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Sustainability and food and nutrition security: an approach on availability and access to food in the municipality of Chókwè-Gaza province, Mozambique

Sustentabilidade e segurança alimentar e nutricional: uma abordagem sobre disponibilidade e acesso aos alimentos no município de Chókwè-província de Gaza, Moçambique

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ABSTRACT

Food and nutrition insecurity is linked to poverty worldwide. Ensuring food and nutrition security is a major challenge for most families in rural Mozambique. The aim of this study was to assess the state of nutritional and food security in families residing in Chókwè Municipality. The study was conducted using semi-structured interviews with 260 families in 7 neighborhoods. The data collected was analyzed using IBM SPSS 22 Statistic software to obtain percentage values and a food safety index. The study revealed an unstable level of food and nutritional security in the Chókwè municipality of the order of 55%. The minimum monthly household income was about MZN 4,900.00 (US$76.6), an amount that does not ensure the supply of all basic consumer goods to meet families' food needs. Corn, rice, oil and tubers are among the foods most commonly consumed by low-income families in Chókwè. Most of the food consumed by the population came from family production, which depends on the region's soil and climate conditions that are limiting factors in obtaining sufficient and sustainable quantities of food for consumption. Implementing existing food and nutrition security management policies in the country can help reduce the level of food insecurity in the Chókwè community.

Palavras-chave:
Alimentos básicos
Recursos agrícolas
Sistema alimentar
Bem-estar da população

RESUMO

A insegurança alimentar e nutricional está globalmente relacionada à pobreza. Alcançar a segurança alimentar e nutricional tem sido grande desafio para maior parte das famílias residentes nas áreas rurais em Moçambique. Este estudo objetivou avaliar o estado de segurança alimentar e nutricional nas famílias residentes no município de Chókwè. O estudo foi conduzido através de entrevista semi-estruturada dirigida a 260 famílias distribuídos em 7 bairros. Os dados coletados foram analisados por meio de software estático IBM SPSS 22 para a obtenção de valores de percentuais e índice de segurança alimentar. O estudo revelou níveis instáveis de segurança alimentar e nutricional na ordem de 55% no município de Chókwè. A renda mínima mensal dos agregados familiares esteve em torno de 4.900.00 MZN ($76.6 USD), valor que não garante a obtenção de todos os bens de consumo básicos para satisfação das necessidades alimentares das famílias. O milho, arroz, óleo e tubérculos, fazem parte dos alimentos consumidos com maior frequência pelas famílias de baixa renda em Chókwè. A maior parte dos alimentos consumidos pela população provinha de produção agropecuária familiar, que depende das condições edafo-climáticas da região, fator limitante à obtenção de quantidades suficientes e permanente para o consumo. A implementação das políticas de gestão de segurança alimentar e nutricional existentes no País, pode contribuir para reduzir o nível de insegurança alimentar no município de Chókwè.

INTRODUCTION

In Mozambique, agriculture is an activity of great importance as it is the basis for the development of the country (GUANZIROLI; GUANZIROLI, 2015; MOSCA, 2014). In addition, agriculture is the main source of income for most Mozambique families and helps to ensure social well-being (MARASSIRO et al., 2021; MOSCA, 2014).

On the one hand, social well-being includes food security for the population as an integral part of basic human rights (FAO, 2015). On the other hand, it aims to ensure that people have access to safe, quality food in sufficient quantities (SETSAN, 2007). Within the framework of ensuring social well-being, agriculture is also a source of family income and ensures food availability in rural and urban areas (SETSAN, 2014).

Access and availability of food for human consumption in urban and in rural areas is different in Sub-Saharan Africa (AJAYI et al., 2016; EKHOLUENETALE et al., 2020). One of the factors that have affected food scarcity and availability is related to climate change. Its impacts are associated with reducing agricultural production and productivity in rural areas (ROJAS-DOWNING et al., 2017; SEARCHINGER et al., 2018).

Food availability in urban areas can also be affected by the difficulty of transporting food from rural to urban areas (OPITZ et al., 2016; WEISS et al., 2018). Problems with product disposal can be related to several factors, with a greater focus on the availability of means of transport, freight costs or access routes (CIACH; FROHLICH, 2017; OPITZ et al., 2016). In addition, the lack of static storage capacity and the unavailability of post-harvest technologies are other factors that significantly reduce food availability (BENDINELLI et al., 2020; MOPERA, 2016).

In Gaza province and especially in Chókwè municipality, adverse weather events such as drought and floods are common. These factors, combined with the lack of infrastructures for grain storage, contribute to high agricultural losses and therefore result in the unavailability of food for human consumption (BRUNNER, 2016; LEIRA et al., 2002) and food insecurity of the population (MOSCA, 2014).

Post-harvest losses, low levels of production and agricultural productivity, and low purchasing power of staple foods are among the factors affecting food availability for the Mozambican population. To ensure the supply of basic foodstuffs in Mozambique, some contributions are made through imports (92%) and donations (8%) (DENARDIN et al., 2015). Therefore, the need arose to assess the status of food availability, sustainability, and food and nutritional quality of the population in the municipality of Chókwè, Mozambique.

MATERIAL AND METHODS

Spatial description of the study area

The study was conducted in the municipality of Chókwè in the province of Gaza-Mozambique. The municipality has an estimated area of 1,864 km², with 222,396 inhabitants according to 2017 census (INE, 2017). The geographic coordinates of the study area are described in Table 1.

Table 1. Geographical coordinates of data collection sites in Chókwè Municipality.

Neighborhoods that make up the municipality of Chókwè	Geographic Coordinates	
	X	Y
1B – First neighborhoods	24^0 32,0525'	33^0 00,3840'
2B – Second neighborhoods	24^0 31,5168'	32^0 59,6560'
3B – Third neighborhoods	24^0 31,6639'	32^0 58,9746'
4B – Fourth neighborhoods	24^0 32,3885'	32^0 59,4868'
5B – Fifth neighborhoods	24^0 32,7593'	32^0 59,5553'
6B – Sixth neighborhoods	24^0 34,1172'	33^0 00,8033'
7B – Seventh neighborhoods	24^0 30,3597'	32^0 58,2472'

Methodological procedures

The data were collected from 260 households in the seven neighborhoods of the Chókwè municipality. Surveys and semi-structured interviews according to Secor (2010) with modifications were used. National data from Integrated Survey of the Mozambique Ministry of Agriculture and Rural Development (MADER, 2020) were also used. Aspects related to household characteristics, level of education, family income, access to food and frequency of food consumption were addressed in the interview. The mechanism for obtaining data, grades and extracts from indicators is described in Table 2.

(i) Household characteristics: were determined by recording the number of families residing in each neighborhood studied. The number of members with stable

Table 2. Indicators used to assess the nutritional and food security status of the population in Chókwè Municipality.

Indicator and relation	Variable	Grade	Indicator
Characteristics of households	-	-	-
Level of education (+)	Illiterate	0	Critical
	Basic	4	Unstable
	Average	6	Stable
	Higher	10	Great
Food availability (+)	Unsatisfactory	0	Critical
	Reasonable	4	Unstable
	Average	6	Stable
	Satisfactory	10	Great
Family income (+)	Unsatisfactory	0	Critical
	Reasonable	4	Unstable
	Average	6	Stable
	Satisfactory	10	Great
Access to food (+)	Unsatisfactory	0	Critical
	Reasonable	4	Unstable
	Average	6	Stable
	Satisfactory	10	Great
Food consumption (+)	Unsatisfactory	0	Critical
	Reasonable	4	Unstable
	Average	6	Stable
	Satisfactory	10	Great

+ - The higher, the better the performance of the indicator.
Source: Adapted from Sitoe et al. (2020)

employment who did not depend on agriculture as their primary source of subsistence for their livelihood and the type of agricultural activity carried out were assessed.

(ii) Educational level: determined from a survey and indicates educational level and literacy.

(iii) Family income: corresponds to the average fixed income that the household receives per month. The data was used to determine consumption/income levels. The yield values determined were divided into three categories. With regard to family consumption patterns, the quantities, qualities and types of products purchased by households were analyzed based on their monthly consumption income and their respective origins. Scores obtained from the family income survey were used to justify individuals' ability or not to purchase products of the required quantity and quality.

(iv) Food availability: determined by the Household Food Availability Survey, which allowed analysis of the amount, origin and type of food available, produced and consumed by households. Additional data on food availability was obtained from the integrated MADER survey (2020). During data collection, producers' losses in the periods of production, transport, sale and storage were also taken into account. This variable also takes into account the extent of product imports to meet local demand. Imported products were all products from outside the country that were bought by traders to provide for families.

(v) Access to food: was determined by assessing families' ability to purchase food. However, the variable economy (money income) of the family was taken into account as it is one of the key factors in family food acquisition. In addition, the ways in which households procured food, e.g. Purchase, production and donations.

(vi) Food consumption: The diet of the family was taken into account. With regard to nutrition, individual nutritional needs and access to basic products such as corn, rice, beans, bread, roots and tubers, vegetables, oil, sugar, milk powder, fresh milk, fish, eggs and fruit were analyzed. The family's eating habits as well as quantities, qualities and distribution in the household were also taken into account.

Statistical Analysis

Data were grouped by indicator and frequencies calculated using IBM SPSS 22 statistical software. Frequencies were subjected to a comparative analysis in relation to the food triangle in order to determine the existing differences in the dietary habits of Chókwè residents. The data were used for graphing with the statistical software Sigma plot version 14.5.

RESULTS AND DISCUSSION

Characteristics of Households

In the municipality of Chókwè, a total population of 69,337 inhabitants was registered, spread over 7 neighborhoods. The 4th and 5th neighborhoods had the highest population densities in the municipality, with 11,452 and 12,093 residents, respectively (Figure 1A). The population with stable employment not dependent on agriculture was concentrated in the 1st and 2nd neighborhoods (Figure 1B). Families with members in paid employment (public sector employees, private industry and merchants) made up 25% of the total population residing in the municipality. Low-income households were the most disadvantaged and vulnerable to food insecurity. The unfavorably low income of the family sector was also highlighted in the study conducted by Mosca (2014) when the author mentioned the vulnerability of access to basic food and other basic services for small farmers in Mozambique.

Figure 1. Characterization of households in Chókwè municipality. Number of inhabitants per neighbourhood (A); Number of inhabitants engaged in other profitable economic activities besides agriculture (B).

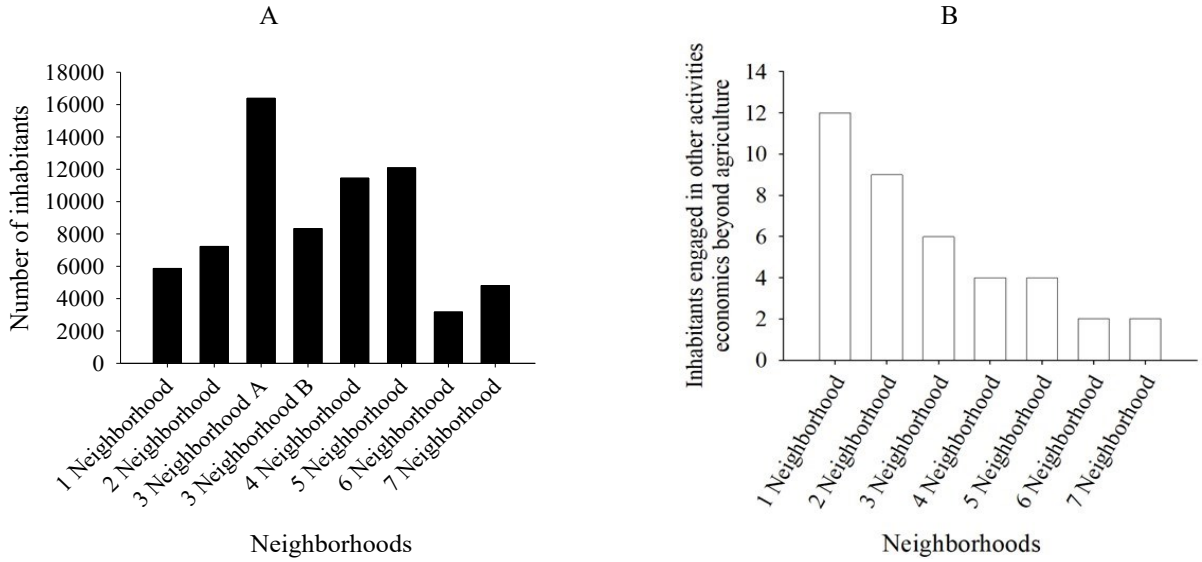
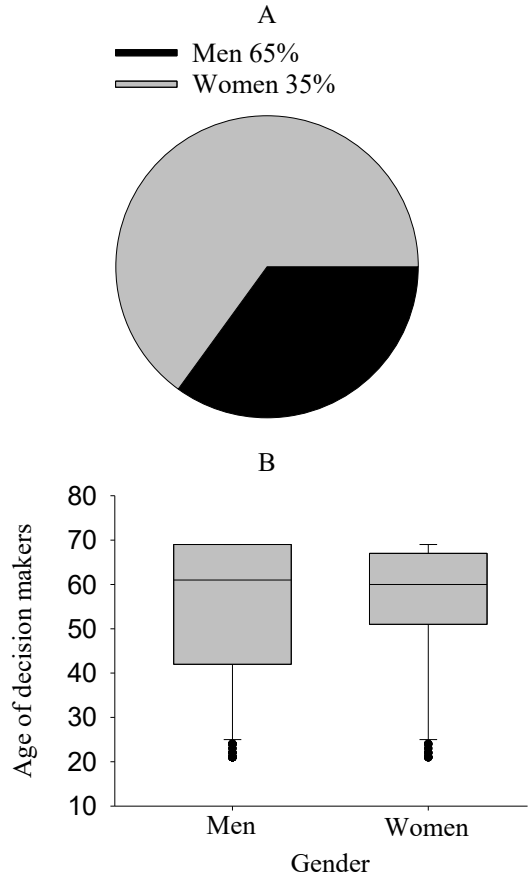


Figure 2 shows the gender of household decision-makers and their respective ages. Overall, 65% of families made male choices (Figure 2A). Households headed by women made up 35% of the inhabitants. The mean age of male and female heads of household was 54 and 56 years, respectively. However, the minimum and maximum ages of decision-makers were 21 and 69 years, respectively, for both sexes studied (Figure 2B). The results of the present study and observations by INE (2015) make it clear that in Mozambique the man is the decision-maker in most families. In Chókwè, the female heads of families largely develop activities such as selling small products in the markets, cultivating smaller plots of land, and

doing housework (maids) in dwelling houses. This range of activities can negatively contribute to ensuring food and nutritional security of the population, especially when the activity developed is on a smaller scale, as suggested by Almeida et al. (2015).

The severe levels of food insecurity observed in this study were recorded in families headed by males or females over the age of 45. As individuals age, they become more reticent and therefore less able to provide resources to their families (MORAIS et al., 2018).

Figure 2. Decision makers within families in the Chókwè community. Genre of actors making decisions within the family (A); Age of actors who make decisions within the family (B). (n=260).



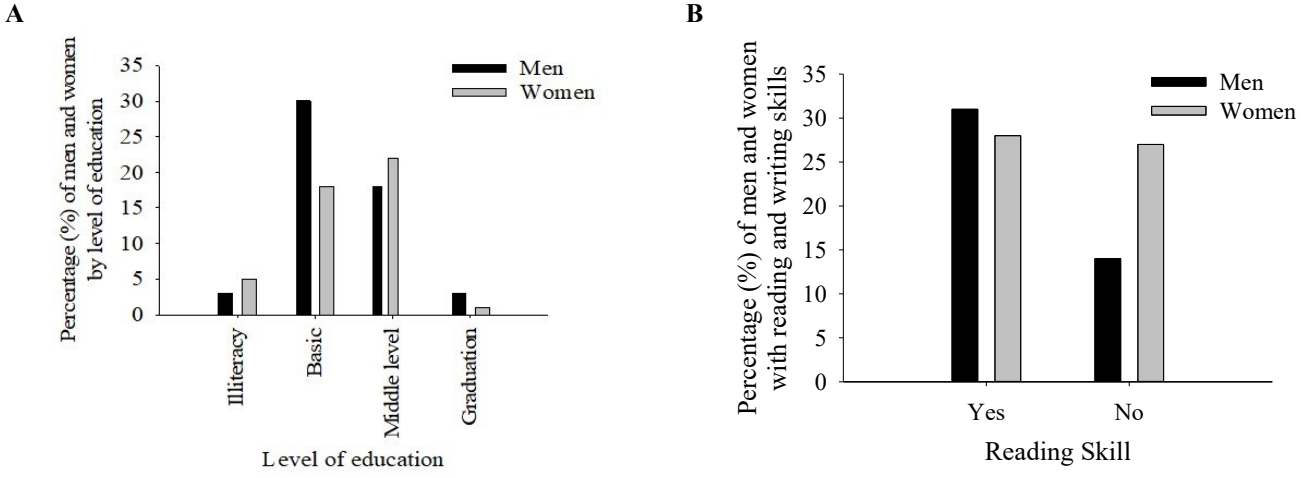
Level of Education

Figure 3 shows the level of education of heads of household residing in Chókwè Municipality. Only 8% (3% of men and 5% of women) had no educational qualifications. About 30% of men have National Education System (SNE) primary education. The proportion of women with basic education was around 18%. Among heads of families with a moderate level of education, a higher proportion was observed for women (22%) than for men (18%). However, at the higher level, the proportion of men was higher (3%) than that of women (1%), as shown in Figure 3A. The data, even referring to the urban environment, showed a low level of education of the citizens of Chókwè, a phenomenon characteristic of the rural areas in Mozambique (MÁRIO et al., 2020).

The low access to school education in rural areas and problems of a socio-cultural nature are one of the main reasons for the low school attainment in most households (INE, 2015). The low value placed on education, the culture of migrating to South Africa in search of better living conditions, especially for men, child and youth work, pastoralism and early marriage are among the many factors that contribute to low levels of schooling in the municipality of Chókwè (ARNALDO; MUANAMOHA, 2013; CHIFECHE, 2018; MUANAMOHA et al., 2010; VAN DER BERG et al., 2017). The level of education has an impact on food insecurity in less educated families. The level of education, especially in relation to food safety or food technologies, helps consumers make decisions for diversification of staple foods for daily consumption (MOURA; MASQUIO, 2014). The impact of schooling on ensuring food security is related to gaining better awareness of the choice and diversification of daily staple foods (LOPES et al., 2017). In order to reduce food insecurity, it is necessary to consider the educational issue of the population and to ensure diverse access to basic foodstuffs (SILVA et al., 2015).

Figure 3B shows the reading literacy levels of heads of household. According to the results, 59% of heads of household are literate and the remaining 41% have literacy difficulties. Heads of household literacy can be considered as one of the key and decision-making components for purchasing food with higher nutritional value and having implications for reducing malnutrition rates in the population. On the other hand, literacy has implications for the process of ensuring constant access and diversification of foods for daily consumption (JUVINO et al., 2020).

Figure 3. Academic level of heads of households in Chókwè Municipality. Level of education (A); Reading and writing skills (B). (n=260).

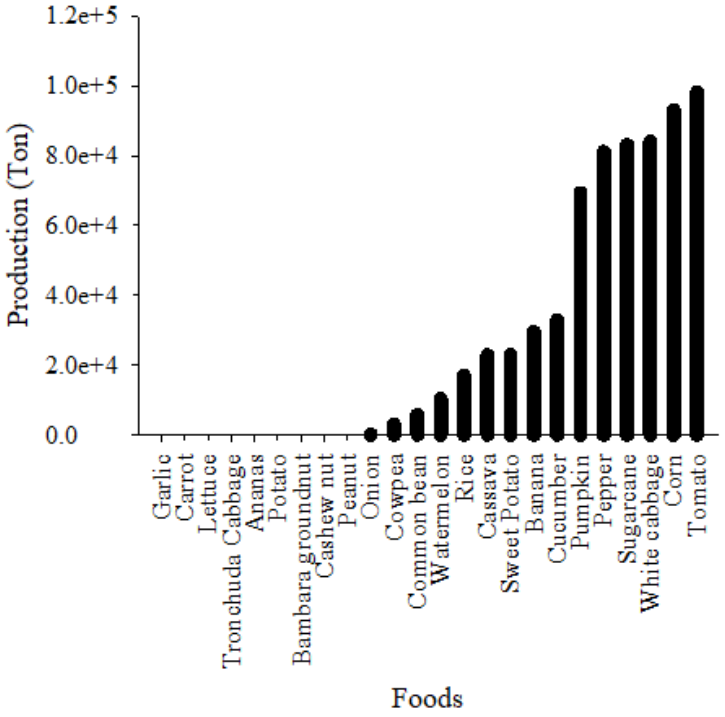


In order for family heads to know what to buy, eat and when to eat, the ability to read is fundamental. Less educated people are those who take longer to adopt technologies related to well-being and development (COSTA et al., 2020; LOPES et al., 2019), a fact that contributes to vulnerability to food insecurity on this scale (AMARAL; BASSO, 2016; SILVA et al., 2020; TOMAZINI; LEITE, 2016). Packaged products carry labels with basic information on the nutritional value of foods that may be recognizable to educated people (LOPES et al., 2019; SANTOS et al., 2018) and are therefore susceptible to change and/or adoption of recommendations. To this end, literacy training for heads of households would be one of the key tools to reduce food insecurity among the most vulnerable citizens.

Food availability

Figure 4 shows the average production of staple foods in Chókwè municipality in the 2019/2020 campaign. A maximum production of 525,228.85 tons of various products was registered, with tomatoes, corn and white cabbage having the highest production quotas with 99,569,208, 93,070,500 and 81,108,500 tons respectively. Agricultural products from production units owned by family farmers, such as rice, corn and beans, are naturally dehydrated and stored in small warehouses.

Figure 4. Production of staple foods in Chókwè municipality, in the 2019/2020 agricultural campaign. Source: MADER (2020).



Small parts of the products are intended for family consumption, sale and use as seeds for later agricultural crops. It is estimated that most of the products produced and stored are lost due to insect pests and fungi. The average percentage of losses of products stored in Chókwè in the family sector is around 80.4%. Similar to the study area, corn, rice, cassava, peanuts and beans are the products with the highest reported losses countrywide (WALKER et al., 2016).

Associated with low levels of production and productivity and post-harvest crop losses, the remaining volumes do not meet consumer needs to ensure food and nutrition security in Chókwè Municipality. The impact of low production levels on worsening food security has been reported previously (CONTI et al., 2015; GUERRA et al., 2018; GUIMAROES et al., 2016). In addition, the lack of sufficient storage infrastructure to preserve agricultural commodities is another factor affecting food availability to ensure food and nutrition security. Food security can only be achieved when there is a balance between the amount of product produced, stored and consumed (MANANDHAR et al., 2018; MESTERHZY et al., 2020). Despite a number of factors affecting food security in different regions, local food production, productivity and rights play an important role in population well-being (PARRY et al., 2009; WHEELER; VON BRAUN, 2013).

In order to ensure a constant supply of food in the desired quantity and variety, it is necessary that the food production quantities correspond to the static capacity of the storage structures in storage units (WOSSEN et al., 2018). The results observed in this study and in the available literature indicate that to ensure food and nutrition security it is essential to: (i) increase the level of food production; (ii) invest in developing conservation and storage sectors for agricultural commodities and (iii) make the food distribution chain more efficient in rural and urban communities (GUIMAROES et al., 2016; MESTERHÁZY et al., 2020; WALKER et al., 2016; WOSSEN et al., 2018).

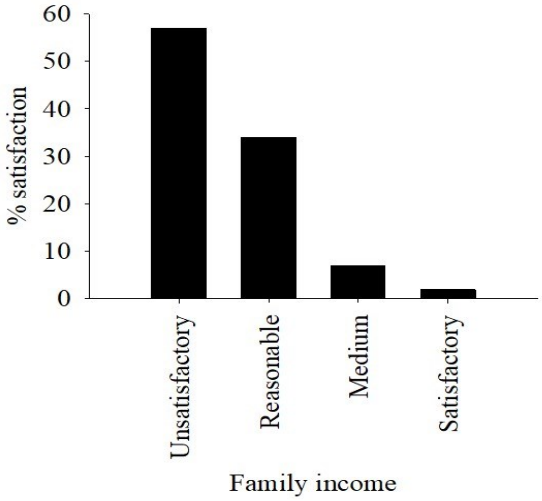
Family income

Figure 5 shows the results on the level of household economic satisfaction. The monthly earnings values were around 4,900.00 (76.6 USD) to 8,000.00 MZN (125.19 USD). Most decision-makers in families (57%) had an unsatisfactory monthly income. Only 2% of agents had a good monthly income to survive and ensure food and nutrition security. Households with an income of less than MZN 4,900.00 (US$76.6) depended on the contribution of agriculture to meet their food needs. On the other hand, family production is relatively low, reflecting socio-economic factors for various reasons, with more emphasis on low technical knowledge, low economic power, use of outdated and/or unimproved agricultural technologies, weaker use of agricultural inputs, and inability to face the situation, including the effects of climate change.

Recent studies by the National Institute of Statistics in Mozambique (INE, 2015) show that the basic food basket is about 10,000.00 MZN/month (156.49 USD), an amount that doubles the average monthly income of most residents. Thus, it can be stated that low income appears to be one of the factors affecting food security and therefore the health and well-being of the residents of the study area, in analogy with the results from (RIBEIRO et al., 2018; SUZART; FERREIRA, 2018), where they observed a direct connection between monthly income and food security in Brazil. Consistent with the results of this work, MUTHIE; JOS (2022), which assessed the state of food and nutrition security in the rural communities of Massingir (a district bordering with Chókwè), also reported

that 80% of households were living with a monthly income of less than MZM 10,000.00.

Figure 5. Level of satisfaction of decision-makers within the family in relation to their monthly income. (n=260).



Research has shown that the value of a person's monthly income has a direct impact on improving food and nutrition security (CONCEIO et al., 2016; NGEMA et al., 2018). In this context, increasing the average monthly income combined with lowering the prices of basic needs would be a crucial strategy to control/reduce food and nutritional insecurity in the population, especially among low-income people.

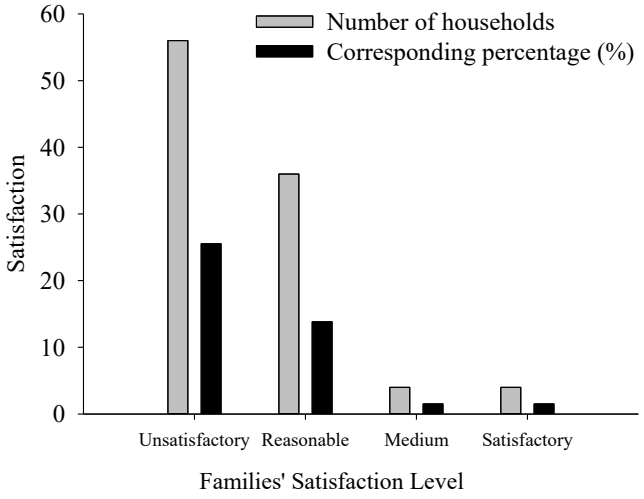
Household satisfaction levels with regard to food availability

Household satisfaction levels with regard to food availability are shown in Figure 6. The results showed a food shortage to ensure food and nutritional security for the majority of the urban population in Chókwè municipality. About 56% of those surveyed rated the availability of food as insufficient. Food unavailability can be linked to a lack of basic necessities. In contrast, 36% of heads of household indicated that the level of satisfaction with food availability in the Chókwè community was reasonable.

Only 4% of households indicated a high level of satisfaction with the constant availability of basic foodstuffs. Food was available for that percentage, but what tended to fluctuate and limited the purchasing power of the population were the set prices. Some householders interviewed reported that certain products had maintained their high prices even at the peak of production and availability. The most frequently mentioned products were: fruits and vegetables 79%, meat 67%, rice 61%, milk 70%, beans 78%, yoghurt 70%, egg 69% and gelatin 67% (Figure 7).

The purchase price of staple foods is one of the limiting factors in ensuring food security. The results obtained in the present study agree with those of Dorneles et al. (2018) and Schabarum and Triches (2019). In fact, the purchase prices of products have an impact on the purchasing power of staple foods that ensure the maintenance of food security within the population (GUERRA et al., 2019; TORRES, 2017). In order to reduce food and nutrition insecurity in rural communities, it is strategically important to implement pricing policies for the purchase and sale of products that take into account the purchasing power of the population earning the minimum wage.

Figure 6. Level of household satisfaction with food availability in Chókwè community. (n=260).

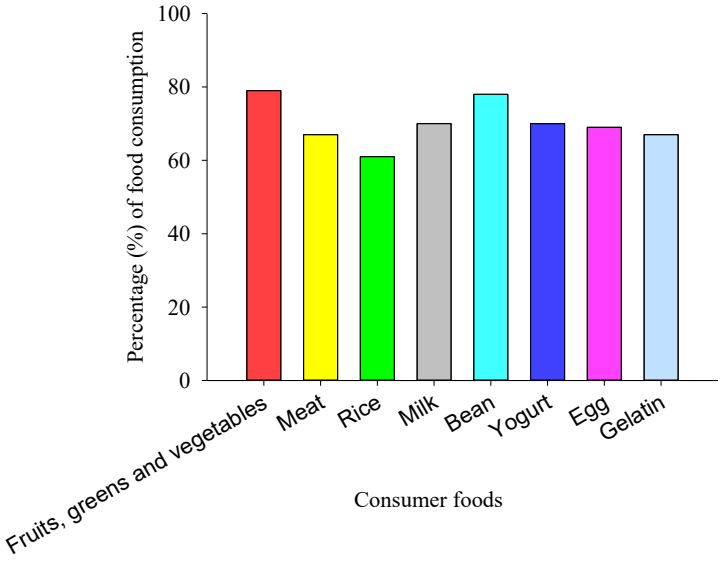


Access to food

Chókwè residents were dissatisfied with basic access to food (55%). Average satisfaction was around 7%, maximum satisfaction around 5% (Figure 8). The low income of the households leads to an inadequate diet, which mainly consists of substandard products and in insufficient quantities. These results are consistent with the FAO (2011) which concluded that middle and upper class households have better financial conditions that ensure access to basic necessities compared to the lower class. In addition, compared to low-income households, middle- and upper-class households have better access to food, regardless of the prices applied to the products.

Leão (2013) found that access to basic foodstuffs requires regular and sustained availability, and must be of quantity and quality that meet demand levels across all social classes.

Figure 7. Percentage of basic food consumption in Chókwè Municipality. (n=260).



Food must be produced directly or through money-making and conform to the cultural traditions of consumers in a region. In contrast to the reality of Chókwè, this diet must guarantee quality of life in physical and mental, individual and collective dimensions. The high percentage of dissatisfaction could be related to the social class at the research location. Low-income families predominated in the neighborhoods studied, a fact that somewhat justifies the limited access to food resources observed in the Chókwè commune's suburban belt.

Figure 8. Household satisfaction levels with regard to access to basic foodstuffs for consumption in Chókwè municipality. (n=260).

Food consumption

Table 3 shows the percentages showing the frequency of food consumption by households in Chókwè municipality. Sugar, oil, bread, corn and rice were among the foods that residents of Chókwè consumed most frequently on a daily basis. The proportion of households consuming these products daily was 70% sugar, 68% oil, 56% bread, 52% corn and 41% rice. These products are considered indispensable in the diet of the commune's households because they are rich in carbohydrates (starches and sugars). Similar results were reported by the FAO (2011) in a study looking at food security in African countries. The worrying aspect is that the majority of households did not eat a varied diet, which could affect the residents' nutritional status and health.

Corn, rice, vegetables, and roots and tubers top the list of products consumed three to five days a week in the Chókwè community. The 4 (four) products are consumed by 25%, 21%, 21% and 20% of households. The proportion of households that consumed beans and bread three to five days a week was 16%. The foods least consumed in the 3 to 5 days/week range were: meat and by-products, fish, fruit and milk. Beans, legumes, roots and tubers, corn and rice were the most commonly consumed items two to three days a week. The consumption of these products ranged from 19% to 13% and the least consumed products were: fish, fresh and milk powder, oil and bread, whose household shares ranged from 5% to 8% (Table 3).

Roots and tubers were the Food consumed by households on a daily basis. The share of root and tuber consumption in Chókwè commune was 35%. Fish, fruit, meat, beans and eggs were the least consumed daily by most households in the Chókwè community. Daily fish consumption at household level was 3%. Daily consumption of fruit, beans, meat and eggs was around 5%. A low proportion of consumption of foods with higher nutritional values can be associated with low availability and low family income (FAO, 2011). Meat and its derivatives are rich in proteins, mineral salts and lipids (IGLESIAS; PREZ, 2016). The consumption of powdered and fresh milk was 60% and 73% respectively in the municipality of Chókwè. These foods are rich in mineral salts, proteins, lipids and lactose (carbohydrates) (CZARNOBAY et al., 2017; ZANELA et al., 2018).

The levels of food insecurity observed in this study may be related to insufficient consumption of foods with high nutritional value. In this context, a balanced diet and the consumption of varied foods would be beneficial to reduce the level of undernutrition in low-income populations (AMORIM et al., 2020). Therefore, the food security of the population of Chókwè municipality can be achieved through the constant availability of these foods for their diet. Increasing investment in agriculture is one of the examples of some strategies needed to improve the competitiveness of domestic production. This could lead to increased profits for farmers and easier access to food for low-income groups in the Chókwè community.

Table 3. Frequency of food consumption by the households living in Chókwè Municipality. (n=260).

Consumer goods	Frequency (%) of food consumption				
	Every day	3-5 days	2-3 days	1-2 days	Rarely
Corn	52	25	14	8	1
Rice	41	21	13	15	9
Bean	3	16	19	27	35
Bread (unit)	56	16	8	8	12
Roots and Tubercles	35	20	16	18	12
Vegetables	35	21	18	14	12
Oil	68	14	8	6	3
Sugar	70	15	12	2	0
Powdered Milk	5	10	8	17	60
Fresh Milk	4	7	8	8	73
Meat and derivatives	3	5	10	13	69
Fish	3	5	5	9	78
Eggs (dozens)	5	6	10	14	65
Fruits	3	6	10	14	65

CONCLUSION

There is food availability in the Chókwè community, albeit not satisfactorily diversified. However, access to food is low and leads to a high prevalence of food and nutrition insecurity. The economic fragility of households, the weakness of the production chain with a focus on low utilization of adequate inputs, significant post-harvest losses and vulnerability to the impacts of climate change contribute to food instability and family well-being. The highest rates of food insecurity were observed in households headed by less educated people. Increased investment in agriculture, the introduction of pricing policies that include the low-income population, and the creation of job opportunities could be among the strategies to be adopted to improve food and nutrition security in Chókwè Municipality.

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