



# The contribution of urban community gardens to food availability in Emfuleni Local Municipality, Gauteng Province

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## Abstract

This study investigated the contribution of urban community gardens to food availability in Emfuleni Local Municipality, Gauteng Province of South Africa. The objectives were to determine the ability of the urban community gardens to produce vegetables throughout the year and to assess the contribution of these gardens to food availability. It was conducted in six (6) townships of Emfuleni Local Municipality by means of semi-structured survey questionnaires. A sample of 254 participants was randomly drawn from 418 urban farmers. A descriptive analysis technique and one-way ANOVA formed part of the data analysis using Statistical Package for the Social Sciences (SPSS) version 23. The study found that community gardens contributed to food availability of the respondents by providing fresh vegetables to most urban farmers and their household members throughout the year. Furthermore, it was discovered that there is no relationship between vegetable availability and gender of the respondents. Based on the results, the study recommended that farmers in urban community gardens should focus on increasing and sustaining their production to ensure that they have adequate vegetables to feed their families throughout the year.

**Keywords** Community garden · Emfuleni · Food availability · Urban farming

## Introduction

Globally, urban agriculture is regarded as one of the livelihood strategies adopted by poor urban communities as a way to improve food security (Battersby & Marshak 2013). Moreover, it has been reported that urban agriculture includes community gardens in an urban setting (Reese 2014). Ferris et al. (2001) and Frayne et al. (2009) have stated that farming in an urban setting has the potential to improve the availability of local food in the surrounding areas. For example, Qiu

(2014) stated that neighbouring communities and farmers can easily source fresh vegetables from community gardens. Empirical evidence shows that some farmers mainly preferred to consume vegetables from their own community gardens in Cagayan de Oro City, Philippines than from supermarkets (Agbayani et al. 2001). In another setting, Wise (2014) reported that in Australia about 91% of home and community gardeners saved money because of producing their own food. In some African countries, vegetable farming has provided a balanced diet to urban populations and enhanced farmers' household income and living standard (Allagbé et al. 2014). In the Southern African Development Community (SADC) region, for example in Lesotho, community gardens improved the nutritional status of beneficiaries by providing micro and macro nutrients (Mashinini 2001).

In South Africa, urban farming was neglected and considered as an illegal activity (Magidimisha et al. 2013). Gardening was mainly considered illegal during the apartheid era (before 1994) when black people in South Africa were not allowed to participate in urban farming. However, urban farming has been recognised as a potential mechanism to provide micro nutrients in urban households (De Bon et al. 2009; Richards and Taylor 2012; Rezai et al. 2016). Likewise, Algert et al. (2014) have expressed a view that community gardens increase gardeners' intake of fresh vegetables,

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providing access to fresh, culturally acceptable produce to the surrounding communities. The development of urban agriculture in South African Metropolitan municipalities is an indication that urban agriculture has the potential to improve food security (City of Cape Town 2007; City of Johannesburg 2013). Furthermore, urban agriculture is also sponsored in integrated development planning (IDP) because it is regarded as the fundamental aspect of ensuring that households have access to adequate food (Magidimisha et al. 2013). It is therefore the reason why South African government provide support to food security programmes with the aim of alleviating hunger, eradicating food insecurity and creating income through agricultural initiatives (GDARD 2017). Some of the programmes include the Comprehensive Agricultural Support Programme (CASP), farmer settlement, land reform and South Africa's Integrated Food Security Strategy (SAIFSS) (NDA 2002). One of the key food security programmes under the SAIFSS is community food gardening. In a study conducted in Vhembe district in Limpopo Province of South Africa, Mudau (2001) concluded that food security programmes were established to create employment opportunities in the surrounding communities. Vulnerable women, children, unemployed youth, and people living with disabilities were mostly targeted by these programmes; and the support is provided in the form of infrastructure (fences and gates), technical advice, training and production inputs (seeds and fertilisers) (GDARD 2017). It was reported in the White Paper on Social Welfare that the quality of lives of South Africans would be improved if they partake in food security programmes such as community gardens (Republic of South Africa [RSA] 1997). Furthermore, food security programmes are mostly funded by the government and many people resort to them because they provide food and income (Mantena et al. 2017). According to the Gauteng 20-year Food Security Plan, the province aims to comprehensively tackle food insecurity in Gauteng by half in 2030 (GDARD 2011). Although the government makes every effort to support community gardens, some studies have found that gardens do not contribute significantly to household food security. For example, empirical study conducted in Maphephetheni Uplands situated in the rural areas of KwaZulu-Natal province, found community gardens to have not contributed significantly to household food security (Shisanya and Hendricks 2011). Moreover, in Limpopo province, contributions of community gardens in reducing poverty were average (Nesengani et al. 2016). Community gardens in an urban settings contribute to food availability by producing local food (Ferris et al. 2001). As a result, local people will refrain from purchasing food from the supermarkets (Flachs, 2010). Similarly, the study of Carney et al. (2012) found that community gardens contributed to food availability by producing food for household consumption. Despite the recognition of community gardens as a key intervention strategy to improve food security in urban

communities of South Africa; Shisanya and Hendriks (2011) maintained that there is limited empirical evidence on the effects of community gardens on food security, particularly in urban areas. Studies conducted by Hendriks (2003); Berti et al. (2004); Shisanya and Hendriks (2011) have mostly focused on the contribution of gardens to food security in rural areas. On the other hand, several studies concluded that active participation in urban farming contributes to food security (Juniawati and Hayuningtyas 2017; Salah 2019). While some studies have found that urban agriculture contributes to food security, it may not be the case in South Africa because literature reviewed indicate a paradigm shift in policy directive where urban agriculture in South Africa is now legal and gaining popularity especially in Metropolitan municipalities. This article is aiming at evaluating the contribution of urban community gardens to food security in the post - apartheid era (1994 onwards). Even though food security has four main pillars (availability, accessibility, utilisation and stability), for the purpose of this paper, we will focus on food availability with reference to urban community gardens as one way of ensuring food availability at the household level. Although, literature has shown that community gardens contribute to food security globally, there is still a vacuum as to whether community gardens contribute to food availability in Emfuleni local municipality, Gauteng Province South Africa. This study sought to achieve the following objectives:

- determine the ability of the urban community gardens to produce vegetables throughout the year; and
- assess the contribution of urban community gardens to food availability.

### Description of the study area

The study was conducted in Emfuleni Local Municipality (ELM). ELM is under Sedibeng District Municipality in the Gauteng Province of the Republic of South Africa. The area of Sedibeng District Municipality consists of three (3) local municipalities, namely Midvaal, Lesedi and Emfuleni. Although the area of Emfuleni is geographically small in the Sedibeng District, about 79% of the people in the District live in Emfuleni Local Municipality (Stats SA 2011), and it is a municipality that is highly urbanised (ELM 2018). Therefore, Emfuleni has a high population compared to the other two local municipalities (Lesedi and Midvaal). It was formerly known as the Vaal Triangle and it consists of six (6) townships namely Sebokeng, Bophelong, Boipatong, Sharpeville, Tshepiso and Evaton (ELM 2017). According to the results of the last census conducted in the area, the number of unemployed households declined by 12.5% between 2001 and 2011; meanwhile the population grew by 0.92% during the

same period. (Stats SA, 2011). Although unemployment rate declined in the study area, the living conditions of more than one third (34.7%) of the households remain poor. This was also confirmed by empirical studies conducted by Oldewage-Theron et al. (2006) as well as Oldewage-Theron and Slabbert (2010) who found that Vaal region situated under municipal jurisdiction of Emfuleni Local Municipality was poverty stricken. Due to lack of employment opportunities, government social grant has become another source of income to reduce poverty among the destitute. In South Africa, social grant entails child support grant, foster child grant, old-age grant, disability grants and war veteran grants and administered by the South African Social Security Agency (SASSA) to improve livelihood and alleviate poverty (SASSA 2008). Child support grant is received by poor parents for each child below 21 years old, old-age grant is for people who are 60 years and above whereas orphans receive foster child grant. On the other hand, physical and psychological challenged people received disability grant. The recipients of war veteran grants are South African citizens and residents, 60 years and above and ought to have fought in the Second World War or the Korean War (RSA 2004). Although social grants offer complementary support to the destitute, it is inadequate to uplift indigent households out of poverty (Mushongera et al. 2018). Moreover, it was reported that people in the area are engaged in various agricultural production activities such as livestock (11.7%), poultry (18.4%), vegetables (31.4%), other crops (15.0%) and other farming types (23.4%) (Stats SA 2011). Based on the aforementioned agricultural production statistics, it is evident that there are various farming activities in Emfuleni. Vegetable production is one of the common agricultural activities in the study area, hence urban community gardens were established by government to improve food security.

## Methodology

The study was carried out using a quantitative research approach and survey design. The population of interest comprised beneficiaries of food security programme in urban community gardens. A list of community gardens was obtained from the Gauteng Department of Agriculture and Rural Development (GDARD). The list showed that there were about 43 urban community gardens in Emfuleni with 418 farmers; therefore the population of study (N) was 418. Thus, a 60% sampling fraction was employed to determine the sample size. Using the sampling fraction chosen, the expected sample size for the study was 251 participants from urban community gardens. Thereafter, 251 participants were randomly selected from a population of 418 farmers. However, there were three more farmers who showed interest to participate in the study during data collection, as a result, the sample size became 254. The study area as depicted in Fig. 1 was distributed as

Sebokeng, Evaton, Sharpeville, Tshepiso, Bophelong and Boipatong townships.

Face-to-face interviews were conducted as part of data collection using structured semi-questionnaires (survey instrument) during March/April 2017. To ensure validity and reliability of the survey instrument, a pilot study was conducted under the supervision of the co-researchers who are food security experts. Statistical Package for Social Sciences (SPSS) version 23.0 was used to analyse data. The analysis included descriptive statistics, precision frequencies, percentage, mean, standard deviation and standard error or mean. Furthermore, one-way ANOVA test was run to ascertain the relationship between the availability of vegetables harvested from community gardens and gender of the participants. The purpose of the analysis was to determine the significant difference of availability of vegetables between male and female farmers (participants). The significant difference was measured at 5% interval level.

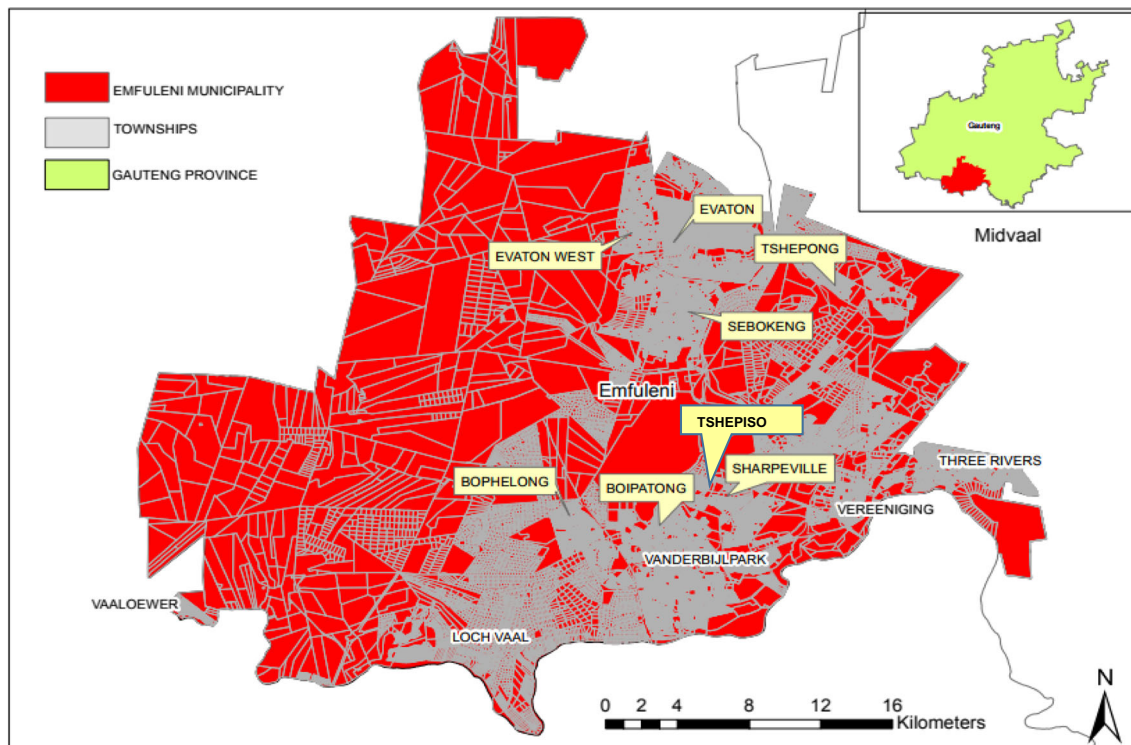
## Results

### Socio-demographic profile of respondents

The research found that the majority of the farmers in urban community gardens in Emfuleni consisted of females (71.3%), while 28.7% were males. The age group of respondents ranged between 18 and above 55 years, with a large proportion of respondents (55.1%) being between 46 and above 55 years old. Youth (18 to 35 years old<sup>1</sup>) participation in community gardens was low as it constituted 23.2%. This is a great concern regarding the future of the community gardens and could jeopardize their sustainability. Respondents above the age of 55 years indicated that they participate in community gardens because they have retired and were keeping their body active. The educational status showed that the majority (62.2%) of the respondents attended secondary school, followed by those who only attended primary school (29.1%), while only 4.3% had tertiary education.

From an income perspective, majority (78.7%) relied on community gardens as their main source of income, whereas 21.3% were dependant on other income sources such as social grant, remittances and business. Remittances were received by the participants whose family members were employed. Whereas social grant was received by older people (60 years and above) and parents with children younger than 21 years old. Thus, sustainability of community gardens was critical as urban farmers view farming as a means of providing vegetables and creating income by selling surplus. Of the respondents, 40% reported that they received monthly allowance (stipened) from government through Extended Public Works

<sup>1</sup> The South Africa's National Youth Development Agency (NYDA) defines youth as 14 to 35 years of age (Republic of South Africa (RSA), 2008).



**Fig. 1** Map showing different locations in Emfuleni local Municipality (ELM) (Source: Emfuleni Local Municipality 2017)

Programme (EPWP) and Independent Development Trust (IDT) for a period of nine (9) months for their participation in community gardens. Moreover, 60% only relied on the income from community gardens, which was derived by selling vegetables.

### Vegetable production in community gardens

Community gardens have mainly produced vegetables. Vegetables planted in the community gardens were potatoes, pumpkins, tomatoes, cabbage, carrots, beetroot, lettuce,

**Table 1** Extent of receiving vegetables from the community gardens on a monthly basis (n = 254)

Month	Proportion of respondents (%)	Mean of frequency of receiving vegetables monthly	Std. Error of mean	Std. deviation	Lowest frequency of receiving vegetables monthly	Highest frequency of receiving vegetables monthly
January	67.7	3.39	0.246	3.926	0	20
February	70.0	3.41	0.267	4.251	0	30
March	66.9	3.08	0.221	3.527	0	20
April	66.9	3.02	0.225	3.584	0	20
May	66.9	2.73	0.212	3.384	0	20
June	62.5	2.56	0.204	3.248	0	20
July	62.5	2.54	0.201	3.204	0	20
August	65.3	2.94	0.223	3.553	0	22
September	67.7	3.20	0.242	3.857	0	26
October	67.7	3.50	0.268	4.272	0	30
November	68.1	3.46	0.262	4.173	0	30
December	64.1	3.45	0.277	4.410	0	30
<b>Average</b>	<b>66.3</b>	<b>3.10</b>	<b>0.237</b>	<b>3.782</b>	<b>0</b>	<b>24</b>

Source: Field data (2017)

**Table 2** Results of one way ANOVA of the relationship between gender and availability of vegetables harvested from community gardens throughout the year (n = 254)

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6.396	1	6.396	0.548	0.460
Within Groups	2943.734	252	11.681		
Total	2950.130	253			

Source: field data (2017)

butternuts, chinese cabbage, onions, spinach, sweet potatoes, green pepper, chomolia, chinese spinach, brinjal, kale, chilli pepper, turnips and green beans. Farmers indicated that under favourable conditions, growing and harvesting of vegetables varied between two and three months. The availability of vegetables harvested from community gardens throughout the year is presented in Table 1.

The results in Table 1 show that on average, nearly two-thirds (66.3%) of the respondents received vegetables from community gardens throughout the year (January to December). It means that most respondents received vegetables from community gardens sustainably. On average, the respondents received vegetables about three times per month (mostly on Fridays) from the gardens on an annual basis. The number of times these respondents received vegetables ranged between 0 and 30 times per month. This implies that there were respondents from some community gardens who did not receive vegetables between January and December. For example, there were respondents who did not receive vegetables in winter but in summer and vice versa. Most respondents largely received vegetables during October, November, December and February because the maximum was 30. The reason why most respondents received vegetables every day during those months is because of summer rainfall. The average annual standard deviation was 3.782, which ranged between 3.204 in July (minimum) and 4.410 in December (maximum). This shows that the variation was low.

Furthermore, one way ANOVA was done to determine the relationships between gender and availability of vegetables. The results showed that on average, males received vegetables about 3.36 times per month throughout the year from community gardens compared to females who received 3.01 during the same period. To determine whether the difference in mean score in males and females was significant or not, Lavene Statistic test was run. The significant value for Lavene Statistic test was 0.025 and therefore statistically significant at 5% interval level ( $p < 0.05$ ). It means that the groups are not homogeneous; therefore the homogeneity between the groups was violated. As a result, robust test of equality of means was run using Welch tests because the groups had unequal sample size. The significant value of Welch tests was 0.531 which is not statistically significant. Therefore, the null hypothesis that there is no significant difference between the mean of two groups is accepted. Table 2 shows results of one way ANOVA of the relationship between gender and availability of vegetables harvested from community gardens throughout the year.

The results in Table 2 indicate that the mean difference between groups (males and females) is not statistically significant (Sig. = 0.460). It implies that even though on average vegetables from community gardens were more available to males per month throughout the year compared to females, the difference was not significant. Therefore, there is no relationship between vegetable availability and gender of the respondents.

Table 3 shows the contribution of community gardens to food availability in Emfuleni Local Municipality.

Table 3 shows that majority (86%) of the respondents (strongly) agreed that they were able to provide fresh produce to their households by participating in community gardens. More than half (54%) experienced anxiety at times as they had no knowledge of obtaining vegetables the following day, due to unreliable production patterns. Most of the respondents were unaffected by these unreliable patterns, though,

**Table 3** Contribution of community gardens to food availability in Emfuleni Local Municipality (n = 254)

Since I participate in community garden...	Level of agreement (%)				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am able to provide fresh produced vegetables at home	3	2	9	19	67
I do not know where the next day's vegetables will come from due to production that is not reliable.	8	25	13	45	9
The vegetables produced are not enough to feed my family.	11	38	10	23	18
I eat more vegetables due to high production	4	13	11	44	28
I eat less vegetables due to low production	8	29	11	39	12
My family is not getting enough vegetables to eat	12	45	10	22	11
I can afford to eat fresh produced vegetables everyday	7	22	7	36	28

Source: field data (2017)

because only 41% indicated that vegetables produced were not enough to feed their families. As depicted in Table 3, 72% of the respondents consumed more vegetables due to high production in the gardens. However, this was not applicable to all the members because 51% of the respondents consumed fewer vegetables due to low production. The results demonstrate that more than half (57%) disagreed that their families were not getting enough vegetables for consumption from the gardens. Furthermore, majority (64%) were able to eat freshly produced vegetables on a daily basis ever since participating in community gardens. This shows that food availability was not a daily concern in the households of most farmers of community gardens in Emfuleni Local Municipality.

## Discussion

### Ability of community gardens to produce vegetables throughout the year

The study discovered that in most urban community gardens, fresh vegetables were produced throughout the year. The findings are similar to what Ngobese (2015) and Mudzinganyama (2012) reported that in community gardens in KwaZulu-Natal (KZN) province of South Africa, farmers' cultivated their gardens throughout the year and produced vegetables continuously. In KZN, vegetables were sometimes sold for income generation when there was surplus production (Ngobese, 2015). Nearly two thirds (66.3%) of the respondents consistently received vegetables for home consumption on a monthly basis from community gardens due to high yields. Similar findings were recorded by Van Averbeke (2007) that in Atteridgeville Township, northern Gauteng province, farming households consistently received vegetables from community gardens on a monthly basis. In support, Mkhize (2011) also found that majority of community gardeners in Emahlabathini area produced vegetables for home consumption and income generation by selling surplus to the neighbouring communities. This shows that farmers' households did not have to purchase vegetables from formal and informal markets. However, it was also found that most harvests in the gardens occurred during summer or rainfall season (October to February) compared to the dry season or winter (March to August). According to Modibedi (2018), vegetable harvests in urban community gardens in Emfuleni were low during winter because of water restrictions since most gardens do not have reliable water sources such as boreholes. This is not surprising because vegetables requires more water to grow. As reported by Zavadil (2009), water is a critical natural resource which plays a key role in vegetable growth because it improves the quality, uniformity and yield of crops. It means urban community gardens without reliable water sources such

as borehole, municipal water and others were more likely to have low harvests during dry months of the year. The problem with relying on municipal water is that there are recurring restrictions in Emfuleni (Khumalo, 2018).

Furthermore, it was found that urban farmers in Emfuleni planted various crops such as leafy vegetables, tuber crops, butternuts, peppers, beans and others as presented in the results. The diversity of vegetables in the study area may be influenced by seasonal variation that is suitable for different crops throughout the year. Similar findings were recorded in several areas in Soweto (Meadowlands, Chiawelo, Mzimhlophe, Nancefield Hostel and Motswaledi) that farmers in urban gardens cultivated various vegetables such as spinach, onion, carrots, beetroot, cabbage and cabbage mostly for home consumption and selling (Molelu, 2014). In addition, Khumalo and Sibanda (2019) also reported that in peri-urban communities in Tongaat, KwaZulu Natal province, farmers cultivated crops such as cabbage, spinach, sweet potato and avocado. When comparing Emfuleni, Soweto and Tongaat, it shows that community gardens preferred cultivating different crops (leafy vegetables, tuber crops and fruits). This is not astonishing because Nkosi et al. (2014) discovered that vegetables are vital in the daily diet composition of people in the townships. Therefore, urban farmers and their family members were more likely to consume a variety of vegetables harvested from the gardens.

### Contribution of urban community gardens to food availability

The results showed that 86.2% of urban farmers were able to provide fresh vegetables to their households by participating in community gardens. Similar findings were documented by Algert et al. (2014) that in the United States of America (USA) community gardens increased the intake of fresh vegetables in the households of the people involved in farming. This shows that in the households of most urban farmers in Emfuleni, they did not rely on purchasing vegetables from markets, supermarkets and spaza shop<sup>2</sup> because they were freely available from the gardens. In support, Kellner (2016) reported that the households of the farmers in Denver, Colorado did not purchase expensive vegetables from commercial market because they were freely available from the gardens or farms. It means that urban farmers were more likely to save money on food expenditure and redirect the savings to other commodities such as school fees, electricity, transport and other food types. This assumption can be linked with what Nkosi et al. (2014) found that community gardeners in Hammanskraal Township (Northern Gauteng province) saved money because

<sup>2</sup> Spaza shop is commonly known as informal business for purchases of small grocery in South African townships & rural areas, normally operated from home.

they did not have to purchase costly vegetables from formal vegetable market. The notion that members of community gardens can save money on food if they acquired vegetables from the gardens is a good thing as reported by Reddy and Moletsane (2009). However, in the other study by Frayne et al. (2010), it was found that most of the households in eleven (11) SADC cities (Blantyre, Cape Town, Gaborone, Harare, Johannesburg, Lusaka, Maputo, Manzini, Maseru, Pietermaritzburg and Windhoek) in eight (8) countries did not largely rely on sourcing food from the supermarkets and street vendors, rather than urban agriculture.

The present study showed that more than half (54%) of the respondents at times wondered where the next day's vegetables would come from as production was not reliable. These results were supported by what Masekoameng (2015) discovered that more than half (66%) of the households in 21 villages of Sekhukhune District in Limpopo province did not know where their next day's food would come from. Although the focus of the current study was solely on vegetables, Masekoameng (2015) explored broader scope of food availability in a rural settings. This shows that the level of food insecurity in poor communities was prevalent to an extent that most people were uncertain whether they will have food to eat on regular basis or not. This is likely to result in vulnerability among the peri-urban communities because of uncertainty as reported by Owino et al. (2014). In the current study, the results showed that 49% of the respondents were able to feed their families with vegetables from community gardens. This finding differs from the results of Harvey et al. (2014) who found that in a small-scale setting, food insecurity was a major problem for farmers because 75% of the households did not produce sufficiently to feed their households. Although in the present study, more than 50% of households received freshly produced vegetables from the community gardens, some of the respondents did not have vegetables continuously throughout the year due to unreliable production.

The study found that there is no significant relationship between vegetable availability and gender of the respondents. On monthly basis, male respondents did not have more vegetables available from community gardens compared to females and vice versa. It means harvested vegetables from community gardens were equally available in the households of male and female urban farmers. Therefore, the variation in the food security (availability) of the respondents cannot be equated to gender. In support to the findings of the study, Kelly and Pemberton (2016) reported that there was no relationship between food security (local food availability and accessibility) and gender in the Eastern Rural areas of the Bahamas. However, on the other hand Lutomia et al. (2019) found that male-headed households were significantly food insecure in comparison to females headed households in Eastern and Western regions of Kenya.

As in this study, Table 2 reflects that more than half (51%) of the respondents consumed less vegetables because of low production. This shows that some of the community gardens did not produce sufficient vegetables; as a result, food insecurity was inevitable, especially availability. When individuals eat less food, it means they have less food available and they are unable to consume sufficient nutrients (Lemke 2001). Although a large proportion of respondents (57%) consumed vegetables in their households because of community gardens, some did not have sufficient harvests. This is not surprising because Broca (2002) pointed out that access by individuals to adequate resources for acquiring appropriate foods is not guaranteed at all. Farming is at times faced with constrains such as natural disasters (Mpandeli and Maponya 2014). From the foregone discussion, it is evident that in the current study area, food availability particularly to vegetables was not a concern for most of the urban farmers in Emfuleni Local Municipality.

## Conclusion and recommendations

The present study has shown that sustainable production in community gardens can improve food availability in urban communities. Community gardens were able to sustainably provide vegetables to about two-thirds of the farmers throughout the year because of high yields even though harvests declined during dry months (March to August). In addition, they reduced reliance on spaza shops, markets and supermarkets as sources of vegetables. Thus, the role played by community gardens in combating food insecurity in urban communities cannot be ignored. Thus, it is recommended that urban community gardens should adopt farming practices such as irrigation, greenhouses, drought resistant cultivars and others in order to increase and sustain production, and ensure that all farmers have sufficient vegetables to feed their families throughout the year. Furthermore, cultivation of various vegetable types should be sustained because it ensures diversity and availability of vegetables during all seasons of the year. The study also recommend that youth participation in community gardens should be encouraged to ensure the sustainability of urban farming, availability of locally produced vegetables and cultivate passion for farming amongst young people.

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**Data availability** The study forms part of Master of Science in Agriculture for the first author (Thabo P. Modibedi) who was enrolled at the University of South Africa (UNISA) between 2016 and 2018. In the participation information sheet (informed consent form), the authors declared that data collected will be kept confidential for a period of five years as required by the University. However, the data that support the

results of this study is available from the corresponding author, upon reasonable request by the Journal of Urban Ecosystem.

## Compliance with ethical standards

Ethical approval for this study was obtained from the Research Ethics Review Committee of the College of Agriculture, Environmental and Sciences (CAES) at University of South Africa. (Reference number: 2016/CAES/118).

**Conflict of interest** All authors declare that they have no conflict of interests.

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