

Article

Can Family Farmers Thrive in Commodity Markets? Quantitative Evidence on the Heterogeneity in Long Agribusiness Supply Chains

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Abstract: *Background:* Family farmers' participation in marketing channels has prompted debates on the types of market best suited to this type of farmer. Commodity production by rural communities and the role of agribusiness long marketing channels for family-based farmers are the subjects of numerous qualitative studies. However, quantitative studies capable of assessing the relevance of long channels to family-based farmers are scarce. Therefore, this study intends to assess the relevance of long marketing channels for family farmers. *Methods:* We compiled the data from the survey responses of family farmers from 155 municipalities in a state in the central region of Brazil. *Results:* (1) There was an economic concentration of some marketing channels, namely, the sale of commodities occurred in 35% of the municipalities and included 4.15% of the sampled family farmers. The income derived through these channels represented 2.13% of the farmers' total income included in the study. (2) There is a low diversity of market types. On average, we found 2.95 long marketing channels per municipality. (3) Family farmers' participation is low in most commodity long channels. Between 0.11% and 4.15% of the family farmers in the sampled municipalities participate in these channels. Long channels linked to the cattle production chain showed more relevant capacity for inclusion. *Conclusions:* Contrary to the expectations of those behind initiatives to promote the marketing and sale of locally-sourced commodities within rural communities, agribusiness long marketing channels provide limited opportunities for family farmers to market their goods.

Keywords: rural development; agri-food systems; alternative models; agriculture; Brazil

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1. Introduction

Family farmers' participation in commodity supply chains has considerably increased in South American countries in recent years, due to the increase in worldwide demand for agricultural produce and the increase in the prices of such products in global markets [1]. This process has contributed to the emergence of a group of highly technified family farmers integrated into the markets. However, it has promoted other developments in the agrarian market's dynamic, such as the weakening of the rural communities involved due to a greater dependence by farmers on external resources, with a related reduction in their autonomy [1].

Studies have shown that the only way for small-scale agriculture to survive the modernization process is to adopt new technologies and participate in large commodity markets [2]. Others studies point to the weaknesses of this process of inclusion in modern agro-industrial systems [3]. However, there is a lack of research that quantifies the social and economic relevance of the processes mentioned above to family farmers. Studies have shown several potential bottlenecks of this inclusion process [4,5], but the lack of

quantitative investigation has made it difficult to deepen the analysis of the role of different markets in the rural development process. Thus, this study seeks to help fill this gap.

This study focuses on the opportunities and limitations for inserting family farmers in long commodity marketing channels. We sought to investigate to what extent such channels can promote the inclusion of family farmers. Thus, this study aimed to assess the capacity of long marketing channels to include and generate income for family farmers.

The specific research objectives of this study were to: (1) identify and spatialize the diversity of long marketing channels available to family farmers in the municipalities of the Brazilian state of Goiás; (2) quantify the participation of family farmers in different long marketing channels; and (3) assess the economic relevance of this type of commercialization to the income of family farmers in Goiás.

2. Literature Review

2.1. Concepts: Long and Short Channels, Agribusiness and Family Farming

Long channels are agro-industrial supply chains that involve an extensive network of intermediary agents that generate standardized products without identity through weak or non-existent relationships between producer and consumer and production and consumption [6]. We can characterize short supply channels (which, in the relevant literature, are called short food supply chains) according to two dimensions. The first relates to the organizational structure through which the product is marketed and can be of three types—direct sales, spatial proximity, or spatially extended. The second dimension relates to the qualitative definition of the product itself (organic, agroecological, healthy, local, regional, traditional, among others) [7].

Short supply channels are not necessarily an alternative to long channels [8], nor are they the antithesis of long channels, or in a diametrically opposite position in agri-food systems [9]. In the same way, we cannot analyze short channels and long channels through the lens of dichotomy [9], as agribusiness and family farming are not necessarily antagonistic social and productive categories either [10].

Despite the construction and consolidation of the concept of agribusiness being the subject of a complex political, academic, and social dispute [11], we can understand agribusiness to be the set of operations and transactions that occur downstream, upstream, and within agricultural units. Therefore, they involve both the production of inputs and machinery, services, processing, and marketing, as well as agricultural production itself [12].

In Brazil, to be legally classified as a family farmer, it is necessary to meet the criteria established by Law 11,326/2006 and the MDA Ordinance n. 102/2012 [13]. In general, we can deem a family farmer as a person who mainly employs family labor, whose family income comes mainly from agricultural production generated within a rural household, and whose farming area does not extend beyond four fiscal modules. According to the municipality, a fiscal module in the state of Goiás varies between 16 and 70 hectares.

2.2. The Productive Inclusion of Family Farmers in Markets

Promoting the development of family farms in Brazil presents several obstacles. First of all, the implementation of public policies can limit the potential of family farmers, as different groups are treated as equals. Few regions have favorable conditions for developing modern family farms, and few farmers are in a favorable position vis-à-vis the established markets. Such conditions may explain the fact that less than 25% of Brazilian family farmers are integrated into these markets [14].

Market integration can be a driving force behind family farming, as the more significant the integration, the greater the income in this category [14]. In recent years, there has been a concomitant increase in the production of various agricultural products (mainly agricultural commodities) in Brazil and a decrease in the number of rural establishments producing such products. This demonstrates that a concentration process has taken place in these production systems, explained by the need to specialize production to reduce costs and increase scale. This is reflected in many family farmers' departure from pro-

duction chains, such as those linked to integration systems with large agribusinesses and contract agriculture [15].

The inclusion of family-based farmers in marketing circuits as a strategy for promoting rural development seems to be something crystallized in the literature [16,17]. The discussion about the types of commercialization that value family farmers and promote the endogenous development of rural communities [18] must also take into account factors that (in the context of national rural development) weaken some chains by having a large part of the links transnationalized [19,20]. Thus, it is necessary to deepen studies on the relevance of the productive inclusion of family farmers in long marketing channels and the consequences of this process in rural development.

We can find three strands in the literature that analyze the insertion of family farmers: the first defends the thesis that it is necessary to insert family farmers in conventional production chains and provide support so that they can compete with large producers—long marketing channels [21]; the second current defends the need to strengthen and create new marketing channels based on reciprocity, territoriality and trust—short sale channels [6]; and the third current presupposes an analysis of the inclusion of family-based farmers under the lens of interaction and coexistence between short and long channels—the coexistence of markets [9].

We can consider the strategy, by some theorists, of including family farmers in long production and marketing channels (commodity chains, for example) as the easiest and fastest alternative for the productive inclusion process of this category and the poverty reduction of rural populations [22]. Therefore, viable marketing channels for family farmers would be the large hegemonic chains (however, we would condition this participation to articulation in associations and cooperatives) and market niches. However, we know a significant portion of this category cannot enter such marketing modalities [23]. The inclusion of family farmers in long marketing channels has been greatly encouraged through public policies of the Brazilian State, mainly in support of soybean cultivation for the production of biodiesel [24].

We also know that family farmers sell their products in different marketing modalities and that long channels are one of these modalities. One of the factors that condition the ability of family farmers to enter and remain in the long channel is the specialization and technification of their production systems [2]. In Brazil, these characteristics are not recurrent among family farmers [25]. From this context emerges the hypothesis that the long channels cannot include many Brazilian family farmers.

Moreover, we can explain the difficulty of family farmers to access markets by the lack of access to production and communication technologies [14]. With the emergence of advanced technologies in agriculture and supply chains, this difficulty can be increased, especially when it comes to the inclusion of family farmers in long channels.

2.3. Advanced Technologies and the Participation of Family Farmers in Agricultural Markets

The use of advanced technologies in different links of the supply chain is growing. Blockchain technology is one of the prominent examples of this process that presents both potential and challenges, especially when it comes to the inclusion of small-scale farmers. This technology guarantees transparency in transactions, traceability of products and production processes, and helps in the governance of supply chains. It has great potential to help family farmer cooperatives increase their competitiveness in inserting their products into long marketing channels. However, such technology is still not very accessible, and demands an extensive information infrastructure and know-how that are not always present in family farmer organizations [26].

2.4. Family Farmers in Long Channels: Lessons and Experiences from Other Countries

The long channels operate with different logics in different countries, presenting differences and similarities regarding the participation of agents from rural communities. Thus, it is necessary to review the literature on the subject in the different realities of

countries to understand how family-based farmers participate in long channels, and to identify their challenges and opportunities. Family farmers' participation in long marketing channels occurs in very heterogeneous ways, and is different in each country in the world.

The vertiginous increase in soy-planted areas in South America has brought several environmental, social, and political consequences to the territories of these countries. In Argentina, it has impacted ways of life of rural communities, provided the reconfiguration of work processes for members of rural families, and contributed to family farmers leaving their agricultural activities in search of wages on soy farms, causing new population flows between regions [27].

Encouraging the insertion of Paraguayan family farmers into the soybean chain led to the differentiation of this social category into two groups: (1) few technified farmers capable of leasing more and more areas; and (2) many indebted farmers who lost their land to pay debts incurred to enable soybean production [1].

The strengthening and growth of large dairy and milk processing companies have, to a certain extent, led to a process of loss of identity for Canadian family farmers who produce milk. Milk and its derivatives, which were previously products that symbolized the approximation between people from the countryside and the city (through the construction of the social value of the products), became impersonal and standardized foods, distancing producers from consumers [28].

Rising global demand for Mexican tequila has contributed to mergers of large beverage companies and acquisitions by transnational corporations of local ventures. Thus, with the growing demand, some Mexican family farmers started to implement agave monocultures, reducing their productive diversity, and others rented their land to large producers, losing autonomy [29].

In South Africa, large supermarkets are increasingly becoming the leading players in the fruit, vegetable, and processed food markets. Although this commercialization channel was not able to include a significant portion of family farmers in that country, it demonstrated the ability to create strategies, protocols, and a chain governance model that promoted the professionalization and productive inclusion of a relatively large number of farmers who were previously excluded from the markets [30].

In some societies, the middleman or intermediary figure in the marketing channels is seen as harmful to agri-food systems, as it supposedly appropriates a large part of the farmers' profit margin. In Papua New Guinea, the population increase in urban centers and the increase and differentiation in demand for food provided a more significant insertion of intermediaries in agri-food systems. This process was necessary to dynamize the mercantile food exchange processes and productive specialization and reduce transaction costs for family farmers. On the other hand, it reduced the earnings of some farmers and excluded others from participating in city fresh food markets [31].

In all previous experiences, family farmers' participation in long channels affected their livelihoods. Some mentioned the consequences of this process in territorial configuration, others in the professionalization of family farmers, others in the dynamization of supply chains, but none addressed the ability to include family farmers in different long channels.

2.5. Gaps in Previous Studies and Contributions of This Research

Studies on family farmers' participation in long marketing channels address the challenges and opportunities of this process without quantifying the capacity of this type of channel to include small farmers. This gap makes it difficult to understand the real potential that these channels represent for the development of Brazilian family farmers. This study addresses this gap by quantifying the capacity of agribusiness long supply chains to include family farmers. This is considered for each of the different long marketing channels, and thus we seek to contribute to the literature by revealing the heterogeneity of long channels and the importance of channel diversity (long and short).

3. Materials and Methods

The low availability of data in the Brazilian Agricultural Censuses regarding the commercialization of family farmers is an obstacle to rural development studies. The 2017 Agricultural Census, as well as the previous ones, gathered data related to different production types (plant extraction, agroindustry, fruit growing, horticulture, temporary farming, permanent farming, and livestock), taking into account aspects of production such as volume produced, technologies used, value and sales volumes, and the profile and condition of the farmer. However, no data were collected concerning how products are marketed. Thus, it is possible, for example, to know the milk volume produced in a particular region or municipality, the sales volume from milk, and the technology used in production. However, agricultural censuses do not generate information that indicates how the milk was sold. Therefore, territories with great economic dynamics are invisible to the public authorities.

The geographic outline of this study is the state of Goiás, located in the central region of Brazil. Goiás is a state that has incentives from the national government for the production of large-scale commodity crops such as soy, corn, cotton, and sugarcane, as well as for dairy and beef cattle raising. All of these farming systems are capitalist [32]. However, family farming is also a relevant segment within the state, and is responsible for 38% of the gross agricultural value production (IBGE, 2017). Therefore, we decided to investigate the importance of long marketing supply chains in developing family farming in the state of Goiás.

Discussions were initially held with researchers in the field of rural studies to define the profile of the survey respondents. We defined that they should be figures who worked with family farmers in the municipalities. After informal conversations with family farming leaders, we concluded that the Goiás Agency for Technical Assistance, Rural Extension and Agricultural Research of Goiás (EMATER/GO) would be an institution with the capillarity and the ability to gather information regarding the marketing processes of family farmers in the 246 municipalities in the state. Thus, through a partnership between EMATER and the Graduate Program in Agribusiness at the Federal University of Goiás (PPGAGRO-UFG), an action plan was designed to collect data on the marketing practiced by family farmers in the state of Goiás.

Meetings were initially held between the research team and the directing board of EMATER to show the relevance of the research in the context of rural development in the region. Then, we held meetings with the coordinators of each EMATER regional office. Such meetings were fundamental to identifying the different types of marketing channels in the municipalities. Accordingly, the regional coordinators categorized each channel as short or long. During this process, a survey was developed with contributions from EMATER regional coordinators and the board of directors, and then sent to field technicians at the EMATER Local Units (LU). The regional coordinators held training meetings with technicians from the local units to categorize the marketing channels available to family farmers.

We instructed the LU technicians to identify the family farmers' leaders from each of the commercialization channels in each municipality. Thus, the responses to the survey for each municipality were collectively constructed from the communication between the LU technicians and the key informants of each sales channel.

We e-mailed the survey to LU technicians via the Google Forms platform. We divided the survey into two sections: (1) long marketing channels available to family farmers in the municipality, and (2) short marketing channels available to family farmers in the municipality. The most frequent long and short channels in the state were listed, and respondents answered two questions for each channel: (1) whether or not family farmers participated in the channel, and (2) how many family farmers participated in the channel. We obtained a response from 155 of the 246 municipalities in Goiás. Among the 155 municipalities that sent the completed survey, we selected 75 to respond to the second survey referring to the economic performance of each sales channel. Of these 75 municipalities, only 58 responded.

In this economic performance survey, we made just one question per marketing channel: how many Brazilian reals (gross income) does the set of family farmers in the municipality participating in the channel receive per month? In turn, the sum of the income obtained by the set of family farmers sampled in each channel was obtained with the data obtained from this question. The sums obtained by sales in all short and long channels were considered the income universe (100%). Therefore, this percentage variable was called productive income from each channel, which expresses the share of income obtained in each channel compared to the total income obtained in all channels.

Next, the research step obtained data referring to the presence of marketing channels and family farmers' participation from 63.01% of the municipalities in Goiás. Economic performance data of the marketing channels were obtained from 37.41% of the sampled municipalities, representing 23.57% of the municipalities in Goiás. We used the number of rural family households obtained in the 2017 Agricultural Census of the Brazilian Institute of Geography and Statistics (IBGE) as the universe in each municipality. Many farmers participated in more than one marketing channel, making it impossible to gather information regarding the number of family farmers participating in long channels. For this reason, the "number of long-channel marketing posts occupied by family farmers in each municipality" variable was created, which we calculated through the sum of the number of family farmers participating in each long channel modality in the municipality.

We collected the data between August 2020 and March 2021. We also used some strategies to ensure the quality of the data collected by LU technicians. After receiving the completed forms, calls were made to each of the LU technicians to check whether the data entered was faithful to the municipality's reality. During the calls, it was possible to assess whether local technicians had understood the research concepts properly. We did not consider the filled-in forms by technicians who did not understand the concepts. During the calls, it was also possible to understand if some outliers represented the reality of the municipality or if their data were collected in the wrong way, and therefore should not be included in the final database.

We completed the data processing as follows: we initially analyzed the municipalities regarding the diversity of marketing channels and family farmers' participation in each channel. Then, the marketing channels were analyzed, with their occurrence in the municipalities of Goiás and the participation of family farmers. In this study, we used means, deviations, and standard errors to measure some variables.

We also used the Qgis platform to prepare a map specializing in the number of long channels present in each municipality. We elaborated the maps using data collected during the study and information from the State Geoinformation System of the State Government of Goiás (SIEG).

The methods and tools mentioned allowed us to answer questions on the participation of family farmers in each of the commodity supply chains available in the Brazilian state of Goiás.

4. Results

4.1. Geographical Distribution and Diversity of Long Marketing Channels Available to Family Farmers

There is little diversity of long marketing channels available to family farmers in the sampled municipalities. Few municipalities had more than five channels, as shown in Figure 1. Southeast Goiás was the region with the most significant number of municipalities with many long channels. The central region of the state (around the capital Goiânia), the southwest region, and the region around the Federal District also had some municipalities with many long channels. The north and northeast of Goiás had few municipalities with many long channels.

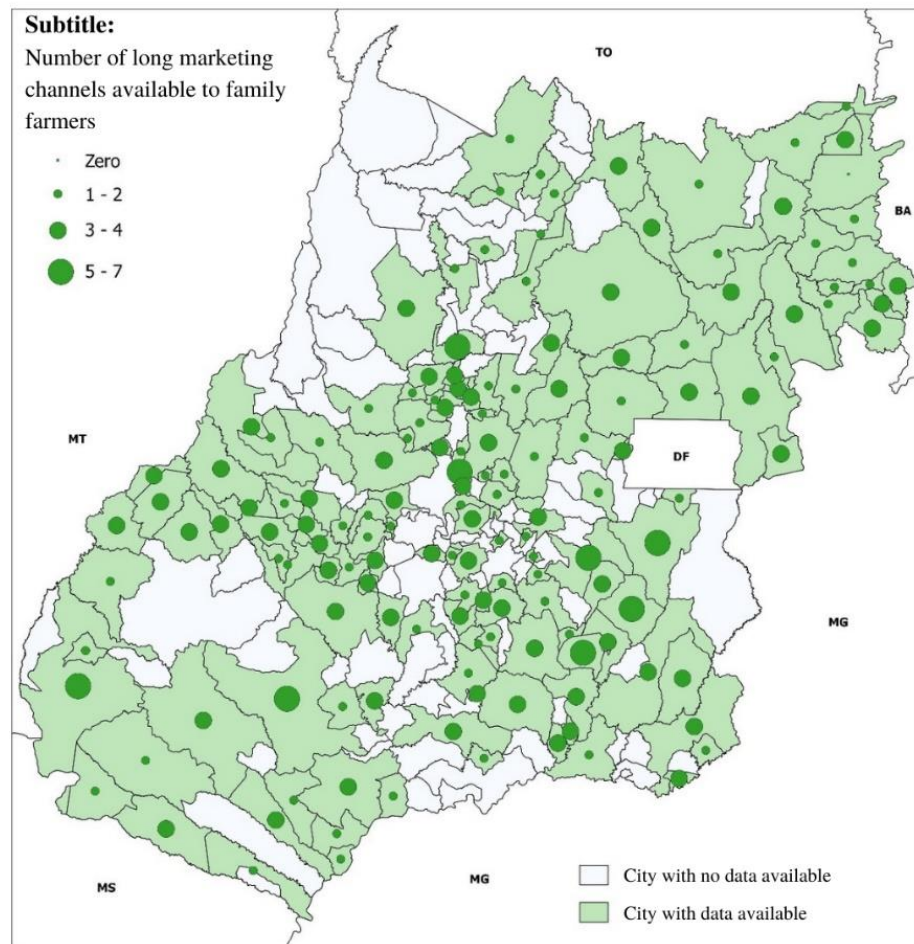


Figure 1. Map of the number of long marketing channels available to family farmers in Goiás.

The average number of long marketing channels available to family farmers, and an average number of marketing posts of the long channel-type available to family farmers, was low compared to the average number of rural family establishments in the sampled municipalities (Table 1).

Table 1. Mean, standard deviation, and standard error of the quantities of long canals, commercialization posts, and rural family establishments in the sampled municipalities.

	Mean	Standard Deviation	Standard Error
Number of long channels available to family farmers in each municipality in Goiás.	2.9548	1.2971	0.1041
Number of long-channel marketing posts occupied by family farmers in each municipality.	195.9493	261.6002	21.0122
Number of rural family establishments in the sampled municipalities.	461.3161	385.3826	30.9546

Source: Data collected in the study and IBGE, 2017.

Regarding the diversity of long commercial channel modalities existing in the municipalities of Goiás and the participation of family farmers in the channels, it was noticed that: (1) there are on average 2.95 long channels available to family farmers in each municipality; (2) there are on average 195.94 long marketing posts occupied by family farmers in each municipality; (3) in total there are 30,371 long-term commercialization posts occupied by family farmers in the sampled municipalities; and (4) the ratio between long-term

commercialization posts and the number of rural family establishments is 42.47%. It should be noted that 42.47% of family farmers cannot be said to be part of long channels, as many participate in more than one marketing channel.

Figures 2 and 3 show the geographic distribution of the different long marketing channels existing in Goiás with family farmers' participation. There is a certain similarity between the maps of the channels for sales of milk to dairies and sales of cattle to slaughterhouses. The sales channel to agricultural market hubs was concentrated around Goiânia and around the Federal District. The sales channel to large supermarket chains was only presented in the horizontal strip located in the state's central portion of the southern region. The sales channel of agricultural commodities proved to be recurrent throughout the central-southern portion of the state and in part of the north and northeast of Goiás. Sales of extractive products from the Cerrado to middlemen were more recurrent in the state's north, northeast, and central-west regions. The presence of other long sale channels did not show a clear trend.

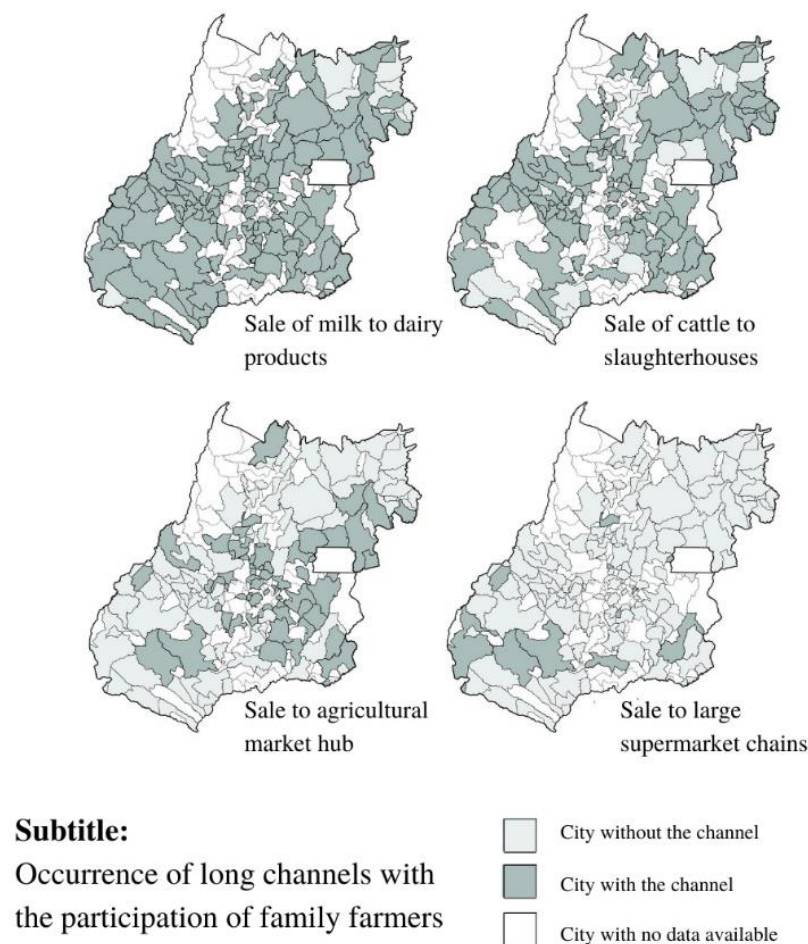
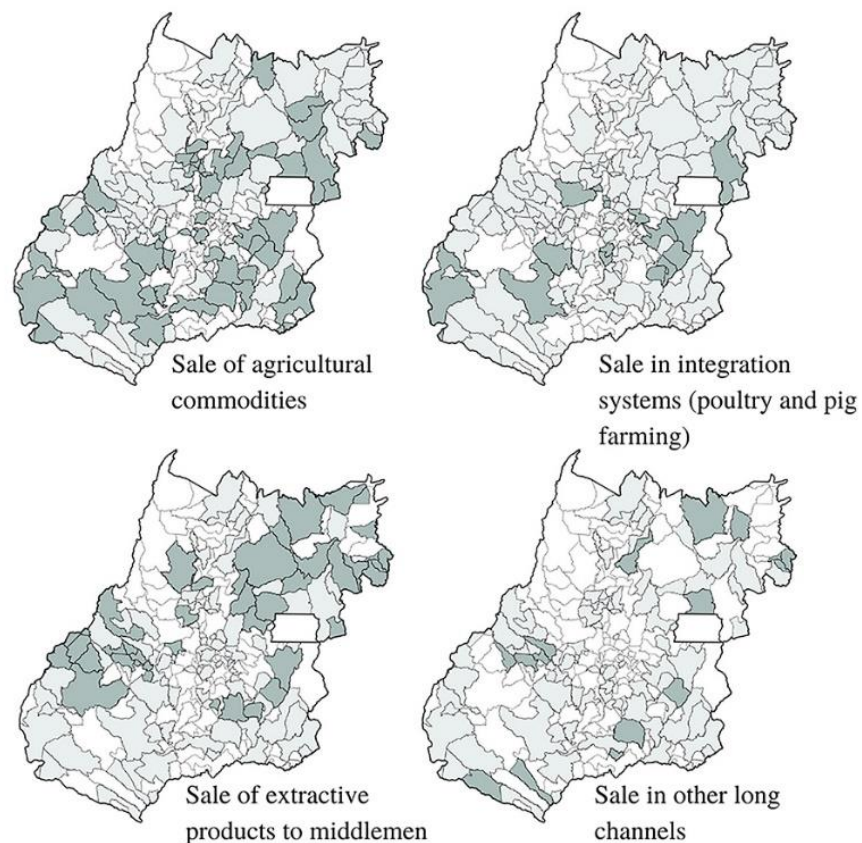


Figure 2. Presence of long sales channels with family farmers' participation (sale of milk to dairies, sale of cattle to slaughterhouses, sales to agricultural market hubs, and sales to large supermarket chains).



Subtitle:

Occurrence of long channels with the participation of family farmers

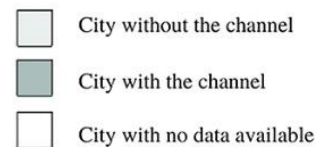


Figure 3. Presence of long sales channels with family farmers' participation (sale of agricultural commodities, sales in integration systems, sales of extractive products to middlemen, and sales in other long channels).

4.2. Participation of Family Farmers in Different Long Channels

Table 2 reveals a more significant share of family farmers in the long sales channel for the sale of milk to dairies and a small share in the sales channels of agricultural commodities and sales in integration systems.

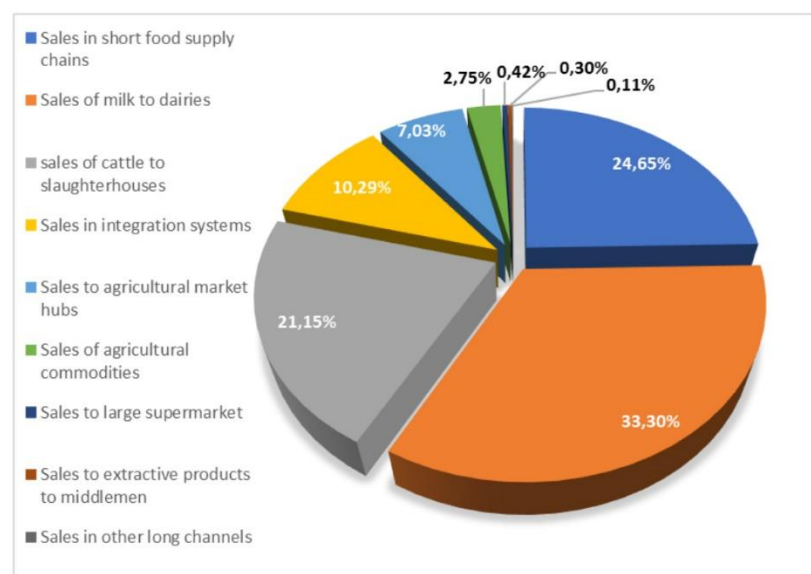
The most recurrent channels in the municipalities and with the highest inclusion rate of family farmers are sales of milk to dairies, which occur in 92.21% of the municipalities and include 27.58% of family farmers, and sales of cattle to slaughterhouses or middlemen, which occur in 77.40% of the municipalities and include 11.79% of family farmers. The least recurrent long channels with the lowest inclusion index are sales to large supermarket chains, which occur in 7.33% of the municipalities and include 0.11% of family farmers, and the integration systems in 10.96% of municipalities, including 0.23% of family farmers. Furthermore, except for the channel for selling milk to dairies, the data revealed that the long marketing channels in Goiás are not very capable of promoting the productive inclusion of family farmers and not very capable of promoting such farmers in the agri-food systems of the studied municipalities.

Table 2. Participation of family farmers and occurrence of long marketing channels in the municipalities of Goiás.

	Family Farmers Participating in the Channel (%)	Municipalities in the State that Have the Channel with the Participation of Family Farmers (%)
Sale of milk to dairies	27.58	92.21
Sale to agricultural market hub	1.91	41.72
Sale of cattle to slaughterhouses or middlemen who resell to slaughterhouses	11.79	77.40
Sale to large supermarket chains	0.11	7.33
Sale of agricultural commodities (soybeans, corn, cotton, etc.)	4.15	35.53
Poultry and pork sales via large integration companies (Sadia, Superfrango, etc.)	0.23	10.96
Sale of fruits and other extractive products from the cerrado to middlemen	1.25	32.00
Other long marketing channels	0.7	10.32

4.3. Economic Relevance of Long Channels to the Group of Family Farmers

Regarding the economic performance of the different commercialization channels (Figure 4), the data revealed that: (1) the set of long channels is responsible for 75.35% of the gross income arising from the productive activities of family farmers; and (2) the long channels with the greatest economic weight were sales of milk to dairies and sales of cattle to slaughterhouses and middlemen, respectively, representing 33.30% and 21.15% of gross revenues from the productive activities of the group of family farmers sampled. It is also noted in Figure 4 that the short sales channels represent almost 25% of the productive income of family farmers in Goiás.

**Figure 4.** Participation of different marketing channels in the gross productive income of family farmers.

In analyzing Table 2 and Figure 4 together, we can see that although the sales channel in integration systems demonstrates specific economic relevance (representing 10.29% of the income of the sampled family farmers) and spatial relevance (occurring in 16 of the 155 municipalities sampled—10.96%), only 0.23% of family farmers participate in this type of commercialization. In other words, it is a channel that generates significant income, but only for a few farmers.

The long sales channel for commodities showed little economic relevance, representing only 2.75% of the productive income of the sampled family farmers, with low participation of farmers (4.15%), and significant occurrence in municipalities being present in 35.53% of the municipalities sampled.

5. Discussion

Few municipalities sampled had more than three types of long marketing channels with family farmers' participation. This is due to two reasons: first, the success and sustainability of these farmers' participation in these channels over time depend on chain coordination and state support [30]. The coordination and governance of long chains take place vertically, meaning without the participation of all actors. In addition, state support for family farmers in Brazil occurs intermittently, varying according to the managers who assume the municipal, state, and federal public powers. These factors make the participation of family farmers subject to specific realities. Another possible reason for the low diversity of long channels is the precarious infrastructure conditions of the municipalities. The operations of these channels largely depend on a configuration that facilitates logistical aspects of the production, distribution, and consumption processes.

Large agri-food chains force participating family farmers to specialize their production and reduce their productive diversity [29]. Due to the small scale of family-based production, their relevance in long channels is minor, meaning they are not protagonists in these exchange processes. The search for recognizing family farmers as a category and social group in society involves their participation in markets capable of explaining their specificities and potentials [18].

The discourse of dairy aptitude in Goiás as something consolidated and indisputable is striking in several meetings, events, and actions with agents of public power and organized civil society. However, such discourse does not usually go beyond the issue of fresh milk. When discussing municipal inspection systems, agro-industrialization, and milk processing, the main difficulty for family farmers is perceived as operationalizing the milk chain so that the family farmer is not a mere milk supplier to large dairies. A factor that corroborates this hypothesis is the low occurrence of special cheeses with specific characteristics of the territories (only Cabacinha cheese in the Parque das Emas territory) and the shallow index of municipalities with the Municipal Inspection System in operation.

The long channel with the greatest occurrence in the municipalities and the greatest participation of family farmers was the sale of milk to dairies. However, even though it is the channel with the greatest participation, there was a lower rate than expected (27.8% of family farmers in the sampled municipalities), since the state's great dairy aptitude is a culturally well-established attribute in Goiana. These data support several hypotheses: the first is that many family farmers are inserted into the milk chain, but few are inserted into the long sales channel of selling milk to dairies, meaning there is a lot of milk production being sold and consumed, but it remains invisible. Another factor that may explain this fact is that the modality of selling milk to dairy products promotes an impersonalization of products produced by family farmers [29], which, together with the high production costs and the low earnings of the activity [7], economically and culturally discourages family farmers from selling their products through this channel.

A significant portion of municipalities have family farmers selling their products to middlemen, with 41.72% to intermediaries who resell in agricultural market hubs, and 32% to intermediaries who buy and resell fruits and products from the Cerrado. This demonstrates the importance of this agent in the agri-food systems of municipali-

ties, especially those that are not close to urban consumer centers. Such intermediaries play a relevant role in the supply of municipalities and significantly interfere in food dynamics. They supply municipalities with products from agricultural market hubs and supply agricultural market hubs with products from municipalities. To a certain extent, this practice hinders the consolidation of alternative food networks and the construction short marketing channels, enabling the productive inclusion of farmers who do not have a commercial profile.

However, these marketing channels occur more frequently in municipalities located on the margins of major state and federal highways, restricting the participation of farmers from more remote municipalities. Although they occur in many municipalities, long channels centered on the figure of the middleman present a very low participation of family farmers, demonstrating the need for the productive specialization of farmers and an improvement in the coordination of chains [31].

Among those investigated, the two long channels that attracted the most attention about family farmers' participation were the sales of agricultural commodities and sales in integration systems. Family farmers' participation in these channels was greatly encouraged through public policies. In recent years (2017 and 2018), 40% of the funding resources allocated to the National Program for Strengthening Family Agriculture (*PRONAF*) were allocated to financing soybean crops [1]. Another great public power incentive for the insertion of family farmers in long channels was the Biodiesel Social Seal, which encouraged many farmers to start planting soybeans [24]. In other words, the contribution of public resources and the incentive by the state to insert family farmers in these channels did not necessarily generate a greater inclusion of farmers.

Family farmers' participation in these long marketing channels, which force intense production specialization and decrease the diversity of agroecosystems in family units, generates intense socio-territorial transformations and other negative impacts [1,27]. The data from this study revealed that these impacts, already discussed in the literature, are not compensated by the production of significant income for the group of family farmers.

Only 3.64% of the productive income of the sampled family farmers comes from participation in agricultural commodity chains, meaning that it is a channel that generates little income for the category. Moreover, in addition to generating little income for local family farmers, it mostly moves the economy of transnational companies downstream and upstream of production [19,20]. In other words, the long channels with greater support from the state and greater political appeal (under the discourse of efficiency, productivity, and income generation) were those with the lowest economic participation in the productive income of the group of sampled family farmers.

The data revealed that short sales channels, even in a state markedly hegemonized by large-scale production [32], are relevant for the economic reproduction of family farmers. The set of short channels accounted for 24.65% of the productive income of the group of sampled family farmers, and the set of long channels accounted for 75.35%. This data supports the hypothesis of coexistence between long and short sales channels. In some moments, they feed back and converge, and in others, they dispute and diverge [9].

Family farming and agribusiness are not antitheses [10], but there is a great diversity of social, environmental, and productive conditions that interfere with the performance of family farmers in the marketing channels [14]. For a portion of family farmers, who have more technical ability and greater competitive attributes, long channels are a possibility [2]. Nevertheless, agribusiness and agro-industrial chains are not open to participation for a much larger portion of family farmers. The cited studies discuss the reasons for not inserting a portion of this category and some impacts that such insertion can cause. On the other hand, the results of this research quantitatively reveal the inability of agribusiness agro-industrial chains to include and generate income in a significant way for family farmers. The results also reveal that short channels are configured as a potential alternative for inclusion and income generation for family farmers excluded from long channels.

6. Conclusions

This study presents empirical evidence of the heterogeneity of food supply chains that are better suited to family farmers, and how this affects farmers' capacity to market their agricultural goods. Agribusiness long marketing channels are different from those expected by initiatives promoting commodities as a solution for the development of rural communities, as they provide limited opportunities for family farmers to market their goods.

A large part of the sampled municipalities had less than three types of long marketing channels in which family farmers could participate, and only a small portion of the municipalities had more than five long marketing channels, revealing few options for family farmers to outflow production via long channels. The sale of commodities occurred in 35% of the municipalities, 4.15% included local family farmers, accounting for 2.13% of the sampled farmers' income from farming activities.

The only long marketing channels with a large participation of family farmers were the sale of milk to the dairy industry and the sale of cattle to slaughterhouses, or middlemen. All other agribusiness long channels proved to be fairly closed to the participation of family-based farmers, with a participation rate ranging from 0.11% to 4.15%.

Despite being present in 35.53% of the municipalities in the state of Goiás, the commodity long marketing channels were relevant to only 2.75% of the sampled family farmers. The sales channel in integration systems showed greater economic participation, but with a reduced number of participating family farmers, revealing a concentration in the long marketing channels.

As a whole, long channels are hardly capable of including a large portion of family farmers and are responsible for a low percentage of farming income for these farmers. These findings reveal the need to explore the possibilities of non-commodity goods in short food supply chains, in which farmers market directly to consumers as a complementary development approach. An important starting point for this effort is to recognize the heterogeneity of food supply chain arrangements (including both long and short supply chains) in terms of opportunities for family farmers to market their agricultural goods.

This study focused on quantifying the participation of family farmers in commodity supply chains and the economic relevance of such channels for family farmers' income. Causal relationships that explain the level of family farmers' participation in each type of long channel were not established in this research, which is a possible agenda for future studies. Another challenge for future research is to quantify the capacity that short food supply chains have to include family farmers and generate income for these farmers.

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