






## Factors associated with the purchase of family farming products for national school feeding program in Minas Gerais in 2017, Brazil

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**ABSTRACT:** *The National School Feeding Program (in abbreviated Portuguese: PNAE) states that  $\geq 30\%$  of the amount transferred by the National Fund for Education Development (in abbreviated Portuguese: FNDE) to the executing entities should be used to purchase products made from Family Farming (FF). This study aimed to identify the municipal characteristics associated with the compliance of the municipalities of Minas Gerais (MG) to this target in 2017. For this, data on municipal purchases of FF for the PNAE were obtained from the FNDE's website. Sociodemographic, economic, and agricultural characteristics of the municipalities were associated with compliance to the PNAE's goal. Approximately half (55.07%) of the municipalities complied with the FF purchase target, wherein carrying out programs or actions to encourage organic agriculture (29.8% vs. 22.6%,  $p=0.018$ ) were associated with a greater compliance to this target, presenting the official rural union registration (76.4% vs. 68.8%,  $p=0.026$ ) and the Municipal Inspection Service: (35.6% vs. 29.1%,  $p=0.048$ ). Overall, a low compliance to the goal was observed in MG municipalities, and associations between certain agricultural management characteristics and goal fulfillment were evidenced.*

**Key words:** *family farming, school feeding, public policies, nutrition and food programs and policies, food and nutrition security.*

## Fatores associados à compra da agricultura familiar no Programa Nacional de Alimentação Escolar em Minas Gerais em 2017

**RESUMO:** *O Programa Nacional de Alimentação Escolar (PNAE) define que  $\geq 30\%$  do valor repassado pelo Fundo Nacional de Desenvolvimento da Educação (FNDE) às entidades executoras devem ser empregados na compra de produtos da Agricultura Familiar (AF). Este estudo objetivou identificar as características municipais associadas ao cumprimento desta meta pelos municípios de Minas Gerais (MG), em 2017. Para isso, os dados de compra municipal da AF para o PNAE foram obtidos do FNDE. Características sociodemográficas, econômicas e agropecuárias dos municípios foram associadas ao cumprimento da meta. Cerca da metade (55,07%) dos municípios cumpriu a meta de compra da AF, e realizar programa ou ação de estímulo à agricultura orgânica (29,8% vs. 22,6%;  $P = 0,018$ ) foram associados ao maior cumprimento dessa meta; assim como apresentar o registro oficial de sindicato rural e o Serviço de Inspeção Municipal: 76,4% vs 68,8%;  $P = 0,026$  e 35,6% vs. 29,1%;  $P = 0,048$ , respectivamente. Evidenciou-se baixa adequação dos municípios de MG à meta estudada e que características da gestão agropecuária se associaram ao seu cumprimento.*

**Palavras-chave:** *agricultura, agricultura familiar, alimentação escolar, políticas públicas.*

### INTRODUCTION

The National School Feeding Program (PNAE) started in 1955, with the aim of combating hunger and malnutrition in Brazil. Over the years, it has become the most extensive national food and nutrition program in the country and an important strategy to promote food and nutrition security, ensuring the fulfillment of the human right to adequate food (MACHADO et al., 2018). The objectives of the PNAE include contributing to the growth and biopsychosocial development of Brazilian children, improving their learning and school performance,

and encouraging healthy eating practices among them (PEDRAZA et al., 2018).

Under the PNAE, school meals must be prepared by a nutritionist, using fresh or minimally processed foods in consideration of the nutritional needs, eating habits, and food culture of the locals, which is based on the region's sustainability, seasonality, and agricultural diversification. Moreover, it is recommended that at least 75% of the financial resources be allocated for the acquisition of fresh or minimally processed foods, with a maximum of 20% for processed and ultra-processed foods and a maximum of 5% for processed culinary ingredients (FNDE, 2020).

In addition, the PNAE has been used in policy-making to strengthen Family Farming (FF) through the implementation of Law No. 11947 in June 16, 2009, which establishes that at least 30% of the amount transferred by the National Fund for Education Development (abbreviated Portuguese: FNDE) to states, municipalities, and the federal district for PNAE implementation, must be used to compulsorily purchase FF products (BRASIL, 2009).

Meeting this 30% target for purchasing school meals made from FF has been noted to benefit both family farmers and the students assisted by the program. Through the PNAE, national FF is stimulated since a market for their production is provided, consequently increasing income and conversely reducing poverty and food insecurity in the countryside. Simultaneously, an adequate and healthy diet is offered to the students, with the promotion of varied, fresh, and safe foods, contributing to their healthy eating habits and preserving the region's traditions and eating practices (SCHWARTZMAN et al., 2017). Furthermore, PNAE's commitment to the environment and sustainable development should be acknowledged because FF products are primarily organic or agroecological, resulting in less impact on the environment in comparison to the damage generated by conventional food production (BRASIL, 2009; 2020).

Despite these aspects, not all states and municipalities reach this target of purchase percentage (FNDE, 2017). In 2011, a cross-sectional study conducted with municipalities across the country indicated that only 44.4% complied with the 30% purchase of FF products for PNAE (MACHADO et al., 2018). It is believed that municipal socioeconomic characteristics and those related to program management were associated with non-compliance with the goal. Thus, determining the characteristics of municipalities associated with PNAE compliance can help in the decision-making of public policy managers related to school feeding and FF.

In this sense, this study aimed to identify the municipal characteristics associated with the compliance of the municipalities of Minas Gerais (MG) to purchase 30% of FF products for school meals in 2017. This state was selected as it is the second most populous state in Brazil, with an estimated population of 21,040,662 people, in addition to being the largest area of agricultural establishments (37,900,000.327 hectares), with the largest number of permanent crops (1,750,220.740 hectares) and largest number of rural producers in the southwest region (IBGE, 2017).

## MATERIALS AND METHODS

This exploratory study used secondary data from the public domain, available on government websites. The 2017 data on the percentage of food purchases for school feeding in MG municipalities were obtained from the FNDE's website (2017), which were in a spreadsheet containing information on food purchases from 848 (99.4%) of the 853 municipalities. Utilizing these data, we identified municipalities that reached the goal of purchasing food products with at least 30% of the resources transferred by the FNDE.

In addition, information related to the sociodemographic, economic, and agricultural profiles of the municipalities, as well as the number of students attending municipal schools, were included in line with this study's objective.

Among the sociodemographic and economic data, the municipal gross domestic product (GDP) (2015), territorial area (2017), municipal human development index (MHDI) (2010), and municipal population (2015) were investigated and consulted with the Brazilian Institute of Geography and Statistics (abbreviated Portuguese: IBGE) cities (IBGE, 2019).

The municipal GDP data were obtained through the sum of all final goods and services produced by the municipality in a one-year period. The territorial area, in turn, was estimated from the latitude, longitude, and parallels 1 and 2 parameters of Brazil. MHDI, on the other hand, is a measure composed of three human development indicators: longevity, education, and income. Lastly, municipal population is the total population estimate of Brazil's municipalities and federative units, which was calculated from the population data obtained from the population projections and the previous federative units, as well as the municipal population growth in the last decade, outlined by the respective census populations in the last two demographic censuses (IBGE, 2020).

Regarding the number of students from municipal public schools who were offered food from the PNAE program in their respective MG municipalities, this information was obtained from the year 2016 on the FNDE website (2016), regardless of education modality.

Meanwhile, variables related to the 2017 agricultural profiles of the municipalities were obtained from the IBGE website, which were in a spreadsheet containing basic municipal information, including the mayor in office, human resources by employment relationship, housing, transportation, agriculture and livestock, environment, risk management and disaster response, and other external variables (IBGE, 2020).

Given the broad range of data, this research only used the following information on agricultural characteristics: presence of a civil servant with training in agriculture and livestock breeding, existence of a Municipal Council for Rural Development, programs or actions to facilitate access to seeds, programs or actions to facilitate access to seedlings, programs or actions to facilitate access to fertilizers, programs or actions to stimulate organic agriculture, programs or actions to stimulate FF, presence of a public agency providing technical assistance and/or rural extension, official registration of rural unions, official registration of producer associations, official registration of cooperative associations, direct purchase programs or actions by the producers, purchase programs or actions by entities (associations or cooperatives), the Food Purchase Program (abbreviated Portuguese: PAA), and the Municipal Inspection Service (abbreviated Portuguese: SIM) (IBGE, 2020).

All collected municipal data were organized in an Excel® spreadsheet, wherein data analysis was performed using the statistical software Stata, version 12.0. We first obtained the average proportion of municipalities that met the PNAE's goal of purchasing FF products, which was then associated with the characteristics of municipalities using statistical tests of comparison for medians (Mann-Whitney) and proportions (Chi-square) at a significance level of 5% ( $P < 0.05$ ). Additionally, the adherence of quantitative variables to normal distribution was tested using the Kolmogorov Smirnov test.

## RESULTS

Of the 848 municipalities in this study, over half (55.07%) of them were able to meet the goal of purchasing FF products, as proposed by Law

11.947/2009, using the resources passed on to the PNAE by the FNDE in the year 2017.

Regarding the municipalities' sociodemographic and economic profile variables in 2017, presented in table 1, the median values were the following: municipal GDP per capita, R\$12,337.7; MHDl, 0.67; number of inhabitants, 8350.5; and area, 359.9 km<sup>2</sup>. The median number of students who attended municipal schools was 831.5. None of the sociodemographic or economic variables showed a statistically significant association with the compliance to purchase FF (Table 1).

Regarding the municipalities' agricultural profiles in 2017, 93.8% of them had a public agency that provided technical assistance and/or rural extension, 82.2% had an official record of producer associations, 80.9% had programs or actions to stimulate the PAA, and 73.9% joined the PAA (Table 2).

Among the municipal characteristics that were associated with the compliance to purchase FF products for the PNAE, the municipalities that implemented programs or actions to stimulate organic agriculture more often (29.8%) complied with the purchase of FF than municipalities that did not perform such actions (22.6%;  $P = 0.018$ ) (Table 2).

In addition, compliance with the purchase of 30% of FF products using FNDE resources was more frequently verified among municipalities that presented an official rural union registration (76.4%) than those that did not (68.8%;  $P = 0.026$ ). Similarly, 35.6% of municipalities that had the SIM met FF purchasing goal for the PNAE, while only 29.1% of municipalities that did not have this service met this goal ( $P = 0.048$ ) (Table 2).

The other variables related to the municipality's agricultural profile showed no statistically

Table 1 - Sociodemographic and municipal economic profiles and their association with the compliance to purchase from family farming by the National School Meals Program in Minas Gerais, 2017.

Variables	-----Total sample-----		-----Achievement of the goal-----				p-value
	M	P25-P75	-----Yes-----		-----No-----		
	M	P25-P75	M	P25-P75	M	P25-P75	
Residents	8330.5	4937-18006	8764	4989-18868	8008	4883-15556	0.272
Students	831.5	509-1644	867	520-1773	768	496-1469	0.092
Area (km <sup>2</sup> )	359.9	195.3-729.8	363.8	196.7-708.1	357.8	194.5-822.4	0.714
GDP (R\$)	12337.7	8989.7-17957.4	12511.1	9177-18363.5	11916.9	8814.4-17750.2	0.350
MHDl	0.67	0.63-0.70	0.67	0.63-0.71	0.67	0.63-0.69	0.142

MHDl: Municipal Human Development Index; M: median; P25: 25th percentile; P75: 75th percentile; GDP: Gross Domestic Product (per capita).

significant association with the achievement of the proposed goal (Table 2).

## DISCUSSION

This study showed that slightly more than half of the municipalities in the state of Minas Gerais met the 30% goal of purchasing FF products under the PNAE, wherein characteristics related to agricultural and livestock management in these municipalities were associated with the compliance to this goal, to the detriment of municipal sociodemographic and economic characteristics.

This percentage of non-compliance to purchase FF products for the PNAE was considered to be high, since Law No. 11947/2009 has been implemented for over 10 years applying to all municipalities in the country. In the Southeast region in 2017, municipalities in the state of São Paulo (37.03%) and Rio de Janeiro (38.04%) presented even lower percentages of compliance with this goal, whereas in Espírito Santo, 74.36% of municipalities were able to follow through with the 30% goal of purchasing FF products by PNAE (FNDE, 2017). In MG in 2011, the percentage of municipalities that purchased at least 30% of FF products for the PNAE was only noted to be 47% (MACHADO et al., 2018).

Similarly, a study that assessed the compliance to purchase food crops for the PNAE in the 26 capitals of Brazil also found great inadequacy. In 2016, only 12 of the 26 capitals had an average value exceeding 30% of the FNDE transferred funds used in the purchase of FF products under the PNAE (DIAS et al., 2020).

Given these findings, the authors have pointed out the need for more precise and efficient mechanisms to enforce this regulation by municipal managers and farmers' organizations. Additionally, an insufficient structure for producers to meet the demands of schools and the presence of large food companies involved in the public purchase of food are all factors contributing to the non-compliance of MG municipalities (REAL & SCHNEIDER, 2011; BEZERRA et al., 2013; SARAIVA et al., 2013).

This discussion was supported by the results of this study, showing that characteristics associated with the management of programs and actions in the agricultural sector were associated with compliance to purchase FF products under the PNAE.

Particularly, a similar study that identified characteristics associated with meeting the PNAE goal of purchasing FF products in 2016 among the Brazilian capitals showed that the South region capitals were the ones that allocated the least resources for the purchase of FF products, whereas the North region capitals were the ones that best allocated these resources (DIAS et al., 2020). Despite this, the literature indicated that the municipalities in the South have a higher percentage of meeting the minimum criteria for using the FNDE's resources for the purchase of FF products under the PNAE, given their rural tradition and better levels of organization and management structures (BACCARIN et al., 2017). Thus, consistent to the present study's findings, the authors in that study argued that the uneven use of resources in the purchase of FF products throughout the national territory seemed to be more related to the

Table 2 - Municipal agricultural and livestock profiles and their association with the compliance to purchase from family farming by the National School Meals Program in Minas Gerais, 2017.

Variables	Total (%)	--Target achievement (%)--		
		Yes	No	p-value
Presence of permanent staff with training in agriculture and cattle ranching	41.6	43.5	39.4	0.228
Existence of the Municipal Council for Rural Development	56.9	58.9	54.6	0.209
Facilitated access to seeds program or action	43.5	42.6	44.6	0.558
Facilitated access program or action seedlings	46.3	48.6	43.6	0.143
Programs or actions facilitating access to fertilizers	16.5	17.6	15.2	0.362
Programs or actions to stimulate organic agriculture	26.5	29.8	22.6	0.018
Programs or actions to stimulate family farming	80.9	82.9	72.5	0.106
Presence of a public agency providing technical assistance and/or rural extension	93.8	94.9	92.4	0.139
Official registration of rural union	72.9	76.4	68.8	0.026
Official registration of producer associations	82.2	81.6	82.8	0.631
Official registration of cooperative associations	27.3	28.3	26.1	0.505
Direct producer purchase programs or actions	38.9	39.2	38.8	0.920
Programs or actions of acquisition by entities (associations or cooperatives)	23.5	25.7	20.4	0.105
Food Purchase Program of Family Agriculture	73.9	74.6	73.1	0.670
Municipal Inspection Service	32.7	35.6	29.1	0.048

administrative and management structures, rather than their extension or other municipal sociodemographic characteristics (DIAS et al., 2020).

Therefore, municipal governments can promote compliance to purchase FF products under the PNAE based on how the transfer of financial resources is made (e.g., centralized, decentralized) by replacing conventional tenders with public calls for proposals, by modifying school menus to adapt to the productive conditions of family farmers and their seasonality, and by prioritizing products with a lower degree of processing. In addition, inspection services can also be offered, which will follow sanitary rules to ensure product safety, guaranteeing the frequency and number of delivery points for FF products through receipt centralization (FERIGOLLO et al., 2017).

In this perspective, studies have also shown that the difficulties of family farmers to supply the PNAE were attributed to the executing entities' lack of consideration towards the need for product packaging, the high travel costs due to the great distance between schools and producers, and the need for weekly or biweekly product deliveries, resulting to the outdated of the advertised prices. Furthermore, factors related to the absence of essential information in public calls, such as the frequency and number of places for delivery, which were associated with the bureaucracy of documents needed by farmers and the limited cooperation among nutrition sectors, were found to limit the participation of family farmers in PNAE public calls (TURPIN, 2009; TORRES, 2011; BACCARIN et al., 2017, ASSIS et al., 2019).

In this study, the municipalities that encouraged organic agriculture had a higher prevalence of compliance with FF purchases under the PNAE. These characteristics were related to the support given to organic producers, either by granting inputs or by direct encouragement. Moreover, the official registration of the rural trade union and the SIM was directly associated with target compliance.

Specifically, the Rural Union System is a form of strengthening and an expansion of the FF, in which the unions of employers and rural workers aim to congregate members of their respective categories to defend their interests in favor of its members' appreciation and socioeconomic development through the promotion of agriculture and livestock (PREZOTTO, 2013; PICOLOTTO, 2018).

Meanwhile, the Municipal Inspection Service (SIM), as identified earlier, is responsible for inspecting and monitoring the sanitation and industrial production of animal products. Thus, the adherence of municipalities to this service favors the

FF since it allows the insertion of local, regional, or national products in the formal market, especially in the institutional market, such as the PNAE and other government purchases, given their health quality requirements (PREZOTTO, 2013; SISTEMA FAMATO, 2019).

Consistent with the present study's findings, TURPIN (2009) also highlighted the relevance of actions, such as the PAA, the simplification of the SIM certification process, and the allocation of resources, for the improvement of production and infrastructure processing. Additionally, the author pointed out the importance of bringing in technical assistance and rural extension companies closer to the PNAE, carrying out the registration of family producers and supporting local businesses to facilitate the product purchasing from the PAA.

Thus, it becomes evident that municipal managers assume an essential role in the management of agricultural programs within their municipalities, regardless of their sociodemographic and economic characteristics. In this sense, this study has an essential interface with public policy, as it highlighted desirable management practices in the context of a city government for the consolidation of the PNAE program to support food and nutrition security and the fulfillment of the human right to adequate food.

Despite these findings, this study had certain limitations, especially with the use of secondary data, of which their quality was assured by the original institutions (FNDE and IBGE). Furthermore, other municipal data not available in the municipalities or their databases could have possibly been associated with the compliance to purchase FF products under the PNAE. In that sense, the importance of recording municipal data and its availability for scientific research needs to be highlighted to build evidence regarding the effectiveness of important public policies in the country, as carried out by this research on the PNAE.

## CONCLUSION

In conclusion, it was found that slightly over half the municipalities of Minas Gerais met the target for purchasing products from the farming sector under the PNAE. Furthermore, it was identified that compliance with the law was related to its existence within the policies of the municipality and the actions promoting the development of family farming enterprises, such as endeavors encouraging organic agriculture and the presence of an official rural union registration and the SIM. Given that the evidence has associated agricultural and livestock management

characteristics with compliance to the food procurement target, further studies are recommended to clarify how these actions effectively contribute to improving food procurement by the PNAE.

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## BIOETHICS AND BIOSSECURITY COMMITTEE APPROVAL

The study contains only freely available secondary data. Also, no data collection involving humans was applied.

## AUTHORS' CONTRIBUTIONS

Conceptualization: IAA, JDLF and PMH. Data acquisition: IAA and PMH. Design of methodology and data analysis: JDLF and PMH. IAA prepared the draft of the manuscript. JDLF and PMH critically revised the manuscript. All authors approved of the final version.

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