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**2017 BRAZILIAN AGRICULTURAL
CENSUS: RESEARCH AGENDA**

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SUMMARY

INTRODUCTION	5
METHODS	5
RESULTS	7
THE NUMBER OF ESTABLISHMENTS COUNTED.....	7
AGRARIAN STRUCTURE	9
LAND UTILIZATION	12
ANIMAL PRODUCTION.....	15
TRACTORS AND AGROCHEMICALS.....	17
EMPLOYED PERSONNEL.....	18
PURPOSE OF THE PRODUCTION	20
CONCLUSION.....	21
ACKNOWLEDGMENTS	22
FUNDING SOURCES	22
REFERENCES	23

ABSTRACT

In July 2018, the Brazilian Institute of Geography and Statistics (IBGE) released the preliminary results of the 2017 Agricultural Census, addressing fundamental matters related to Brazilian agrarian structure. The preliminary results point to important transformations that have occurred in the 11 years since the previous agricultural census. Some of these findings indicate shifts in agricultural land, including changes in the productive structure of the fields, an increase in the average area of establishments, a possible increase in the concentration of access to land, an expansion of temporary cropping areas in the North Region, and an increase of forest areas in the Southeast Region. Other results reveal changes in the agrarian labor force, such as an aging population of agricultural workers, a decreasing number of agrarian workers, and increased participation of women in the management of establishments. The census also suggests an increase in the use of machines and agrochemicals, among other findings. In summary, the results indicate a continuous process of agricultural modernization, but also point to the permanence and importance of subsistence production in rural Brazil.

Keywords: Agrarian structure, Agricultural Census, Research

INTRODUCTION

The purpose of this work is to recommend future research agendas based on the information obtained from the 2017 Agricultural Census. On July 26, 2018, the Brazilian Institute of Geography and Statistics (IBGE) released the preliminary results of the 2017 Agricultural Census, providing users with the most current information on the state of Brazilian agricultural production and rural development.

Following the tradition and experience of previous censuses, the preliminary results were released as soon as a representative number of interviews have been conducted, aiming at wide public consultation of the data. During this time, the data was reviewed using other information databases, administrative records, and expert opinions to validate or adjust the results presented. In the preliminary disclosure of July 2018, the IBGE had already collected data from 5,072,152 agricultural establishments, and data from 7,795 other producers remained to be collected, of which 6,582 were refusals and another 1,213 were special collection units (IBGE, 2018a).

The release of the final data is planned for July 2019 (IBGE, 2018a, p.7). Since the remaining collections may include large units, due to special collection, whose values may substantially affect the preliminary results, the statements presented in this paper are subject to alteration at the time of the final disclosure of results. For this reason, they are not offered incisively.

Although partial and preliminary, the data already provides important information on current trends for governmental and academic reflection. The wealth of data available points to several research agendas focusing on geography, economics, sociology, administration, environment, and anthropology matters, just to name a few.

There is a wide range of topics covered by the 2017 Agricultural Census. The census started in 1940 by the IBGE has been improved in each edition, shedding light on the Brazilian agrarian reality (DelGrossi & Marques, 2014). Based on the 2017 preliminary results, this article proposes to analyze some aspects of the agrarian structure, animal and plant production, labor force, use of supplies, and purpose of the establishments, as well as the importance of its sources of income.

METHODS

The first point to be clarified is that the information recorded in the 2017 Agricultural Census is declaratory, provided by the interviewee at the time of the visit. The enumerator does not count the number of animals, weigh production, check documentation, or measure the producer's area. All the data recorded is based on interviewee statements. This procedure follows the international standard and, in the case of the 2017 Agricultural Census, also follows the guidelines of the World Programme for the Census of Agriculture 2020 issued by the Food and Agriculture Organization of the United Nations (FAO, 2017). Due to its differentiated way of collection, the census data will not be identical to the administrative

records, which present diverse concepts, objectives, and data collection methodologies. Examples of these types of records include registers of rural properties, agrarian reform settlements, general animal registration, and credit agreements.

The collection unit used by the 2017 Agricultural Census is the rural establishment. This productive collection unit is different from the rural property used for registering agricultural properties and for the rural environmental registry (CAR, 2018). A productive unit may cover several rural properties, or a rural property may not be considered an establishment because it has no productive activity. The IBGE defines an agricultural establishment as:

“Any production/exploration unit dedicated totally or partly to agricultural, forestry and aquaculture activities, regardless of size, legal form (whether it belongs to a producer, to several producers, to a company, to a set of companies etc.), or its location (urban or rural area), with the objective of producing, either for sale (production commercialization) or for subsistence (subsistence of the producer or their family) (IBGE, 2018a, p.17).”

The 2017 Agricultural Census, therefore, covers all active rural producers located by the enumerators, regardless of whether they own the land.

Researchers should also be aware of methodological changes that occurred during the census. A small change that occurred relates to the counting of establishments with two or more non-continuous areas. In previous censuses, they were considered as a single establishment if they were in the same collection census tract¹, while in the 2017 Agricultural Census, they are considered a single establishment if they are in the same municipality. This small alteration tended to reduce the number of establishments in 2017 compared to previous censuses.

Another important methodological aspect relates to the data collection period. In the 2017 Agricultural Census, it refers to the period from October 1, 2016, to September 30, 2017. In the 2006 Agricultural Census, it corresponds to January 1, 2006, to December 31, 2006, and in the 1995/96 Agricultural Census it was from August 1, 1995, to July 31, 1996. It may seem like a minor detail, but this affects the number of temporary establishments installed only in the harvest period, such as those of partners and small tenants and those located temporarily in floodplains. Hoffmann & Graziano da Silva (1999) pointed out that the 1995/96 Agricultural Census tended to sub-enumerate temporary establishments in relation to the previous census due to the change in the reference periods.

To minimize this limitation, since 2006 the IBGE has carried out the collection of the "producers without area":

“Production unit that did not depend on a specific area on the reference data, the producer no longer owned it, such as honey producers, producers in riverbeds in the ebb season, producers in the

¹ Census tracts Bureau is a cadastral control unit for statistical purposes of the IBGE, which can cover 100 to 200 agricultural establishments, and therefore, a municipality can cover dozens of census tracts. In the 2017 Agricultural Census, it covered more than 127,000 census tracts.

protection belt or road side, charcoal producers who owned the kilns using firewood acquired from third parties, and the activities of extraction, collection or harvesting of products that were obtained from natural forests (IBGE, 2018a, p.17).”

Even with this great effort to collect information from all producers, the period in which the enumerators go to the field may affect the location of these temporary producers, and the change in the reference period opens a research agenda on the impact of that change.

There has been a significant change in the way the units related to the producers without area are collected that affects their counting. In the 2006 Agricultural Census, the production from establishments’ employees was considered as that of a producer without area; but, in 2017, this production was not considered as a separate unit, and it integrated the production of the establishment where it is inserted:

“For the 2017 Agricultural Census, a questionnaire was not opened for this employee/resident producer, and all production/creation referred to this condition integrated the questionnaire of the agricultural establishment (IBGE, 2018a, p.13).”

Consequently, the number of producers without area decreased between 2006 and 2017. This alteration also opens a new research agenda on assessing the effect of such change.

RESULTS

THE NUMBER OF ESTABLISHMENTS COUNTED

In the preliminary results of the 2017 Agricultural Census, the IBGE had already identified 5,072,152 agricultural establishments, slightly lower than the 5,175,636 establishments counted in 2006. However, it is necessary to distinguish establishments with area from those without area, whose conceptualization was altered (Table 1).

Table 1: Number of agricultural establishments with and without area. Brazil, 2006 Agricultural Census and preliminary results of 2017 Agricultural Census.

Type of Agricultural Establishments	2006	2017	Difference	
	(estab)	(estab)	(estab)	(%)
Total	5,175,636	5,072,152	-103,484	-2.0%
without area	255,019	76,671	-178,348	-69.9%
with area	4,920,617	4,995,481	74,864	1.5%

Source: IBGE, *SIDRA* (2018b), Tables 1109 and 6707, accessed on Jul 30, 2018. Table 6707 was used, instead of table 6635 by technical recommendation of the IBGE.

Putting aside the effect of the methodological change in the collection of establishments without area, the 2017 Agricultural Census indicates a growth of more than 74 thousand new establishments with area, especially in the North and Southeast Regions (Table 2).

Table 2: Number of agricultural establishments with area. Brazil and Regions, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Territorial Unit	2006	2017	Difference	
	(estab)	(estab)	(estab)	(%)
BRAZIL	4,920,617	4,995,481	74,864	1.5%
NORTH	444,622	571,522	126,900	28.5%
NORTHEAST	2,272,956	2,261,458	-11,498	-0.5%
SOUTHEAST	902,580	965,587	63,007	7.0%
SOUTH	986,392	850,846	-135,546	-13.7%
CENTRAL-WEST	314,067	346,068	32,001	10.2%

Source: IBGE, *SIDRA* (2018b), Tables 1109 and 6707, accessed on Jul 30, 2018. Results from 2017 obtained by the difference between the total amount of establishments minus those without area.

The Southern Region was notable for the reduction in the number of establishments with area, where more than 135,000 units ceased to exist, followed by the Northeast Region with 11,000 fewer establishments. The small reduction in the number of Northeastern establishments may be due to the intense drought that occurred in the region in recent years. The significant reduction in establishments in the Southern Region constitutes an important research agenda for the future, especially due to the significant presence of families of farmers in the region.

The increase in the number of establishments was accompanied by an expansion of the area by 17 million hectares, with the largest increase occurring in the North Region, which increased by 10 million hectares. The Northeast was the only region that experienced a reduction in the total area of the establishments, accompanied by a reduction in the average area of the establishments. The South Region is notable once again because it had the largest increase in average area of establishments, which rose from 42.4 hectares to 50.4 hectares (Table 3).

Table 3: Total and average area of agricultural establishments with area. Brazil and Regions, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Territorial Unit	Total Area (millions ha)				Average area (ha)	
	2006	2017	Difference	(%)	2006	2007
BRAZIL	334	350	16	5%	67.8	70.1
NORTH	56	66	10	19%	124.9	115.8
NORTHEAST	76	71	-5	-7%	33.5	31.2
SOUTHEAST	55	60	5	9%	60.9	62.1
SOUTH	42	43	1	3%	42.4	50.4
CENTRAL-WEST	105	111	6	5%	335.4	319.6

Source: IBGE, *SIDRA* (2018b), Tables 263 (2006), 6707 (for number of establishments- 2017) and 6635 (for area- 2017), accessed on Jul 30, 2018.

AGRARIAN STRUCTURE

When analyzing the establishments according to the total area groups, it is evident that there was an increase of almost 75 thousand new establishments with less than 100 hectares in the country, especially in the North and Southeast Regions, while in the South Region, a significant reduction of these establishments was observed. Establishments with 1,000 hectares or more increased in number and area: there were 16 million more hectares with large establishments, which expanded their area especially in the North and Central-West Regions (Table 4).

Table 4: Number and total area of establishments with area, according to area groups. Brazil and Major Regions, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Total Area Groups (ha) per Territorial Unit	Number of establishments with area			Area (million ha)		
	2006	2017	Difference	2006	2017	Difference
Brazil						
Less than 100	4,448,751	4,523,693	74,942	71	72	1
100 to less than 1.000	424,288	420,136	-4,152	113	112	-1
1.000 or more	47,578	50,865	3,287	150	166	16
North Region						
Less than 100	355,637	471,711	116,074	10	12	2
100 to less than 1.000	80,518	89,844	9,326	19	22	3
1.000 or more	8,467	9,918	1,451	27	33	6
Northeast Region						
Less than 100	2,149,260	2,154,929	5,669	24	23	-1
100 to less than 1.000	115,484	98,944	-16,540	29	24	-5
1.000 or more	8,212	7,303	-909	24	23	-1
Southeast Region						
Less than 100	804,897	863,472	58,575	15	16	1
100 to less than 1.000	91,727	95,086	3,359	24	25	1
1.000 or more	5,956	6,680	724	16	19	3
South Region						
Less than 100	921,958	785,433	-136,525	15	14	-1
100 to less than 1.000	59,927	59,689	-238	17	17	0
1.000 or more	4,507	5,684	1,177	10	12	2
Central-West Region						
Less than 100	216,999	248,148	31,149	7	7	0
100 to less than 1.000	76,632	76,573	-59	25	25	0
1.000 or more	20,436	21,280	844	74	79	5

Source: IBGE, *SIDRA* (2018b), Tables 263 and 6710, accessed on Jul 30, 2018.

Establishments with less than 100 hectares represent 91% of Brazilian agricultural producers, but only access 20% of the land. The large establishments, with 1,000 hectares or more, represent 1% of the producers, but occupy 48% of the area. This contrast reveals the persistence of Brazilians' historic inequality in accessing the land, especially in the Central-West Region (Table 5). The increase of the share area in large establishments (1,000 hectares or more) may indicate a concentration in land access in the period, especially in the South Region.

Table 5: Relative share of establishments with area, according to total area groups. Brazil and Major Regions. 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Total Area Groups (ha) per Territorial Unit	Number with area (%)		Area (%)	
	2006	2017	2006	2017
Brazil	100	100	100	100
Less than 100	90	91	21	20
100 to less than 1.000	9	8	34	32
1.000 or more	1	1	45	48
North Region	100	100	100	100
Less than 100	80	83	17	17
100 to less than 1.000	18	16	34	33
1.000 or more	2	2	48	49
Northeast Region	100	100	100	100
Less than 100	95	95	31	33
100 to less than 1.000	5	4	38	34
1.000 or more	0,4	0,3	31	33
Southeast Region	100	100	100	100
Less than 100	89	89	27	27
100 to less than 1.000	10	10	43	41
1.000 or more	1	1	30	32
South Region	100	100	100	100
Less than 100	93	92	37	32
100 to less than 1.000	6	7	40	39
1.000 or more	0,5	1	23	29
Central-West Region	100	100	100	100
Less than 100	69	72	6	6
100 to less than 1.000	24	22	24	22
1.000 or more	7	6	70	71

Source: IBGE, *SIDRA* (2018b), Tables 263 and 6710 excluding establishments without area, accessed on Jul 30, 2018.

Access to land in ownership form remains predominant in the country: more than 4 million landowning producers occupy more than 300 million hectares, with an increase of more than 160,000 new establishments (Table 6). Contrary to the North and Northeast Regions where the number of landowners increased, in the South Region there was a reduction of more than 100,000 landowners.

Table 6: Legal status of the land. Brazil, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

LEGAL STATUS OF LAND	Number (thousands)		Area (millions ha)		Average Area (ha)	
	2006	2017	2006	2017	2006	2017
Owned	3,946	4,108	302	301	77	73
Granted by an agrarian body but without a definitive title	195	265	6	6	31	23
Leased	334	320	15	30	45	94
In partnership	186	178	3	8	17	44
Occupied ¹	474	464	7	10	15	21

Source: IBGE, *SIDRA* (2018b), Tables 1244 and 6635, accessed on Jul 30, 2018.

1) Includes the areas on loan in 2017.

The number of untitled producers who received land from agrarian bodies increased during the period but occupied practically the same area (6 million hectares). It is important to note that to have the full dimension of land tenure, these must still be added to the areas granted by agrarian bodies but already titled. As mentioned previously, there may be differences between the census data and that of administrative records, such as those of the National Institute of Colonization and Agrarian Reform (INCRA), which counted 972,000 families based on more than 87 million hectares without considering dozens of state regularization programs (INCRA, 2018). One way to circumvent this limitation is to geographically delimit the perimeters of agrarian reform settlements and regularized areas (Marques, DelGrossi, & França, 2012). This task constitutes another future research agenda.

The land access situation that stood out between 2006 and 2017 was the leased areas: They jumped from 15 million to 30 million hectares, increasing the average area per producer from 45 to 94 hectares. Almost half of this increase in leased land occurred in the Central-West Region (46%), followed by the Southeast (22%) and the South (17%). This significant growth may point to a production pattern that deserves greater attention from academia. The same occurs with partnerships, which had a reduction in number, but an expansion in area, possibly indicating a new pattern of modern partnership, especially in the Southeast and Central-West Regions.

LAND UTILIZATION

The good environmental news is that land utilization by agricultural establishments has increased by almost 10 million hectares between the Agricultural Censuses of 2006 and 2017 (Table 7). Some major decreases in natural pastures (11 million hectares) and natural woods (18 million hectares) were ameliorated by significant increases in permanent preservation or legal reserves (24 million hectares) combined with modest increases in other types of agricultural land use.

Part of the expansion of the forests occurred in the North Region (4 million hectares) where new areas began to be identified as agricultural establishments, thus registering an increase in the associated forests. Other regions also recorded an increase in forest areas, particularly the Southeast Region, where the increase corresponded to almost 4 million hectares. The only region with reduced forest areas was the Northeast (Graph 1).

Other environmentally relevant news was the growth of areas with agroforestry systems: there were 14 million hectares in 2017 with this productive system.

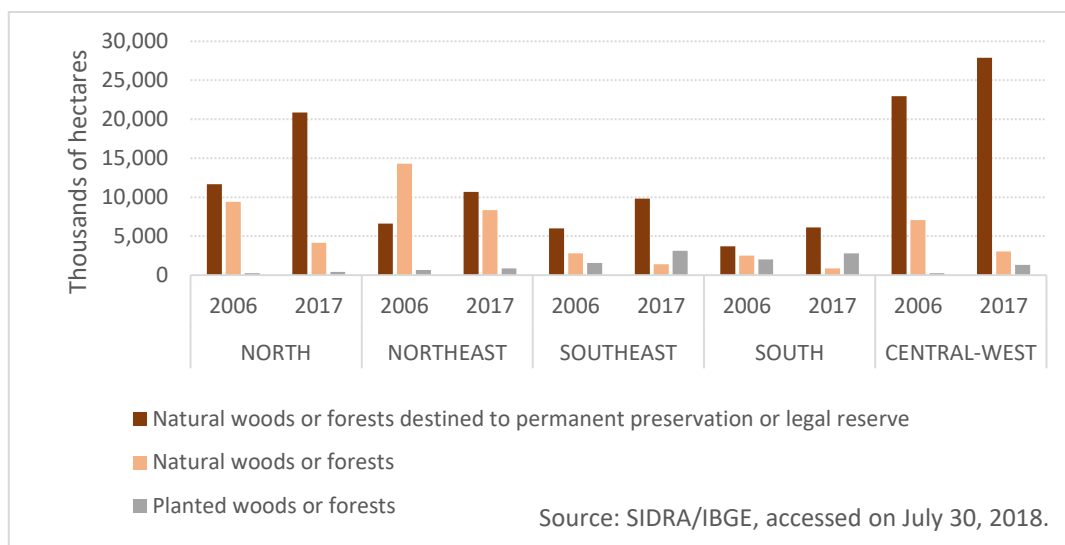
Table 7: Land utilization by agricultural establishments. Brazil, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

LAND UTILIZATION	Area (millions of hectares)		
	2006	2017	Difference
Permanent crops	12	8	-4
Temporary crops ¹	49	55	6
Flowering crops	0.1	0.1	0.03
Natural pastures	58	47	-11
Pastures planted in good conditions	93	100	7
Pastures planted in bad conditions	10	12	2
Permanent preservation forests or legal reserve	51	75	24
Natural woods or forest	36	18	-18
Planted wood or forests	5	8	4
Agroforestry systems	8	14	6
Lakes, constructions, degraded or unusable lands	13	13	0.1

Source: IBGE, *SIDRA* (2018b), Tables 854 and 6722, accessed on Jul 30, 2018.

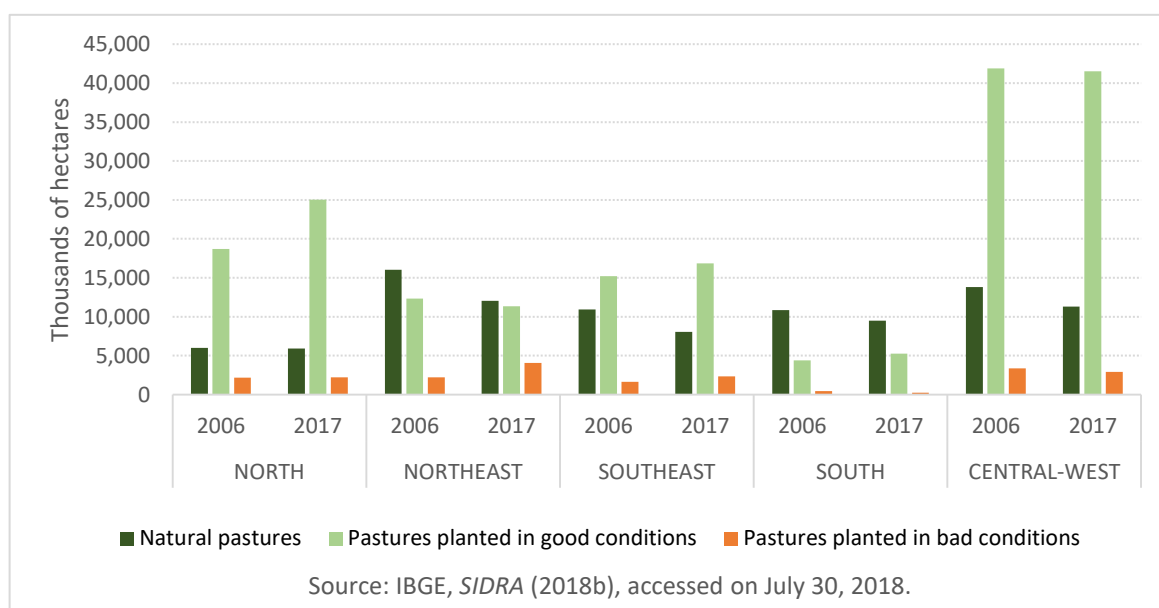
1) Includes areas planted for forage in 2006.

Graph 1: Areas with woods and forests according to the type and regions of Brazil. 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.



The main use of agricultural land in the country was pasture: 158 million hectares (45% of the land), of which 100 were planted in good condition. Once again, the Northern Region stood out due to the increase in pasture, with 6 million hectares planted (Graph 2). In the other regions, the pasture balance was negative due to a significant reduction in natural pastures. The Northeast Region is noteworthy because the pasture areas planted in bad conditions grew by 1.8 million hectares.

Graph 2: Areas with pastures according to the type and the large Brazilian regions. 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.



Areas with temporary crops increased from 49 to 55 million hectares between 2006 and 2017. The crops with the most growth in the harvested area were soybeans (12.6 million hectares), maize (4.8 million hectares), and sugarcane (3.4 million hectares) (Table 8); while beans, manioc, and rice crops presented significant reductions (2.5 million hectares, 0.8 million hectares, and 0.6 million hectares, respectively). Soybeans were the only crop that expanded its harvested area in all Brazilian regions.

The fantastic jump in soybean production, from 30 to 104 million tons, was mainly due to the expansion of the cultivated area with the crop, which explains the 66% production variation during this period. There was also a productivity gain of 34% in the national average, but in all regions the productivity gain was lower than the production gain due to the expansion of the areas (Table 8), a phenomenon also observed by Mattei (2014). This topic also constitutes a future research agenda, considering the effect of climatic conditions in addition to other factors that affect productivity.

Table 8: Causes of increased soybean production, according to increase in productivity or area expansion. Brazil and Major Regions, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Territorial Unit	Area Harvested with soybeans (millions of ha)		Soybean production (millions of ton)		Causes of Increase in Soybean Production	
	2006	2017	2006	2017	Productivity	Area
Brazil	18	30	46	104	34%	66%
North	0.3	1	1	4	20%	80%
Northeast	1	3	4	9	25%	75%
Southeast	1	2	3	9	46%	54%
South	7	10	17	35	43%	57%
Central-West	8	14	21	48	26%	74%

Source: IBGE, *SIDRA* (2018b), Tables 822 and 6614. Accessed on Jul 30, 2018.

Most of the expansion of temporary crops, specifically soybean, maize, and sugarcane, occurred in the Central-West Region. In the South and North Regions, the crop with the highest growth was soybean; while in the Southeast Region sugarcane and soybean experienced the highest growth. In the Northeast Region there was a reduction in almost all crops, especially beans (black eyed) and maize; the only exception in this region was soybean, which increased by almost 1.5 million hectares between the censuses (Table 9).

Table 9: Area harvested by some temporary crops. Brazil and Major Regions. 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

TEMPORARY CROP	2006 (mil ha)	2017 (mil ha)	DIFFERENCES 2006 to 2017 (thousands of ha)					
			Brazil	North	Northeast	Southeast	South	Central-West
Soybeans	17,883	30,470	12,587	1,010	1,453	1,007	2,699	6,418
Maize	11,604	16,382	4,778	259	-1,270	323	-385	5,850
Sugarcane	5,682	9,123	3,440	38	-353	2,301	281	1,175
Beans ¹	4,728	2,260	-2,468	-160	-2,252	9	-297	232
Wheat in grain	1,298	1,780	482	-	3	136	350	-7
Rice in shell	2,418	1,772	-645	-185	-610	-51	250	-49
Forage maize	794	1,543	749	12	-9	304	337	105
Manioc ²	1,708	943	-765	-232	-496	13	-87	36
Herbaceous cotton	859	910	51	5	-43	-21	-12	122
White oats	235	555	321	-	-	18	307	-29
Sorghum in grain	368	507	139	15	27	111	-17	5
Forage crops	447	465	18	2	-329	297	40	8

Source: IBGE, *SIDRA* (2018b), Tables 822 and 6615. Accessed on Jul 30, 2018. Note: '-' indicates no production.

1) Sum of black beans, colored, black and green.

2) Also known as 'aipim' or 'macaxeira'.

Among the crops of regional character, wheat, white oats, and rice presented the strongest growth in the south of the country. Cotton had significant growth in the Central-West Region, while sorghum and forage crops had a focused growth in the Southeast Region (Table 9).

Among the permanent crops, the most frequent products were banana (650,000 establishments), orange (629,000 establishments), mango (508,000 establishments), lemon (487,000 establishments) and guava (385,000 establishments). Coffee, which was a very popular crop during the 20th century, decreased to just under 226,000 establishments in 2017 (IBGE, 2018b, Table 6616).

ANIMAL PRODUCTION

Livestock farming was present in almost 2.6 million establishments, with a small reduction from 176 million units to almost 172 million in 2017, particularly in the Northeast and Southeast Regions, and in establishments with less than 50 units (Table 10). The only region with an increase in herds was North Region. The difference between the censuses may be due to the change in the reference date (December 31, 2006 to September 30, 2017), because in the spring there is a concentration of calf births (CNA, 2018, p.40). There was practically no change in the density per hectare: an average of 1.1 unit/hectare of pasture.

The production of cow's milk increased by almost 50%, reaching more than 30 billion liters per year, with cow's productivity increasing from 1.6 to 2.5 thousand liters per cow per year.

This remarkable growth in dairy production constitutes another research agenda, especially regarding the types of establishments.

Table 10: Agricultural establishments with livestock, according to some characteristics. Brazil, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Information	2006	2017
Number of establishments with livestock (millions)	2.7	2.6
With less than 50 units (millions)	2.1	1.9
With 50 units or more (millions)	0.5	0.6
Number of livestock units (millions)	176.1	171.9
With less than 50 units (millions)	32.2	28.4
With 50 heads or more (millions)	144.0	143.5
Area of pasture with livestock (millions of ha)	150.9	149.7
Average units per pasture area (unit/ha)	1.17	1.15
Amount of cow's milk in the year (billions of liters)	20.6	30.1
Average milk per cow in the year (millions of liters/unit)	1.6	2.5

Source: IBGE, *SIDRA* (2018b), Tables 922 and 6783, and special IBGE tabulation. Accessed on Jul 30, 2018

There was an increase in the number of pigs, poultry, goats, and buffaloes in the other animal groups, and a reduction in the number of horses, donkeys and cows' herds between the censuses (Table 11). The production of pigs and poultry grew in all regions, but in the South, there was a reduction in the number of producers, which suggests an intensification of production.

Table 11: Number of establishments and animal groups. Brazil, 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Type of animal	Establishments (thousands)		Effective group (thousands)	
	2006	2017	2006	2017
Buffaloes	13	15	885	948
Equine	1,408	1,166	4,542	4,219
Asinine	395	237	655	377
Mules	366	281	751	612
Caprine	287	326	7,108	8,255
Bovidae	439	512	14,168	13,771
Swine	1,496	1,445	31,189	39,176
Poultry ¹	2,713	2,847	1,143,456	1,453,645

Source: IBGE, *SIDRA* (2018b), Tables 960 and 6624. Accessed on Aug 29, 2018.

Note 1: Effective of chickens, roosters, pullets and cockerels.

TRACTORS AND AGROCHEMICALS

To understand the use of agroindustrial supplies by the agricultural establishments, information related to the number of tractors and the use of agrochemicals were taken for this study. The number of establishments with tractors was 734,000, an increase of more than 200,000 establishments, and the number of tractors amounted to 1.2 million, representing an increase of more than 400,000 new units. The influence of credit policies such as Pronaf Mais Alimentos (França, Marques, & DelGrossi, 2016) during the period of tractor acquisition is another topic for the research agenda.

Table 12: Number of establishments with tractors and number of tractors. Brazil and Regions. 2006 Agricultural Census and preliminary results of the 2017 Agricultural Census.

Territorial Unit	Establishments (thousands)		Tractors (thousands)	
	2006	2017	2006	2017
Brazil	530	734	821	1,229
North	17	35	27	58
Northeast	42	54	62	84
Southeast	155	209	257	373
South	253	347	347	517
Central-West	64	89	127	196

Source: IBGE, *SIDRA* (2018b), accessed on Aug 29, 2018.

During the period between censuses, more than 260,000 new establishments began to use agrochemicals, amounting to more than 1.6 million establishments in 2017. The exception was the Southern Region, where around 46,000 establishments stopped using agrochemicals (Table 13), which may be due to the reduction in the number of establishments in the region. The number of establishments that declared the practice of organic agriculture also decreased from 90,500 in 2006 to 68,700 in 2017.

Table 13: Number of agricultural establishments that use agrochemicals, according to their use in the period. Brazil and Regions. 2006 Census of Agriculture and preliminary results of the 2017 Agricultural Census.

Territorial Unit	Yes, but did not need to use in the period		Yes, uses in the period	
	2006	2017	2006	2017
Brazil	157	134	1,396	1,681
North	11	20	59	126
Northeast	67	67	459	552
Southeast	36	24	226	325
South	32	12	601	575
Central-West	12	11	52	103

Source: IBGE, *SIDRA* (2018b), tables 913 and 6653. Accessed on Aug 29, 2018.

Including those who use agrochemicals regularly but did not need to use them during the period, the number of establishments using agrochemicals rose to 1.8 million. However, only 1 million establishments received technical assistance, pointing to the risk of using agrochemicals without appropriate technical support.

Unfortunately, the number of establishments that received technical assistance decreased in the period, with 138,000 producers failing to receive it. The largest source of technical assistance, the Brazilian Government, provided support to 492,000 producers in 2006 and reduced its service to 370,000 producers in 2017 (IBGE, 2018b, Tables 767 and 6651).

EMPLOYED PERSONNEL

The increasing use of machinery and modern technologies has a direct impact on the number of people employed in agricultural establishments. People employed in Brazilian agriculture reached its apex in 1985, with more than 23 million workers. Since that year, this number has continually decreased, reaching 15 million workers in 2017 (Table 14). Despite the total reduction in number of workers, the North and Central-West regions presented an increase in the number of establishments in the period, with an associated increase in personnel (Graph 3).

Table 14: Evolution of the personnel employed by the agricultural establishments, at the reference dates. Brazil and Major Regions. Agricultural Censuses 1970-2006 and preliminary results of the 2017 Agricultural Census.

Territorial Unit	People employed in the reference dates (millions)						
	1970	1975	1980	1985	1995	2006	2017
Brazil	18	20	21	23	18	17	15
North	1	1	2	2	2	2	2
Northeast	8	9	9	10	8	8	6
Southeast	4	4	4	5	3	3	3
South	4	5	4	4	3	3	2
Central-West	1	1	1	1	1	1	1

Source: IBGE, *SIDRA* (2018b), Tables 265 and 6718, accessed on Jul 30, 2018.

The category that displayed the most reduction between 2006 and 2017 was producers and workers related to the producer: 1.8 million fewer people. The number of temporary workers and partners fell by more than 200,000. Conversely, the number of permanent employees increased by nearly 600,000 (Table 15).

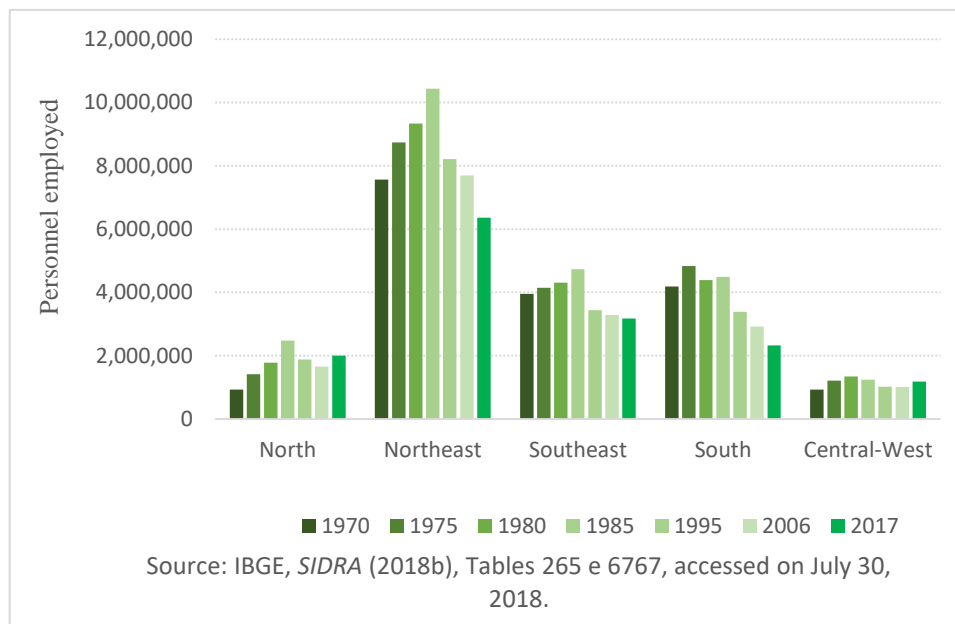
Table 15: Evolution of the personnel employed by the agricultural establishments, according to the employee type, in the reference dates. Brazil, Agricultural Census 2006 and preliminary results of the 2017 Agricultural Census.

Type of Personnel employed on the reference dates	2006 (millions of people)	2017 (millions of people)	Variation (millions of people)
Producer and workers related to the producer	12.8	11.0	-1.8
Permanent workers non-related to the producer	1.4	1.9	0.6
Temporary workers or partners non-related to the producer	2.4	2.2	-0.2
Total	16.6	15.0	0.7

Source: IBGE, *SIDRA* (2018b), Tables 788, 811, 564 and 6718, accessed on Jul 30, 2018.

The number of establishments managed by women increased from 656,000 to 747,000 between 2006 and 2017 (IBGE, 2018b, Tables 786 and 6707), revealing advancement by women in this sector. There are many questions to pursue in this area, such as: What types of establishments and activities have raised female participation, and in what regions? What are the characteristics of the establishments coordinated by couples in 2017? The participation of women who did not indicate that they oversee the establishment, but are present in all production activities, is another area to investigate in a future research agenda.

Graph 3: Personnel employed by the establishments on the reference dates, according to the Regions of Brazil. Agricultural censuses 1970-2006 and preliminary results of the 2017 Agricultural Census.



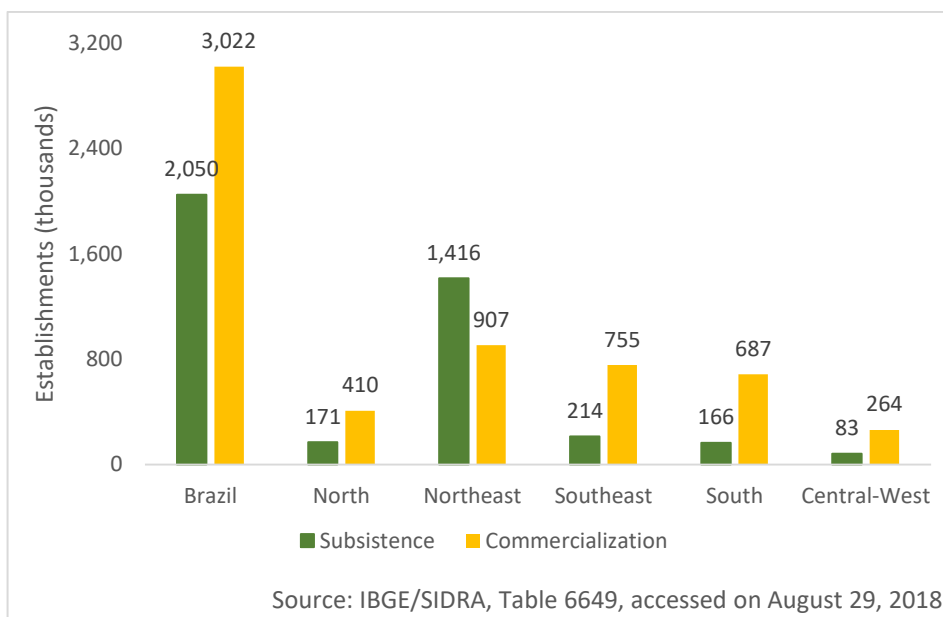
PURPOSE OF THE PRODUCTION

The 2017 Agricultural Census questionnaire included an important question regarding production objectives, "What is the main purpose of the production of the establishment?" The question had two answer options:

- Own consumption and consumption by people related to the producer (subsistence)
- Commercialization or barter exchange of the production

More than 3 million producers responded that the main objective of production was commercialization, but another 2 million responded that the main objective was for family consumption (Graph 4). These types of establishments are located especially in the Northeast Region, but are also present in other regions to a lesser extent. However, establishments focused on commercialization are present in all regions. These results reinforce the theory of duality in Brazilian agriculture (Aquino et al., 2018).

Graph 4: Purpose of the production of the establishments according to the Regions of Brazil.
Preliminary results of the 2017 Agricultural Census.



CONCLUSION

The purpose of this work was to recommend future research agendas. The topics mentioned here are not exhaustive, and the release of the final data collected from the 2017 Agricultural Census will bring a huge challenge in terms of the analysis and interpretation of results.

The preliminary results indicate the important transformations that occurred in Brazilian agriculture between 2006 and 2017: a significant expansion of livestock production in the North and of soybeans across the country, intensification of swine and poultry farming, an increase in the number of tractors and use of agrochemicals, and an increase in access to land. On the other hand, the data reveals that 2 million establishments are intended for subsistence production.

For agricultural and rural development policies, the challenge is to bring rural development policies to the subsistence producers and productive opportunities to the market-oriented producers.

The 2017 Agricultural Census also reveals the great diversity of Brazilian agriculture in five different biomes, with regionally diverse social and economic realities. The preliminary results confirm the diversity and heterogeneity of the Brazilian agrarian structure.

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