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Food supply dynamics from the perspective of Farmers Markets: aspects of the consumer food environment

Dinâmicas de abastecimento alimentar na perspectiva das feiras livres: aspectos do ambiente alimentar do consumidor

Abstract

Introduction: Farmers markets are a segment of food supply dynamics and play a significant role as part of the consumer food environment. **Objective:** To present the dynamics of food supply at farmers markets in the municipalities of Mariana and Ouro Preto - MG, as well as the sociodemographic characteristics of vendors and attendees. **Methods:** Cross-sectional study carried out in farmers markets in the municipalities of Mariana and Ouro Preto - MG, with primary data. Seven farmers markets were evaluated in relation to the supply profile, profile of vendors and attendees. The Shapiro-Wilk test was used to assess the normality of the data and a descriptive analysis was performed using the mean, prevalence percentage and confidence interval (95% CI). **Results:** There was a predominance of conventional markets; organic foods were sold alongside a greater supply of fruits and vegetables relative to ultra-processed foods; most vendors produced the food they sold; and attendees reported shopping at the farmers markets weekly and had been attending the market for more than 6 months. **Conclusions:** Farmers markets provide healthy food to the population, thereby fulfilling an important role in food supply and contributing to spaces capable of promoting Food and Nutrition Security through sustainable and healthy food environments.

Keywords: Food Security. Food Supply. Food Production. Access to Healthy Foods. Urban Food Consumption.

Resumo

Introdução: As feiras livres são um segmento de dinâmica de abastecimento alimentar e desempenham significativo papel enquanto ambiente alimentar do consumidor. **Objetivo:** Apresentar as dinâmicas de abastecimento alimentar das feiras livres dos municípios de Mariana e Ouro Preto-MG, bem como as características sociodemográficas dos feirantes e frequentadores. **Métodos:** Estudo transversal realizado nas feiras livres dos municípios de Mariana e Ouro Preto, Minas Gerais, com dados primários. Foram avaliadas sete feiras em relação ao perfil de abastecimento, perfil dos feirantes e dos

frequentadores. Foi utilizado o teste Shapiro-Wilk para avaliar a normalidade dos dados e realizada análise descritiva pela média, percentual de prevalência e intervalo de confiança (IC95%). **Resultados:** Observou-se predominância de feiras convencionais, com comercialização de alimentos orgânicos, maior oferta de frutas e hortaliças em detrimento da comercialização de alimentos ultraprocessados; os feirantes produziam os alimentos comercializados e os frequentadores declararam fazer compras nas feiras semanalmente e frequentavam a feira há mais de 6 meses. **Conclusões:** As feiras livres fornecem alimentos saudáveis e de qualidade à população, cumprindo assim importante papel no abastecimento alimentar, contribuindo com espaços capazes de promover a Segurança Alimentar e Nutricional por meio de sistemas e ambientes alimentares sustentáveis e saudáveis.

Palavras-chave: Segurança Alimentar. Abastecimento de alimentos. Produção de alimentos. Acesso a alimentos saudáveis. Alimentação no contexto urbano.

INTRODUCTION

The food environment can be defined as the “collective physical, economic, political, and sociocultural environment, as well as the opportunities and conditions that influence food and beverage choices and individuals’ nutritional status,”¹ for which growing scientific evidence has demonstrated a direct relationship with dietary choices and the nutritional status of the population.²

As a component of the food environment, farmers markets constitute an important segment of food supply dynamics within food systems since the emergence and development of cities. In Brazil, they date back to the colonial period, with the arrival of the Portuguese.^{3,4} These are places where food is offered and, together with their attributes - such as location, accessibility, price, and food quality - are notable for their influence on individuals’ purchasing decisions, often distinguishing them from conventional retail markets.^{5,6}

With their development and expansion, farmers markets have come to play an important role as part of the consumer food environment, particularly with regard to their function as venues for the provision of healthy foods to the population and as a typology of traditional food systems.⁷ Despite economic development and transformations in urban food supply dynamics, farmers markets persist in different locations as important representatives of traditions, culture, regional identity, social interaction, and knowledge, in addition to serving as a key means for the availability and access to products originating from family farming.⁸

With the aim of promoting Food and Nutrition Security (FNS) among the population, national policies and programs - including farmers markets - include among their guidelines the facilitation of the commercialization (availability and access) of healthy foods, in addition to fostering more equitable and sustainable food systems.^{3,9} In this context, it is important to highlight the relevance of farmers markets as instruments for promoting FNS. However, there are still few scientific studies that explore this topic with regard to food supply dynamics, particularly emphasizing the consumer food environment as a setting for the provision of healthy foods.¹⁰

Given the relevance of these spaces as promoters of a healthy food supply, it is essential to understand the characteristics of farmers markets as components of the consumer food environment and as instruments of public food policies. Therefore, considering the importance of food-related issues, the objective of this study was to present the food supply dynamics of farmers markets in two Brazilian municipalities. The analysis is based on the hypothesis that farmers markets are potential instruments for the provision of healthy foods to the population.

METHODS

A descriptive, cross-sectional study was conducted in the municipalities of Mariana and Ouro Preto, Minas Gerais (MG), Brazil, in which the following were assessed: (i) farmers markets; (ii) vendors; and (iii) market consumers. The municipality of Mariana has a total population of 61,387 inhabitants, according to the 2022 Brazilian Institute of Geography and Statistics (IBGE) Census. In addition, it has a territorial area of 1,194.208 km² (2020), with 47,642 individuals residing in urban households and 6,577 in rural areas, and a population density of 45.40 inhabitants per km² (2010). The municipality’s Human Development Index (HDI) is 0.742.^{11,12}

The municipality of Ouro Preto has a total population of 74,824 inhabitants, according to the 2022 Brazilian Institute of Geography and Statistics (IBGE) Census. It has a territorial area of 1,245.865 km² (2020),

with 61,120 individuals residing in urban households and 9,161 in rural areas, and a population density of 56.41 inhabitants per km² (2010). The municipality's Human Development Index (HDI)^{1a} is 0.741.^{11,12}

Data collection was carried out from March to April 2020 by three properly trained and qualified evaluators (two undergraduate students and one graduate student, all from the field of Nutrition). To prepare the evaluators, a theoretical and practical training was conducted covering the questionnaire's characteristics, approaches to participant engagement, and data recording procedures. In addition, a detailed field manual was developed, outlining the entire data collection process and the instrument used. The entire data collection process was supervised by a field coordinator and the principal investigator, in order to ensure consistency in data collection procedures and homogeneity of the information collected.

The sample comprised all farmers markets existing in the two selected municipalities. Information regarding the presence and operation of markets in the municipality of Mariana (MG) was obtained from the official Municipal Government website (<https://www.mariana.mg.gov.br>), identifying two markets held on Saturdays and Wednesdays, operating in the morning from 7:00 a.m. to 12:00 p.m. For the municipality of Ouro Preto (MG), information was obtained from the Municipal Department of Agriculture (<https://ouropreto.mg.gov.br/lista-secretarias>), identifying seven farmers markets, all operating in the morning from 7:00 a.m. to 12:00 p.m., at different locations and on different days of the week.

Due to the social distancing measures imposed during the COVID-19 pandemic, adopted in accordance with the guidelines of the Ministry of Health and the World Health Organization (WHO), and aimed at ensuring care, safety, and the integrity of both participants and the research team, data collection was not conducted in two of the seven farmers markets located in the municipality of Ouro Preto.

In addition to the markets, vendors operating in the farmers markets of the municipalities under study were assessed, that is, individuals who sell food in these settings.¹³ The inclusion criteria for vendors were: being present at the market on the day of questionnaire administration and agreeing to participate by signing the Informed Consent Form (ICF). Finally, market consumers were also assessed, including individuals aged 18 years or older who attended the markets, randomly selected, and who agreed to participate in the study at the time of data collection by signing the ICF.

A previously tested questionnaire was used, developed by the research team based on items obtained and adapted from national studies on food consumption and acquisition.^{6,14}

To characterize the commercialization profile of farmers markets, the questionnaire was administered to individuals responsible for the markets, previously identified through the Mariana Vendors' Association and the Municipal Department of Agriculture of Ouro Preto. This questionnaire included items related to market operation, location, and type of market (agroecological, in agroecological transition, and conventional). Agroecological markets were defined as those whose products originate from agroecological farming—production systems that preserve biodiversity, do not use chemical inputs, and value fair production relations, including gender and labor relations. Markets in agroecological transition were defined as those that commercialize products from farmers transitioning from conventional to agroecological production. Conventional markets, in turn, were characterized by the sale of products sourced from wholesale supply centers (CEASA), with vendors acting as intermediaries, or products from producers who use chemical inputs in their production (such as fungicides, herbicides, and pesticides in general).¹⁵ Regarding the characteristics of foods commercialized in the markets, according to the consumer food

^{1a} According to the latest official data from the 2010 Census.

environment, the following were assessed: quantity (number of items available in each evaluated food category), availability (yes or no), variety (total number of varieties of each evaluated food), cost (lowest prices found for fruits and vegetables (FV)), and the quality (good or poor) of FV. The types of foods offered at the markets were also examined, categorized according to the NOVA classification as: (i) fresh or minimally processed foods - fruits, vegetables, herbs, cheeses, breads, eggs, and milk; and (ii) ultra-processed foods - filled cookies, chips, soft drinks, and fruit nectars; as well as ready-to-eat foods, such as tropeiro, spaghetti, griddled pasta, sugarcane juice, coxinha, pastel, and sweets.¹⁶

The fruits assessed in the study questionnaire were banana, orange, and apple. The vegetables evaluated were lettuce, tomato, and carrot. The selection of these foods was based on consumption data from the 2017-2018 Household Budget Survey (POF) for the state of Minas Gerais.¹⁷

Additionally, the availability and variety of non-conventional food plants (PANCs) were assessed. The foods evaluated in this category were ora-pro-nóbis, taioba, and azedinha, corresponding to the most common PANCs in the municipalities under study.¹⁸

To assess vendors, the questionnaire included socioeconomic variables such as age, sex, and education level (no formal education, incomplete primary education, complete primary/incomplete secondary education, complete secondary/incomplete higher education, and complete higher education). In addition, vendors were asked about the sale of organic products, the approximate quantity of organic products commercialized, whether they held an organic and/or agroecological certification label, whether their family produced the food they sold, and the category in which they were classified - farmer, intermediary, farmer and seller of their own products, vendor, street vendor of manufactured products, artisan, or other. The items were based on previous studies on the topic, and data were collected through face-to-face interviews.^{13,19}

Regarding these categories, farmer refers to vendors who are engaged in farming activities, agriculture, and land cultivation; intermediary refers to vendors who commercialize products from third parties, including other buyers and/or producers; farmer and seller of their own products refers to vendors who exclusively commercialize products from their own crops, livestock, or processing activities; vendor refers to those who sell products from third parties; street vendors of manufactured products are those who commercialize products industrially processed from raw materials; and artisans are vendors who sell handcrafted products that they themselves have created or produced.²⁰

Regarding consumers, the questionnaire comprised sociodemographic variables such as age, sex, and education level (no formal education, incomplete primary education, complete primary/incomplete secondary education, complete secondary/incomplete higher education, and complete higher education), as well as perceived proximity of residence to the market. It also included questions on the purchase and consumption of FV, frequency of market attendance, duration of market use, the main establishment where FV are purchased, other establishments where these foods are purchased, reasons for shopping at the market, weekly consumption of FV, and the estimated number of portions consumed. The items were also based on previous studies on the topic, and data were collected through face-to-face interviews.²⁰

After completion of questionnaire administration, data consistency checks were performed by the responsible researchers. Subsequently, the data were entered into a spreadsheet using Microsoft Excel (version 2010). Further consistency analyses were conducted for all variables to identify unusual and/or missing values. Finally, descriptive data analysis was performed using Stata software (version 14.0), with results presented as means, prevalence, and 95% confidence intervals (95% CI).

The main project of which this study is a part was approved by the Research Ethics Committee of the Federal University of Ouro Preto, Minas Gerais, under protocol number 4,288,463. Participants were

informed about the objectives and methods of the study and, upon agreeing to participate, signed the Informed Consent Form (ICF).

RESULTS

Farmers Markets

Data were collected from seven farmers markets (28.6% in Mariana and 71.4% in Ouro Preto). Most were conventional ($n = 4$; 57.2%; 95% CI: 15.0-91.0), had official registration with the municipal government ($n = 5$; 71.5%; 95% CI: 21.5-95.9), were located in urban areas ($n = 4$; 57.2%; 95% CI: 15.0-91.0), and operated on weekdays ($n = 4$; 57.2%; 95% CI: 15.0-91.0). All markets operated only once per week and during the morning period. Most markets had a small number of stalls, and Market E stood out with the highest number of vendors ($n = 32$) (Table 1).

Table 1. Characterization of the farmers markets evaluated in the municipalities of Mariana and Ouro Preto, Minas Gerais, Brazil, 2020.

Variables	Total ($n = 7$)	% (95% CI)*
<i>Type</i>		
Agroecological	3	42.8 (9.0-85.0)
Agroecological transition	0	-
Conventional	4	57.2 (15.0-91.0)
<i>Registered with the Municipal Government</i>		
Yes	5	71.5 (21.5-95.9)
No	2	28.5 (4.2-78.5)
<i>Territorial area</i>		
Urban area	7	100 (1)
Rural area	0	-
<i>Location</i>		
Urban area	3	42.86 (9.0-85.0)
Peripheral area	4	57.14 (15.0-91.0)
<i>Days of operation</i>		
Weekdays	4	57.2 (15.0-91.0)
Weekends	3	42.8 (9.0-85.0)
<i>Frequency of operation</i>		
One day	7	100 (1)
More than one day	0	-
<i>Operating hours</i>		
Morning	7	100 (1)
Afternoon	0	-
Night	0	-
<i>Number of vendors</i>		
Market A	1	2.04 (0.2-14.0)
Market B	9	18.37 (9.6-32.2)
Market C	2	4.08 (0.9-15.6)
Market D	3	6.12 (1.9-18.0)
Market E	32	65.31 (50.6-77.6)
Market F	1	2.04 (0.2-14.0)
Market G	1	2.04 (0.2-14.0)

*Confidence interval.

Most vendors sold organic foods (66.7%; 95% CI: 51.7-78.8), and the proportion of organic foods available at the stalls represented more than half or the entirety of the products sold (68.8%; 95% CI: 50.0-83.0). A large proportion of vendors did not hold organic and/or agroecological certification (94.7%; 95% CI: 80.2-98.8) (Table 2).

Table 2. Characterization of foods sold at farmers markets in the municipalities of Mariana and Ouro Preto. Minas Gerais, Brazil, 2020.

Variables	Total (n=49)	% (95% CI)*
<i>Commercialization of organic foods</i>		
<i>Commercialization of organic foods</i>		
Yes	32	66.7 (51.7-78.8)
No	16	33.3 (21.2-48.3)
<i>Percentage of organic foods commercialized</i>		
1 to 25%	2	6.3 (1.5-23.2)
26 to 50%	5	15.7 (6.3-33.7)
51 to 75%	2	6.3 (1.5-23.2)
76 to 100%	22	68.8 (50.0-83.0)
Does not know	1	3.2 (0.4-20.9)
<i>Holds organic and/or agroecological certification</i>		
Yes	0	-
No	36	94.7 (80.2-98.8)
Does not know	2	5.3 (1.3-19.9)
<i>Commercialization of non-conventional food plants (PANCS)</i>		
<i>PANCs available at the stall</i>		
0	36	73.5 (59.0-84.2)
1	9	18.4 (9.6-32.3)
2 or more	4	8.2 (2.9-20.4)
<i>Availability (yes)</i>		
Ora-pro-nóbis	2	4.1 (1.0-15.6)
Taioba	10	20.5 (11.0-34.5)
Azedinha	2	4.0 (1.0-15.6)
<i>Commercialization of foods according to degree of processing</i>		
<i>Availability (yes)</i>		
Fruits	32	65.3 (50.6-77.6)
Vegetables	33	67.3 (52.7-79.2)
Ultra-processed foods	1	2.0 (0.2-14.0)
Ready-to-eat foods	5	10.3 (4.2-22.9)
<i>Variety of fresh/minimally processed foods at the stall (number of items available)</i>		
0	10	20.5 (11.0-34.5)
1	6	12.3 (5.5-25.2)
2 or more	33	67.3 (52.7-79.2)
<i>Availability of fruits at the stall (number of items available)</i>		
0	17	34.7 (22.4-49.4)
1	13	26.5 (15.8-41.0)
2 or more	19	38.7 (25.8-53.4)
<i>Availability of vegetables at the stall (number of items available)</i>		
0	16	32.7 (20.8-47.3)
1	5	10.3 (4.2-22.9)
2	28	57.2 (42.5-70.6)
<i>Availability of ultra-processed foods at the stall (number of items available)</i>		
0	46	97.8 (85.5-99.8)
1	0	-
2 or more	1	2.2 (0.2-14.5)
<i>Availability of ultra-processed foods at the stall</i>		
Industrialized cookies	0	-
Ultra-processed cookies	0	-
Packaged snacks	0	-
Soft drinks	1	2.0 (0.2-14.0)
Sugary beverages ^A	1	5.3 (0.7-33.7)

Table 2. Characterization of foods sold at farmers markets in the municipalities of Mariana and Ouro Preto. Minas Gerais, Brazil, 2020.(Continues)

Variables	Total (n=49)	% (95% CI)*
<i>Commercialization of organic foods</i>		
<i>Ready-to-eat foods available at the stall (number of items available)</i>		
0	37	78.7 (64.2-88.5)
1	1	2.2 (0.2-14.5)
2 or more	9	19.1 (10.1-33.4)
<i>Availability of ready-to-eat foods at the stall</i>		
Savory snacks ^B	4	21.0 (7.4-47.4)
Stews, tropeiro	0	-
Sugarcane juice	2	10.5 (2.3-37.2)
Homemade sweets	12	63.2 (38.1-82.7)

*Confidence interval.

A: Soft drinks, fruit juices, and sweetened beverages

B: Pastries and coxinha

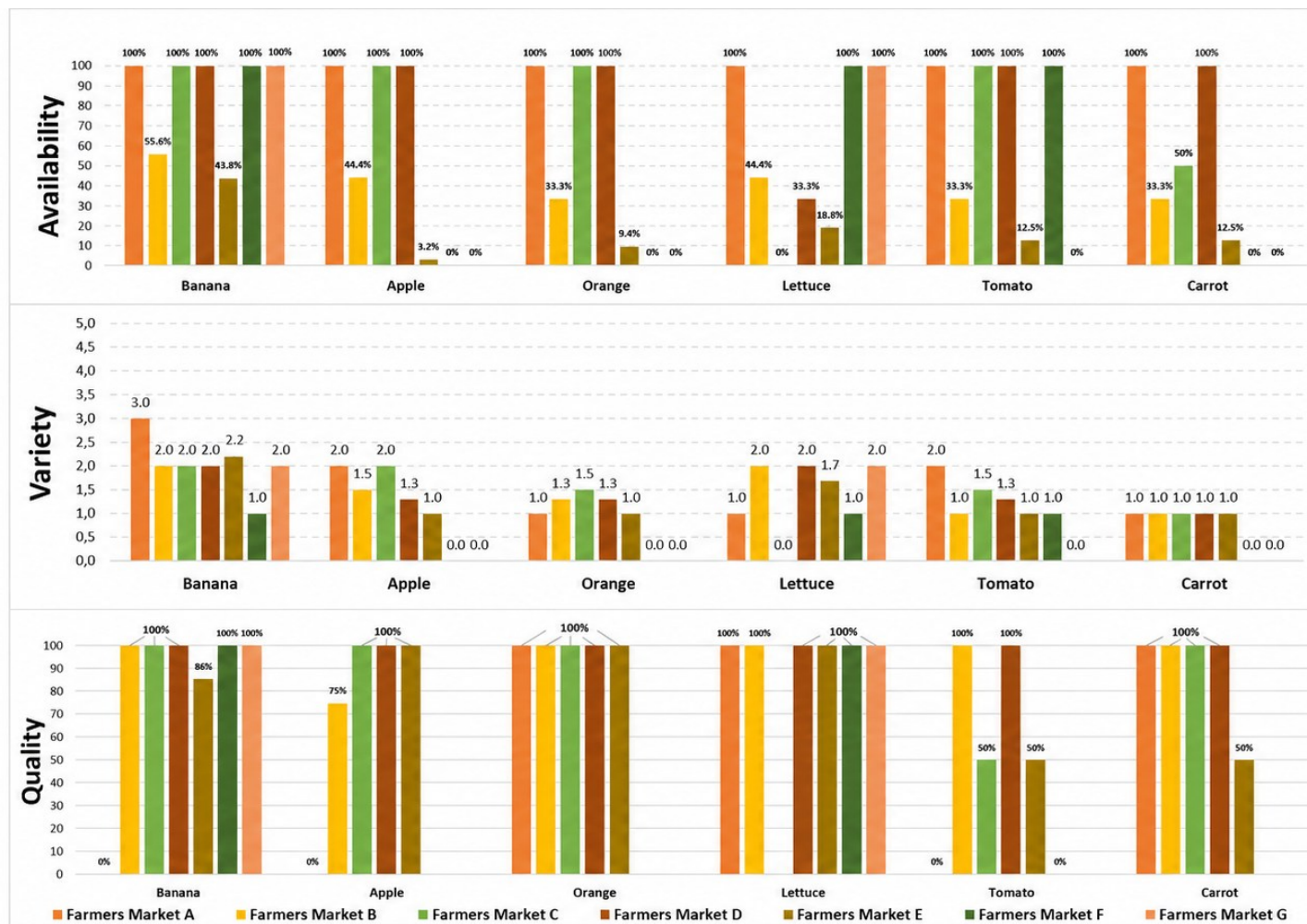
Regarding the commercialization of non-conventional food plants (PANCs), most vendors did not sell any type at their stalls (73.5%; 95% CI: 59.0-84.2). With respect to the availability of PANC varieties, taioba was the most commonly found (20.5%; 95% CI: 11.0-34.5), followed by ora-pro-nóbis (4.1%; 95% CI: 1.0-15.6) and azedinha (4.0%; 95% CI: 1.9-18.0).

Most vendors also sold fruits (65.3%; 95% CI: 50.6-77.6) and vegetables (67.3%; 95% CI: 52.7-79.2). The majority offered two or more fresh and/or minimally processed food items (67.3%; 95% CI: 52.7-79.2). Regarding variety, most reported having two or more varieties of fruits (38.7%; 95% CI: 25.8-53.4) and vegetables (57.2%; 95% CI: 42.5-70.6) (Table 2).

Overall, among the markets evaluated, a low commercialization of ultra-processed foods was observed (2.0%; 95% CI: 0.2-14.0), with no variety identified at most stalls (97.8%; 95% CI: 85.5-99.8). This finding was corroborated by the limited availability of only soft drinks (5.3%; 95% CI: 0.7-33.7) and sugar-sweetened beverages (5.3%; 95% CI: 0.7-33.7). Regarding ready-to-eat foods (10.3%; 95% CI: 4.2-22.9), most stalls did not offer any variety (78.7%; 95% CI: 64.2-88.5). However, some vendors reported offering two or more items, which was confirmed by the observed sale of homemade sweets (63.2%; 95% CI: 38.1-82.7), savory snacks (21.0%; 95% CI: 7.4-47.4), and sugarcane juice (10.5%; 95% CI: 2.3-37.2).

Regarding the commercialization of FV, availability, variety, and quality were assessed for each market, as presented in Figure 1. Concerning the fruits evaluated, most markets sold apples, bananas, and oranges; however, overall, they exhibited low variety, although the majority were of good quality. The least expensive fruit was orange, with an average price of R\$2,40/kg, followed by banana at R\$2,50/kg and apple at R\$5,00/kg..

Figure 1. Commercialization of fruits and vegetables at farmers markets in the municipalities of Mariana and Ouro Preto. Minas Gerais, Brazil, 2020.



Among the vegetables assessed, lettuce, tomato, and carrot showed low availability, as well as low variety. The least expensive vegetable was lettuce, with an average price of R\$2,10 per unit, followed by carrot at R\$2,90/kg and tomato at an average price of R\$4,30/kg.

Vendors

The final sample comprised 49 vendors. Among those interviewed, the majority were male (60.5%; 95% CI: 45.6-73.6), aged between 40 and 59 years (42.9%; 95% CI: 29.5-57.2), and had incomplete primary education (47.0%; 95% CI: 33.1-61.2). Most vendors reported producing the food they sold (68.8%; 95% CI: 53.8-80.6) and classified themselves as both farmers and sellers of their own products (46.9%; 95% CI: 33.9-62.2) (Table 3).

Table 3. Characterization of vendors at farmers markets in the municipalities of Mariana and Ouro Preto. Minas Gerais, Brazil, 2020.

Variables	Total (n=49)	% (95% CI)*
<i>Age group</i>		
14 to 19 years	3	6.12 (1.9-17.7)
20 to 24 years	1	2.04 (0.28-13.7)
25 to 39 years	15	30.61 (19.1-45.1)
40 to 59 years	21	42.86 (29.5-57.2)
60 years or older	9	18.37 (6.8-27.7)
<i>Sex</i>		
Male	29	60.5 (45.6-73.6)
Female	19	39.5 (26.4-54.4)
<i>Education level</i>		
No formal education	0	-
Incomplete primary education	23	47.0 (33.1-61.2)
Complete primary / incomplete secondary education	9	18.4 (9.6-32.3)
Complete secondary / incomplete higher education	16	32.7 (20.8-47.3)
Complete higher education	1	2.0 (0.2-13.0)
<i>Commercialization characteristics</i>		
<i>Produces the food they sell</i>		
Yes	33	68.8 (53.8-80.6)
No, purchases from municipal markets	3	6.3 (1.9-18.4)
No, intermediary of another producer	12	25.0 (14.5-39.7)
<i>Producer category</i>		
Farmer and seller of their own products	23	47.92 (33.9-62.2)
Intermediary	14	29.17 (17.8-43.9)
Seller	10	20.83 (11.4- 34.9)
Street vendor of manufactured products	0	-
Artisan	1	2.8 (0.2- 14.0)

*Confidence interval.

Consumers

A total of 79 consumers were interviewed across the evaluated markets. Among those interviewed, the majority were female (64.6%; 95% CI: 53.2-74.4), aged 60 years or older (53.2%; 95% CI: 42.0-64.0), had completed secondary education or had incomplete higher education (38.0%; 95% CI: 27.7-49.3), and lived near the market (64.6%; 95% CI: 53.2-74.4).

Regarding the frequency of shopping at the markets (Table 4), most respondents reported purchasing food at these locations on a weekly basis (72.1%; 95% CI: 62.0-81.0) and were regular attendees, having frequented the markets for more than six months (89.8%; 95% CI: 80.8-94.9). Among the possible establishments for purchasing FV, farmers markets were reported as the primary source for acquiring these foods (67.1%; 95% CI: 55.7-79.6) (Table 2). As for the potential acceptability of consuming unfamiliar FV, most consumers reported that they would purchase FV available at the markets (67.0%; 95% CI: 55.7-76.7 and 60.8%; 95% CI: 49.3-71.1, respectively), even if they were not familiar with them.

Table 4. Characteristics of food purchasing by attendees of the farmers markets evaluated in the municipalities of Mariana and Ouro Preto. Minas Gerais, Brazil, 2020.

Variables	Total (n=79)	% (95%CI)*
<i>Frequency of market visits</i>		
Weekly	57	72.1 (62.0-81.0)
Biweekly	13	16.5 (9.6-26.6)
Monthly	2	2.5 (0.6-9.9)
Rarely	7	8.9 (4.2-17.6)
<i>Length of time attending the market</i>		
More than 6 months	7	89.8 (80.8-94.9)
Less than 6 months	4	5.1 (1.8-12.9)
Does not know	4	5.1 (1.8-12.9)
<i>Purchase of fruits and vegetables</i>		
Mostly at the market	53	67.1 (55.7-79.6)
At the market and other places (greengrocers, supermarkets, etc.)	19	24.0 (15.7-35.0)
Mostly at other establishments	7	8.9 (4.2-17.6)
<i>Purchase of fruits and vegetables at other establishments</i>		
Greengrocer / Fruit and vegetable store	22	27.8 (18.9-38.9)
Local neighborhood market	12	15.2 (8.7-25.1)
Supermarkets / Hypermarkets	27	34.1 (24.4-45.5)
Street vendors	5	6.3 (2.6-14.5)
Other establishments	1	1.2 (0.1-8.8)
Purchase only at the market	12	15.2 (8.7-25.1)
<i>Reason for purchasing at the market</i>		
Cheaper	2	2.5 (0.6-9.9)
Better quality	12	15.1 (8.7-25.1)
Close to home, work, or other location	9	11.4 (6.0-20.8)
Part of my culture	4	5.1 (1.8-12.9)
I trust the vendors	8	10.1 (5.1-19.2)
Support the producers and sustainability	1	1.3 (0.1-8.8)
Pesticide-free / healthier	35	44.3 (33.6-55.7)
Other	8	10.1 (5.1-19.2)
<i>Purchase of unfamiliar fruits</i>		
Would purchase	53	67.0 (55.7-76.7)
Would not purchase	26	33.0 (23.2-44.3)
<i>Purchase of unfamiliar vegetables</i>		
Would purchase	48	60.8 (49.3-71.1)
Would not purchase	31	39.2 (28.9-50.7)

*Confidence interval.

Consumers reported that the main reasons for shopping at farmers markets were the availability of healthier foods/foods produced without the use of pesticides (44.3%; 95% CI: 33.6-55.7) and better product quality (15.1%; 95% CI: 8.7-25.1).

DISCUSSION

As observed, regarding the typologies of farmers markets and food supply dynamics, most markets - located in Ouro Preto and Mariana, Minas Gerais - commercialized both conventional and agroecological foods, including some non-conventional food plants (PANCs). They were also favorable environments for the commercialization of fresh and/or minimally processed foods. Other noteworthy aspects include the good availability, quality, and low cost of FV in most of the markets evaluated, as well as the low commercialization of ultra-processed foods and ready-to-eat items.

Regarding the vendors assessed, most were farmers and producers of their own food, predominantly male, and with low levels of education. Finally, the majority of farmers market consumers were women aged over 60 years, with complete secondary education or incomplete higher education, who lived near the markets and attended them regularly.

The demand for healthy and sustainable diets has increased in recent years, as reflected by the growing demand for and consumption of organic foods, although organic food markets remain fewer in number.²¹ As part of this context, non-conventional food plants (PANCs) are noteworthy, as their cultivation contributes to the development of sustainable agriculture, the conservation of local biodiversity, and the preservation of cultural heritage across generations, thereby supporting food sovereignty.¹⁸ In this sense, Food and Nutrition Education actions targeting vendors represent viable strategies to encourage the purchase of locally produced foods, as opposed to foods from the dominant food system, in line with the 2030 Agenda for Sustainable Development proposed by the United Nations.²²

Farmers Markets represent an important instrument that facilitates the commercialization of FV. Therefore, their existence and presence are highly relevant, which is supported by a study conducted by Costa et al. in the territory of the Health Academy Program in Belo Horizonte,²³ where farmers markets were the most frequently identified establishments within the study area. However, it is important to consider that, as a large proportion of producers commercialize organic foods from their own production, the availability, diversity, and quality of these products are influenced by factors such as climate and seasonality, leading to fluctuations in food variety and prices.²⁴ Regarding price variations, it is noteworthy that food prices changed after the data collection period. Therefore, costs should be continuously monitored, as globalized food systems are under strain due to climate change, potentially exacerbating inequalities and worsening FNS outcomes.²⁵

Although a large proportion of fresh foods was available, some ultra-processed items were identified, including soft drinks, juices, and ready-to-eat foods (savory snacks, sweets, and sugarcane juice). This notable availability of foods high in sugar, oils, and sodium was also observed in a study conducted in Health Academy Program (PAS) centers in Belo Horizonte, suggesting an increasing presence of unhealthy foods in environments previously considered health-promoting.²³ Despite the growing trend of small and traditional markets incorporating elements of the dominant food system, it is important to emphasize that farmers markets still show resistance to this shift, as evidenced by the relatively low number of ultra-processed foods found to be commercialized.¹⁰

Another important element concerns the socioeconomic characteristics of vendors. Although the findings indicate that a large proportion of responsibility for market activities lies with men, women have increasingly occupied these spaces in search of autonomy.²⁶ The low level of education observed among vendors reflects broader issues within the Brazilian educational system, which limits access to education for more vulnerable populations and/or those at risk - conditions that are common in rural areas and among lower-income groups.²⁷ Therefore, it is essential to provide favorable conditions that enable farmers to improve their level of education, including as a means to increase their income.

This finding has positive implications for the relationship between vendors and consumers, as it strengthens interpersonal ties and highlights the role of vendors in food production, thereby increasing trust in the products purchased. It also contributes to price negotiation and to meeting consumer preferences.²⁴ From this perspective, it is also important to emphasize the appreciation of quality, as well as the economic, environmental, cultural, and political dimensions associated with the short distance that food travels from production to final consumption.²⁸

Regarding the consumers interviewed in this study, who were predominantly women, it is assumed that they are primarily responsible for food selection and preparation within the household, a role that is well documented in the literature.²⁹

In addition to being predominantly women, most consumers were aged over 60 years, indicating that farmers markets constitute alternative spaces beyond the mere commercialization of goods, such as for cultural exchange and leisure. They also encourage the consumption of FV and are associated with concerns about healthier eating habits.²⁴ However, it is important to examine the age groups that attend these markets, as younger individuals were less frequently observed, which may be related to factors such as accessibility, awareness of the markets, days of operation, and opening hours. The flexibility of market schedules and the visibility of these spaces as more than just food outlets are important aspects to be further investigated.²¹

Another barrier to physical access is the concentration of markets in central and urban areas of cities, failing to cover peripheral regions. In other words, the farther households are from central areas, the lower their access to healthy food environments and quality foods.²¹ This finding was also reported by Araújo et al. in a study conducted in Belo Horizonte, which identified a lower distribution of farmers markets in more peripheral areas and in regions with lower per capita income.²⁸ These findings highlight the importance of public policies aimed at ensuring the Human Right to Adequate Food and FNS, as well as promoting both physical and financial access to adequate and healthy foods.³⁰

With the limited availability of farmers markets in peripheral neighborhoods, the likelihood of purchasing food from other types of establishments—such as supermarkets and grocery stores—increases, where the availability of ultra-processed foods is higher, potentially contributing to increased consumption of these products.¹⁰ These findings are supported by a study conducted in Ouro Preto, which assessed the community food environment and found that beneficiaries of the Bolsa Família Program lived closer to establishments that sell unhealthy foods, predisposing them to choose these options due to the convenience of proximity.²⁸

Although supermarkets and hypermarkets offer greater accessibility due to extended hours of operation, it was observed that consumers at farmers markets purchased a large proportion of their FV at these venues. The main reasons reported were the availability of pesticide-free produce, the offer of healthier foods, and the commercialization of higher-quality products. In this context, farmers markets play an important economic role in the provision of FV and in enabling the population to access quality products at affordable prices.³¹

The results of this study should be interpreted in light of its limitations. Notably, the non-probabilistic sample of vendors and the fact that data collection was conducted on a single day and time at each market limit the generalizability of the findings. It was also not possible to account for food seasonality, as data collection occurred on only one occasion, preventing the assessment of food availability throughout the year. Furthermore, there are few studies that evaluate the quality, availability, and prices of products sold in farmers markets, which hinders comparability of results and highlights the need for further research in this area, including studies with longitudinal designs.

Despite these limitations, the relevance of the present study's findings should be emphasized, as they reinforce the importance of farmers markets as powerful environments for promoting the availability of healthy foods to the population.⁴ Such environments encourage healthier eating habits, including increased consumption of FV, which have high nutritional quality, provide numerous health benefits, and play a protective role for individuals, while also contributing to FNS.⁸ However, it is important to consider that the impacts of climate change on food systems directly affect farmers markets, potentially compromising FNS by reducing access to, availability of, and utilization of food - particularly among populations with lower income, lower educational levels, unemployment, and other factors that exacerbate social inequalities.^{32,33}

Based on primary data collection, this descriptive and exploratory study represents a novel investigation of farmers markets and their vendors in the regions analyzed, highlighting the importance of these settings and reinforcing the need for public policies aimed at promoting more sustainable food production and consumption, both socially and environmentally. Furthermore, the findings underscore the need to support agroecological family farming and to promote improvements in farmers markets so that they become increasingly attractive.

It is important to emphasize the need to promote agroecological family farming, as producers contribute to the provision of healthy, high-quality, sustainable, and financially accessible foods. The advantages of implementing agroecological markets should be considered, taking into account the associated environmental and cultural impacts, as these spaces serve as sites of social interaction with strong potential to connect producers and final consumers. They also foster the growth of local family farmers and support local development, thereby contributing to food sovereignty. However, there is a lack of monitoring and evaluation of consumer food environments by policymakers and public managers.

CONCLUSION

The farmers markets in the municipalities evaluated fulfill their role in facilitating the promotion of adequate and healthy diets and advancing FNS, by offering high-quality, healthy, and low-cost foods. They are characterized by low commercialization of processed and ultra-processed foods, and satisfactory availability of organic, fresh, and minimally processed foods.

To preserve the culture of farmers markets within communities, it is important to consider the characteristics of those who attend them, who in this study were predominantly women, older adults, and individuals with higher levels of education. It is also important to encourage younger populations to become familiar with and engage in these spaces. Greater concern for health, access to information, and better financial conditions may contribute to increased demand for farmers markets and healthier foods.

To foster a healthy food environment in urban areas, it is important to increase the visibility and accessibility of farmers markets by expanding their distribution to peripheral regions, rather than concentrating them solely in central areas, and by implementing rotating schedules of operating days and

hours. It is also essential to empower, strengthen, and support farmers in order to expand the availability of healthy foods for the population. In addition, promoting Food and Nutrition Education activities is crucial to raise awareness about the population's potential role in strengthening the production and consumption of healthy and sustainable foods, as well as encouraging the purchase and commercialization of foods from short supply chains.

Thus, the importance of public food and nutrition policies is reinforced, at both municipal and national levels, aiming to improve aspects related to farmers markets, support family farmers, and promote healthy and sustainable food environments.

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Contributors

Avelar BA, Justiniano ICS, and Menezes MC participated in conception and design, data analysis and interpretation, review and approval of the final version; Araújo ML, Teixeira TK, and Martins RFS participated in data analysis and interpretation, review and approval of the final version.

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