the valleys (Eloy *et al.*, 2020), causing, for example, increasing damage to maize and bean crops in an agricultural sector that had previously been able

to protect itself from these attacks by using cultivated biodiversity. Given the profound erosion of biodiversity, water pollution (Soares *et al.*, 2017; Hunke *et al.*, 2015), and the multiplication of crop pathogens and pests, will farmers in the valleys be able to overcome this new potential crisis of coexistence, this time of an ecosystemic nature?

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