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Food security and edible plant cultivation in the urban gardens of socially disadvantaged families in the municipality of Viçosa, Minas Gerais, Brazil

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Abstract Subsistence farming in urban gardens may be a strategy for food and nutrition security, particularly in socially disadvantaged families, because it eases access to food. This study aimed to assess the following factors in socially disadvantaged families: (1) prevalence of food insecurity, (2) characterization of gardens and cultivation of edible plants in urban areas, and (3) relation between characteristics of urban gardens and cultivated edible plants and food security in families. A survey was conducted on the management and cultivation of plants in gardens and on the perception of food security according to the Brazilian Food Insecurity Scale for 118 families living in urban areas in the municipality of Viçosa, Minas Gerais, Brazil. We observed that 78.8% of families were exposed to food insecurity and were socially vulnerable. Among these, 56.8% experienced mild food insecurity conditions, 15.3% moderate conditions, and 6.7% severe conditions. Management of urban gardens and cultivation of edible plants vary widely according to families' needs and interests, available space, age of farmers, cultivation time, and previous relationship between the family and rural environments. There was no relation

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between characteristics of gardens, management, and cultivation of edible plants in urban gardens and the perception of food security of socially disadvantaged families.

Keywords Urban agriculture · Brazilian food insecurity scale · Brazilian family allowance program · Social sustainability · Public policies

1 Introduction

Food security is an issue discussed in many policy agendas worldwide, involving not only availability of foods in markets, but also the purchasing power of families, particularly in underdeveloped countries such as Brazil. The increasing urban population is one of the greatest challenges and is closely related to increased poverty and food insecurity (FAO—Food and Agriculture Organization of the United Nations 2007).

Food insecurity in families is primarily concerned with access to enough safe and nutritious food to maintain health. Food and nutrition security is defined as "everyone's right to regular and permanent access to quality food in sufficient quantities without compromising other essential needs. It is based on sustainable food practices that value cultural and biological diversity" (CONSEA 2004; BRASIL 2006). Food insecurity indices in Brazil have decreased throughout the years from 30.2% in 2009 to 22.6% in 2013. However, this statistic remains a concern since nearly 52 million Brazilians still have no daily access to satisfactory food quality and quantity (IBGE—Brazilian Institute of Geography and Statistics, 2010a). The Brazilian Food Insecurity Scale (BFIS), adapted from the American scale, has been used to measure the population's perception regarding food security in the household by considering access to foods as well as psychological and socioeconomic dimensions (Pérez-Escamilla et al. 2004; Kepple and Segall-Corrêa 2011).

Among socioeconomic factors, income is highlighted as the primary factor in the prevalence of food insecurity, since lack of financial resources may hinder access to the quality and quantity of food (Orsini et al. 2013; Falcão et al. 2015). Public policies worldwide have implemented measures to combat food insecurity (FAO—Food and Agriculture Organization of the United Nations 2014). In Brazil, the Brazilian Family Allowance Program (PBF) was created in 2003 after merging already existing cash transfer programs. The PBF aims, among other things, to fight hunger and promote food and nutrition security in low-income families (BRASIL 2004). Despite the advances obtained with this program, the high prevalence of food insecurity remains, which requires new policies focusing on low-income families living mainly on the outskirts of the cities.

Urban agriculture stands out as a strategy to promote food security aimed at providing access to food (Dubbeling et al. 2010). Urban agriculture, including planting in residential gardens, is a growing practice around the world and a dynamic concept comprising various agricultural systems, with products consumed locally. This modality is practiced in confined spaces by economically disadvantaged families living in the center or on the outskirts of cities and aiming for food production for subsistence or trade (Mougeot 2000; Eigenbrod and Gruda 2014). Urban gardens are characterized by spaces used by families around the house to produce foods (Madaleno 2000; Kumar and Nair 2004). However, lack of incentives, strategies, and management of residential gardens hinder food production for subsistence by socially disadvantaged families.

Food production in urban gardens may be a way to complement food supply, improve health, and promote family sustainability in low-income families exposed to food insecurity (Orsini et al. 2013). Production in urban gardens varies according to available area,

cultivation system, plant variety, and management by families (Dewaelheyns et al. 2014). These aspects are relevant in terms of the quality and quantity of food production.

Several works have reported the importance of food production in urban areas as a measure in promoting food security (Dubbeling et al. 2010; Kortright and Wakefield 2011; Obeng-Odoom 2013; Eigenbrod and Gruda 2014; Mok et al. 2014). However, studies addressing the relation between food production in residential gardens and food security are scarce in Brazil, specifically for socially and economically disadvantaged families, thus justifying this study. Food production in urban gardens for subsistence may be a strategy to promote food and nutrition security, especially in ensuring access to a variety of food and contributing toward improving nutritional aspects (Fraser 2005; Ministry for social development and fight against hunger 2008) through its low cost, variety, and quality. As such, it is important to understand the characteristics of urban gardens and cultivated edible plants, and to assess the prevalence of food insecurity among low-income families.

This work aimed to assess the following factors in socially disadvantaged families: (1) prevalence of food insecurity, (2) characterization of gardens and cultivation of edible plants in urban areas, and (3) relation between characteristics of urban gardens and cultivated edible plants and the food security of families.

2 Materials and methods

2.1 Study area

Characterization of gardens through household visits was conducted from January to July 2014 with 118 families assisted by the Brazilian Family Allowance Program (PBF) living in urban areas in the municipality of Viçosa, Minas Gerais, Brazil. The families under study had at least one member who received the PBF and gardens with cultivated or wild edible plants. We aimed to include families that were recipients of the PBF in the study, because conditional cash transference programs target economically disadvantaged families, who generally represent high food insecurity indices (IBASE—Brazilian Institute of Social and Economic Analyses 2008). Therefore, these families represent a social segment for whom gardens assume high relevance in terms of providing access to food.

The municipality of Viçosa is located in the Zona da Mata of Minas Gerais, between the Mantiquera, Caparaó, and Piedade mountains within the Atlantic forest biome. It has 72,220 inhabitants, of which approximately 93% are located in the urban area (IBGE—Brazilian Institute of Geography and Statistics, 2010b). The municipality comprises 41 neighborhoods (according to the Master Plan zoning), many of which have infrastructure deficiencies due to the practice of spontaneous settlements without adequate planning (Pereira Neto 2010).

2.2 Sampling and collection of data

A sample calculation considering the prevalence of 80.3% of food insecurity in families receiving the PBF, as identified by the Brazilian Food Insecurity Scale (IBASE—Brazilian Institute of Social and Economic Analyses 2008) in southeast Brazil, was used to select families for this study. A maximum error of 5% was estimated from 3030 family homes receiving the PBF and registered as active in December 2013. This resulted in a sample of 226 households, to which approximately 15% were added to control confusion factors, thus

resulting in 261 homes. The software EPI-INFO 6.04 was used for the calculation. The drawing was performed based on families receiving the PBF in December 2013. From the 261 homes visited, 46% ($n = 118$) practiced subsistence farming with cultivated or wild edible plants.

The present work was approved by the Ethics in Research Committee for Human Participants at the Federal University of Viçosa, MG (Registry 442.561/2013). All volunteers participated in the research after signing an Informed Consent Form. Data were collected from members of households receiving the PBF. The collection of sociodemographic data, characterization of gardens, and perception regarding food insecurity of families were conducted through semistructured interviews (Amorozo 2002; Boni and Quaresma 2005).

2.3 Food security

Perception regarding food insecurity was assessed using the Brazilian Food Insecurity Scale (BFIS). The BFIS was used because it is a validated instrument and it allows the direct diagnosis of food safety or food insecurity in family homes. The BFIS was applied to those receiving the PBF to directly investigate the perception of food insecurity in families, since these were the individuals responsible for feeding the family (Segall-Corrêa 2007).

This instrument was validated in 2004 by Brazilian researchers and considers the social context of the country. The current structure of the scale includes 14 questions, which comprise conceptual groupings that allow an estimation of the prevalence of food security and classify homes on four levels: Food Security, and Mild, Moderate, or Severe Food Insecurity (Table 1) (IBGE—Brazilian Institute of Geography and Statistics, 2010c). The 14 questions were asked when someone aged more than 18 years lived in the household, while the remaining inhabitants were subject only to the first 8 questions (Segall-Corrêa 2007).

2.4 Characterization of gardens

The survey on management of gardens and cultivation of plants was conducted by observing the areas around the household with the interviewee. Some families planted in plots beside their house, which was also considered in the survey. During the interview, questions were asked regarding time of cultivation and the relationship between the

Table 1 Description of food security classifications. Source*: IBGE* 2010b

Food security situation	Description
Food security	Inhabitants had regular and permanent access to quality food, without compromising access to other essential needs
Mild food insecurity	Concerns or uncertainty regarding access to food in the future; inadequate quality of food resulting from strategies aimed at not compromising the quantity of food
Moderate food insecurity	Quantitative reduction of food among adults and/or interrupted feeding patterns resulting from a lack of food among adults
Severe food insecurity	Quantitative reduction of food among children and/or interruption of feeding patterns resulting from lack of food among children; hunger (when someone stays all day without eating because of a lack of money to buy food)

interviewee and other members of the family with rural environments. Further questions probed management practices, use of fertilizer, chemical products to control pests, agroecological practices such as alternatives to fertilization and/or pest control, and criteria to select species and season of planting.

Subsequently, interviewees showed the plants available in the yard and provided information on each plant's popular name, acquisition source, cultivation strategy (if cultivated in the ground or in pots), and purpose of production, which was recorded. The plants were classified into four categories according to the use (medicinal, food, mystical-religious, and other) established previously by researchers and as indicated by the interviewee. Information was also recorded regarding the reasons interviewees practiced subsistence farming in the garden, major difficulties faced during management, and whether technical guidance was received regarding cultivation practices in urban environments.

The area demarcated for farming was measured using a tape measure; however, these measurements were not possible for 12 homes. After this step, the interviewee showed the available edible plants in the garden and information for each was collected concerning popular name and availability of the species in the household. Plants collected and consumed by at least one household member were considered as "available" plants.

Botanical identification of species existing in gardens was performed when possible through photographs, since plant samples were not collected. The classification system Angiosperm Phylogeny Group III (APG III 2009) was used, and binomial nomenclature was used to name species according to the database provided by the Missouri Botanical Garden available at "www.tropicos.org."

Plants shown by the interviewee were classified according to four edible groups: (a) vegetable crops: green vegetables and leguminosae, (b) fruit crops: fleshy fruits, (c) condiment crops: plants used to flavor food, and (d) other: plants used for tea and other beverages without medicinal purposes.

2.5 Statistical analysis

Descriptive statistics of the data as well as absolute and relative frequency analysis of variable "edible plants availability" considering the classification of plants per edible group were conducted. Fisher's exact test, the linear trend Chi-square, and Pearson's Chi-square with a significance level of $p < 0.05$ were applied to assess the association between food security and the variables that were part of the sociodemographic characterizations of the urban gardens, management, and edible plant cultivation. Tests were conducted using the software SPSS version 18.0.

3 Results and discussion

3.1 Sociodemographic characterization and food security

Among the 118 interviewees receiving the PBF, 98.3% ($n = 116$) were females aged between 21 and 62 years, with a median of 42 years. Among the total number of interviewees, 52.5% ($n = 62$) were married, and the median for interviewees with schooling was 5 years (0–12 years), whereas 9.3% were illiterate ($n = 11$). We observed that 50.0% ($n = 59$) of women had some type of job, even if casual, as a source of income, with 59.3% ($n = 35$) employed as cleaning women, maids, or day laborers.

Conditioned Cash transference programs tend to favor women, as they are generally caregivers responsible for the family's well-being (IBASE—Brazilian Institute of Social and Economic Analyses 2008). Population studies data on the effects of the PBF in the food security of families indicates that 66.6% of women in southeast Brazil receiving the allowance attended elementary school.

The median corresponding to the time interviewees lived in the neighborhood was 20 years (0.4–61 years), and the median of the time lived in the household was 9 years (0.25–58 years). In total, 71.2% ($n = 84$) of families owned the household, while 28.8% ($n = 34$) lived in houses that were provided or rented. Families that lived in rented or provided houses considered it a limitation to cultivation in their gardens and thus did not improve those spaces.

In total, 78.8% ($n = 93$) of families experienced food insecurity conditions according to guidelines from the BFIS, which assess the perception of food security. Of these, 56.8% ($n = 67$) of families experienced mild food insecurity, 15.3% ($n = 18$) moderate food insecurity, and 6.7% ($n = 8$) severe food insecurity. According to the BFIS, the prevalence of high food insecurity in families receiving the PBF is confirmed in other works (IBASE—Brazilian Institute of Social and Economic Analyses 2008; Oliveira and Lima-Filho 2011; Anschau et al. 2012; Souza et al. 2012). These observations demonstrate that families receiving assistance from allowance programs are in vulnerable situations and more susceptible to factors that promote food insecurity (Anschau et al. 2012). Given this scenario, new actions directed toward families receiving the PBF should be implemented to promote food security.

Regarding reasons highlighted by interviewees for cultivation in their gardens, 75% ($n = 90$) highlighted "pleasure in gardening," 44.2% ($n = 35$) "need to feed the family," 29.1% mentioned "life history," 22.5% ($n = 27$) "income strategy," and 20.8% ($n = 25$) noted "other reasons" such as embellishment of the yard. It should be noted that regarding this issue, interviewees were given the possibility to choose multiple answers. Three interviewees received technical guidance regarding plant cultivation in urban environments. Of the participants, 47.5% reported not having difficulties planting in urban areas, 15% ($n = 18$) reported that difficulties were encountered because of a lack of water, and 6.6% ($n = 8$) mentioned the type of soil as causing difficulties in planting.

3.2 Characterization of gardens, management practices, and food security situation

The variables studied to characterize gardens were presented in frequencies and distributed between security and insecurity according to the BFIS (Table 2). Garden areas varied between 5.45 and 650.31 m^2, with a median of 85.70 m^2, while cultivated areas ranged from 1.05 to 650.31 m^2 with a median of 73.95 m^2. The measurements for total and cultivated areas refer to 106 and 107 gardens, respectively, since it was not possible to measure all the gardens. In the assessment of measurements, the household area strictly destined to cultivation was considered when it was demarcated. In some cases, families also cultivated areas around the household other than the garden, which was also considered for the survey.

The median of cultivation time was 96 months (1–420 months) for 117 gardens, as one interviewee did not know the cultivation time. Among the 117 families, 47.0% ($n = 55$) had been cultivating edible plants in their gardens for more than 8 years; thus, cultivation was not a temporary activity. Time living in the neighborhood and households were variables that could indicate a relation between the interviewee in terms of their place of

Table 2 Characterization of urban gardens and management practices regarding the food security classification of socially disadvantaged families in the municipality of Viçosa, Minas Gerais, Brazil

Characterization of gardens and management practices	FS ($n = 25$)		FI ($n = 93$)		p*
	n	%	n	%	
Area of garden (m^2)[1,4,5]					0.765
< 60.16	4	11.4	31	88.6	
60.16l–l119.72	12	33.3	24	66.7	
> 119.72	5	14.3	30	85.7	
Cultivated area (m^2)[2,4,6]					0.592
< 40.74	6	16.7	30	83.3	
40.74l–l109.02	11	30.6	25	69.4	
> 109.02	4	11.4	31	88.6	
Cultivation time (months)[2,4,7]					0.600
< 48	8	22.9	27	77.1	
48l–l164	10	23.3	33	76.7	
> 164	7	179	32	82.1	
Relation with rural environment[3]					0.103
Yes	17	18.1	77	81.9	
No	8	33.3	16	66.7	
Use of fertilizer[3]					0.395
Yes	17	19.3	71	80.7	
No	8	26.7	22	73.3	
Use of pesticide[1,8]					0.168
Yes	5	13.5	32	86.5	
No	20	24.7	61	75.3	
Agroecological practices[3,9]					0.455
Yes	15	23.8	48	76.2	
No	10	18.2	45	81.8	
Selection criteria for species[3]					0.205
Yes	7	15.2	39	84.8	
No	18	25.0	54	75.0	
Criteria in the cultivation season[3]					0.962
Yes	9	21.4	33	78.6	
No	16	21.1	60	78.9	
Diversity of plants[1,4,10]					0.917
< 6	5	14.3	30	85.7	
6l–l11	14	31.1	31	68.9	
> 11	6	15.8	32	84.2	

FS food security, *FI* food insecurity; [1]Fisher's exact test; [2]linear trend Chi-square test; [3]Pearson's Chi-square test; [4]cutoff points obtained according to the third; [5]areas for 106 gardens: 12 could not be assessed; [6]areas for 107 gardens: 11 could not be assessed; [7]time of cultivation for 117 gardens: 1 interviewee was not able to provide information; [8]chemical product to control pests; [9]agroecological practices used to control pests and/or fertilization; [10]total number of edible plants cited; *significance level lower than 5%

residence and garden farming practices. The greater the time spent living in the neighborhood or household, the greater was the time for cultivation in the garden.

Nearly, 79.7% ($n = 94$) of interviewees or relatives reported some relation with the rural environment such as being from the country, having worked on a farm, and/or having learned farming practices from relatives living in rural areas. Of the households classified as experiencing a food security situation, 68% ($n = 17$) had a previous relation with rural environments. It was reported previously that most families that cultivate plants in urban areas were originally from rural areas (Amaral and Guarim Neto 2008; Carniello et al. 2010; Althaus-Ottmann et al. 2011). In the urban gardens assessed in Mirassol D' Oeste (MT), Brazil, nearly 82.75% lived in rural environments or practiced farming activities (Carniello et al. 2010). Another study on urban farming conducted by Pessoa et al. (2006) in Santa Maria (RS), Brazil, indicated that 63.1% of the sampled population was originally from rural environments. Planting in urban gardens represents an activity performed in rural communities, and when inhabitants move to the urban environment, they continue the farming and cultural practices typical in rural environments, although within different and reduced territorial dimensions (Amorozo 2002; Carniello et al. 2010).

Fertilizers were used in most gardens (74.5% [$n = 88$]), while pesticides were used in 31.3% ($n = 37$). In 61.0% ($n = 72$) of the gardens, cattle manure was used, poultry manure in 10.2% ($n = 12$), and other organic fertilizers such as peels of vegetable in 11.0% ($n = 13$). In some gardens, more than one type of fertilizer was used. Regarding chemical products used for pest control, ant insecticide was used by 24.6% ($n = 29$). The use of agrochemicals in urban gardens is not currently recommended, since food production is essentially for subsistence, meaning that urban farmers consume the foods fresh and people have free access to the crops cultivated in gardens.

Agroecological practices were common in 53.4% of the gardens ($n = 63$) surveyed, with greater prevalence in the group of families considered to be experiencing food insecurity by the BFIS, a total of 76.2% of the families. These practices comprised the use of a natural broth such as tobacco leaves to control aphids and caterpillars in addition to fertilization with homemade compost. According to Eigenbrod and Gruda (2014), agroecological production of food in urban gardens is performed significantly by economically disadvantaged families aiming to provide subsistence. The use of agroecological practices in urban gardens has multiple functions such as promoting healthy eating, social well-being, nutritional and environmental education of families, sustainability through re-using organic waste produced in households, improvement of the local landscape, decreased expenditure on food, and complementary nutrition for the family through safe and nutritious foods.

Only 39.0% ($n = 46$) of the interviewees reported having some sort of criteria to choose species to cultivate. Regarding the cultivation season of species, 35.5% ($n = 42$) reported using criteria such as the rainy season (32.6%), ideal season for that species (27.9%), and moon phase (18.6%). Practices adopted to select species and cultivation season are important for urban gardens, since they contribute to increased food production.

The diversity of plants found in the 118 gardens under study corresponded to 1176 cited during the interviews to be used as food, with a variation of 1–27 plants per garden. Overall, the diversity of cultivated species, type of management, and use of the plants were related to the needs and interests of the family, architecture, and available space in the garden, in addition to the age range of urban farmers. Siviero et al. (2011) observed a relation between the farmer's age and diversity of plant species found in urban gardens.

There was no association between variables related to characterization of gardens and management practices and food security. In this scenario, probably other relevant factors

not considered by the BFIS may be associated with food security. The BFIS is not only a perception analysis, but is based on a wide concept of food and nutrition security as it involves the complexity of diverse dimensions including socioeconomical, psychological, and nutritional issues (Segall-Corrêa 2007; Melgar-Quiñonez and Hackett 2008; Kepple and Segall-Corrêa 2011; Guerra et al. 2013).

3.3 Characterization of plants in urban gardens and food security classification

The availability of plants cultivated in gardens was classified as four food groups: (a) vegetables: present in 99 gardens, (b) fruits: present in 107 gardens, (c) condiment plants: present in 80 gardens, and (d) other plants: present in 37 gardens (Table 3). The variation of plants such as vegetables, leguminosae, fruits, herbs, medicinal plants, and ornamental plants has always been an outstanding characteristic of Brazilian urban gardens (Amaral and Guarim Neto 2008; Carniello et al. 2010; Siviero et al. 2011; Eichemberg and Amorozo 2013; Botelho et al. 2014).

The variation of edible plants cultivated in urban gardens is also important in the families' diets. According to Coelho et al. (2009), low-income families in Brazil do not consume a sufficient volume of vegetables and fruit. The Brazilian Household Budget Survey (POF) conducted from 2008 to 2009 in urban areas indicated that vegetable and fruit intake increases with a higher family income (IBGE—Brazilian Institute of Geography and Statistics 2010d). By assessing 747 families receiving the Family Grant (bolsa família), Lima et al. (2011) showed that 45% of families did not include vegetables in their diet. Against this background of insufficient food intake by socially disadvantaged families in Brazil, gardens become important in terms of complementing their diets by providing the household with a diverse range of healthy and nutritious food.

The most frequent species are presented in Table 4. There are 21 taxonomies indicated for the first 15 levels of frequency of the sampled gardens. Overall, the plants were easy to propagate, accessible with regard to the acquisition of seedlings, and less demanding in terms of management and climatic conditions.

The cultures of edible plants cultivated in gardens were presented according to frequency and distribution in food security and insecurity households according to the BFIS (Table 5). There was no association between the cultivation of edible plants in urban gardens and food security classification for any of the food groups or the total of groups assessed. This result may be explained by other factors possibly related to food security classification such as household income and psychological factors, in addition to the fact

Table 3 Distribution of plants and percentage of availability per food group in urban gardens in the municipality of Viçosa, Minas Gerais, Brazil

Food group	Available in the garden		Not available in the garden		Total	
	n	%	*n*	%	*n*	%
Vegetables	99	83.9	19	16.1	118	100
Fruits	107	90.7	11	9.3	118	100
Condiment plants	80	67.8	38	32.2	118	100
Other	37	31.4	81	68.6	118	100

Table 4 Relation of species of most frequent edible plants in urban gardens in the municipality of Viçosa, Minas Gerais, Brazil

Level of relevance	Taxon	Popular Name	Fa	Fr (%)	Food group
1	*Brassica oleracea* var. capitata	Cabbage	69	58.5	V
2	*Citrus* sp.2	Lemon	58	49.2	F
3	*Allium fistulosum* L.	Spring onion	54	45.8	C
4	*Musa x paradisiaca* L.	Banana	51	43.2	F
5	*Carica papaya*	Papaya	48	40.7	F
6	*Citrus* sp.3	Tangerine	47	39.8	F
7	*Malpighia glabra* L.	Acerola	42	35.6	F
8	*Xanthosoma sagittifolium* (L.) Schott	Elephantear	41	34.8	V
9	*Sechium edule* (Jacq.) Sw.	Chayote	40	33.9	V
9	*Citrus* sp.1	Orange	40	33.9	F
10	*Petroselinum crispum* (Mill.) Fuss	Parsley	38	32.2	C
11	*Pereskia aculeata* Mill.	Lobrobro	37	31.4	V
12	*Solanum gilo Raddi*	Scarlet eggplant	35	29.7	V
13	*Psidium guajava* L.	Guava	34	28.8	F
14	*Saccharum officinarum* L.	Sugarcane	33	27.9	F
15	Manihot esculenta Crantz	Cassava	31	26.3	V
16	*Abelmoschus esculentus* (L.) Moench	Okra	31	26.3	V

Fa absolute frequency, *Fr* relative frequency, *V* vegetables, *F* fruits, *C* condiment plants

Table 5 Relation between groups of edible plants and food security classification in socially vulnerable families in the municipality of Viçosa, Minas Gerais, Brazil

Edible plants[1]	FS ($n = 25$)		FI ($n = 93$)		p*
	n	%	n	%	
Vegetables[1,2]					0.768
≤ 3	14	22.2	49	77.8	
> 3	11	20.0	44	80.0	
Fruits[1,2]					0.897
≤ 3	13	21.7	47	78.3	
> 3	12	20.7	46	79.3	
Condiment plants[1,2]					0.412
≤ 1	16	23.9	51	76.1	
> 1	9	17.6	42	82.4	
Total plants[1,2]					0.842
≤ 9	14	21.9	50	78.1	
> 9	11	20.4	43	79.6	

FS food security, *FI* food insecurity; [1]Pearson Chi-square test; [2]cutoff points obtained with the median value; *significance level lower than 5%

that the BFIS assesses the perception of food security. Using the FANTA food security scales, the African Food Security Urban Network (AFSUN) conducted a baseline household food security survey in 11 cities in nine Southern African countries (Crush et al. 2012). This research demonstrated that while 77% of households were food insecure, urban agriculture played a limited role in ameliorating food insecurity at the household level

(Crush et al. 2011). Further analysis of this data set by Frayne et al. (2014) confirmed that there is no significant correlation between the practice of urban agriculture and household food security. These authors emphasized that additional research is needed to better understand the relationships between urban agriculture and domestic food security in low-income households.

The food insecurity situation was assessed according to the perception of the interviewee; thus, it included important psychological components such as concern, uncertainty, and fear regarding the family having enough food in the following month (Salles-Costa 2007). The first question in the BFIS refers to concerns regarding lack of food: "In the last three months, were you concerned that your food in the household would be finished before you could buy more?" Of the 118 interviews, 50% of families reported positive for this question; thus, that this concern was present. This aspect was significant and present during conversations with interviewees, who reported that concerns regarding lack of food and the resources needed to acquire it were frequent, especially at the end of the month. Although we found a large number of families who grew edible plants in their gardens with great diversity of species, the presence of all these vegetables did not decrease concerns about having enough food. In particular, this was stronger in individuals who have already suffered from hunger. It is well known that few studies in Brazil aim to search for associations between food production in urban gardens and the food and nutrition security of low-income families. The association between urban agriculture and food security has been a challenge as demonstrated in a review by Warren et al. (2015), where the authors' results ranged from a negative association, to lack of association, and positive association. According to Pritchard et al. (2017), for simple associations between dependent variables are not able to capture the multidisciplinarity that involves the food and nutritional security of families. These authors report that the incorporation of geospatial information mainly in the historical–geographical context is a promising way to better interpret the relationship between urban agriculture and food security.

3.4 Final considerations

A high prevalence of food insecurity has been found in families receiving the PBF, which reinforces the importance of searching for strategies to minimize the problem. The production of food in urban gardens for subsistence of families is partly a strategy for sustainable urban development, because of the practice's social, economic, and environment impacts. Therefore, according to the results obtained in this study, the need to conduct further studies on food production in urban gardens, in both amplitude and depth, should be undertaken to include other factors associated with food security. In this way, conclusions of cause and effect can be reached, with the possible quantitative and qualitative contribution of urban gardens to the food and nutritional security of socially disadvantaged families.

4 Conclusion

A high prevalence of food insecurity (78.8%) in socially and economically disadvantaged families was observed in the municipality of Viçosa-MG, with more than 20% classified as experiencing moderate and/or severe food insecurity.

The management of urban gardens and cultivation of edible plants varied according to families' needs and interests, available space, age of urban farmers, cultivation time, and relationship with rural environments.

There was no relation between characteristics and management of gardens and cultivation of edible plants in urban gardens, and food security of socially disadvantaged families.

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