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Food security: The role of urban and peri-urban agriculture. A case of Dar es Salaam City, Tanzania

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Abstract

This study examined the contribution of urban and peri-urban agriculture (UPA) on food security in Dar es Salaam city. With the massive population increase in most cities in the world, food insecurity has become a challenge. One of the responses to this is promotion of urban and peri-urban agriculture (UPA). Primary and secondary data were collected using structured questionnaires, in-depth interviews, direct observations, focus group discussions and literature survey. About 201 respondents engaging in urban and peri-urban agriculture were interviewed. Also, 100 local market traders from 10 local markets, and 7 supermarket managers from 7 representatives supermarkets in Dar es Salaam city were interviewed. The Statistical Package for Social Sciences (SPSS) version 20 was used to analyze the data. The findings revealed that UPA had a positive contribution to food security as it was observed that the main aim of 84% of the farmers who engaged in crop production was to get food and income. In the surveyed local markets about 47% of food products were sourced from UPA, also, 60-80% of vegetables and 57.1% of the eggs sold in the surveyed supermarkets were sourced from UPA. The study recommends adoption of modern technology for better output with use of limited land and water resources. Also available policies supporting UPA should be reviewed for its sustainable development.

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Introduction

Food insecurity continues to be a challenge in most cities in the developing world due to massive population increase and exodus from rural areas. In order to meet part of the food needs of urban dwellers, urban farming both in intra-urban and peri-urban areas is becoming a popular and almost permanent feature in the developing world (Baseka 2016; Mulugeta 2010). Globally, cities occupy a small percentage of land (4%) but now are habitats for over half the global population (Seto *et al.*, 2011; Potts, 2012). The world's urban population has been estimated to have increased to 54% a proportion that is expected to reach up to 66% by the year 2050. Therefore, countries are urged to face the challenges of meeting the needs of their urban population (UN, 2014). It is estimated that roughly 60% of population growth in medium (sized) cities in the middle to lower income countries is due to natural increase (Potts, 2010). The remaining 40% is attributed to net rural-urban migration and the reclassification of rural settlements as urban (Potts, 2010).

Urban and peri-urban agriculture is defined as "the production, processing and distribution of foodstuff from crops and ornamental plants and flowers as well as animals including, fish, pork, dairy and poultry, within and around urban and peri-urban areas (Mougeot, 2000).

This definition which has also been adopted in this article can have a positive impact on urban employment and raising income to the farmers themselves, thereby diminishing their food insecurity (Brown, 2002; Battersby, 2011). Also, urban and peri-urban agriculture(UPA) plays an important role in enhancing urban food security which is defined as the situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996; FAO, 2002). Traders, civil servants and artisans are finding it increasingly difficult to cope with the high cost of living and the stagnant income in the urban areas; these have prompted agricultural production within the vicinity of the city (Olayioye, 2012).

Furthermore, Urban and peri-urban agriculture (UPA) helps in diversifying urban diets and providing environmental services in urban and peri-urban areas and also by greening the cities and making productive reuse of urban wastes (Oyedipe, 2009; Jayne, 2013; Mlozi *et al.*, 2014).

Although Tanzania is still predominantly rural, there is a rapid urbanization going on especially in the city of Dar es Salaam (URT, 2014). Dar es Salam is the fastest developing city in Tanzania and has a population density of 3133/km^2 while the country's population density is only 51 people per km^2 (Baseka, 2016). Dar es Salaam has 4,368,541 people equal to 10% of Tanzania's population (URT, 2012). Its growth rate is 5.6% which translates to 250,000 additional people per year (URT, 2012).

This rapid growth rate in Dar es Salaam denotes the increasing demand for food supply and availability. Technically, UPA is seen as an activity which can improve food security at city and household level by supplying fresh products to the urban markets since it has been reported that in Dar es Salaam city about 90% of the city's leafy vegetables and 60% of its milk comes from urban and peri-urban agriculture (Jacobi *et al.*, 2000; McLees, 2011; Mlozi *et al.*, 2014). UPA plays important role with regard to income and food supply especially for marginalized group such as women and youths (Kiango, 2001). Different social groups are involved in urban and peri-urban agricultural activities for varying reasons; for high-income households, UPA has increasingly become a response to growing business opportunities in peri-urban areas, particularly for livestock and poultry/egg production, while for low-income people, and some middle-income households engaging in vegetable production, urban and peri-urban agriculture is an important livelihoods strategy (Mlozi *et al.*, 2014).

This study intended to assess the contribution of urban and peri-urban agriculture (UPA) to various dimensions of food security in cities i.e. food accessibility, availability, stability and utilization with specific focus in Dar es Salaam city.

Methods and materials

The study was conducted in Dar es Salaam region in Tanzania. This area was selected because it is one of the regions in Tanzania with the highest population of about 5.5 million people (POD, 2017) and the city has the largest number of urban farmers. In 2012, Dar es Salaam region had 75,948 households engaging in crop production and a total of 84,631 households were reported to engage in livestock keeping (URT, 2014). A total 201 respondents from ten wards which engaged in UPA from five districts of Dar es Salaam region were selected for the study, i.e. Toangoma, Chanika, Kivule, Ukonga, Kipunguni B, Mbezi, Kisarawe II, Mabwepande and Mbweni wards as shown in figure 1.

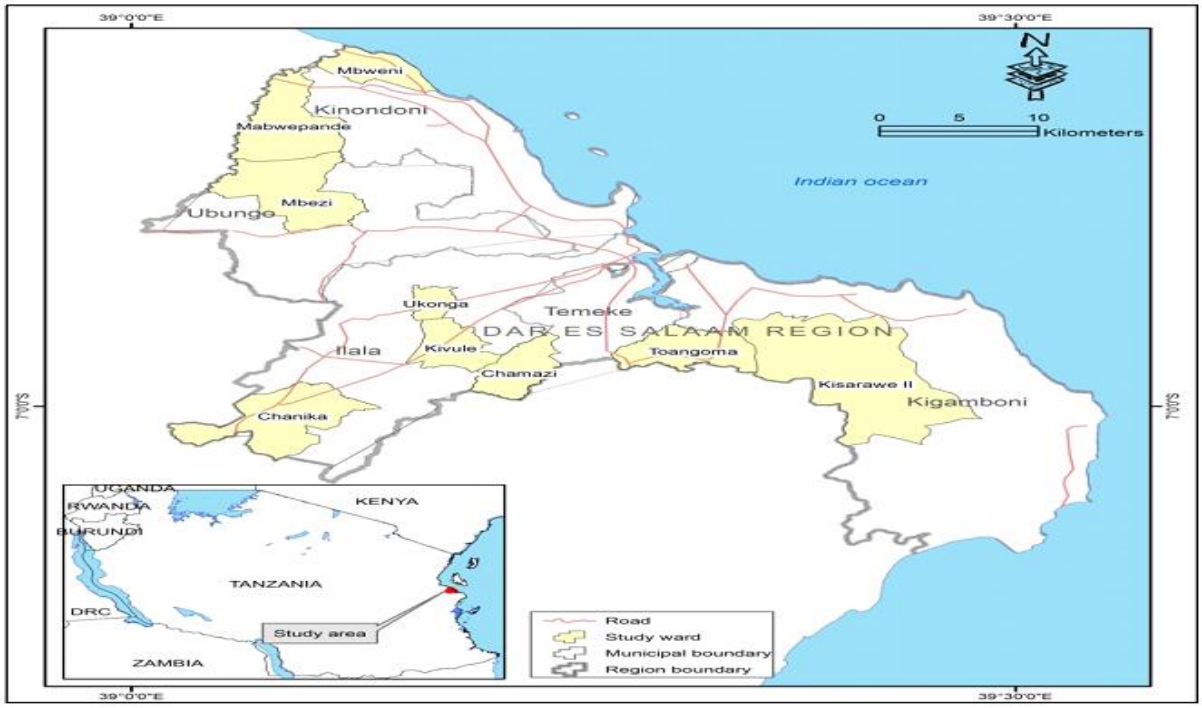

Fig. 1. Map of Dar es Salaam showing studied wards.

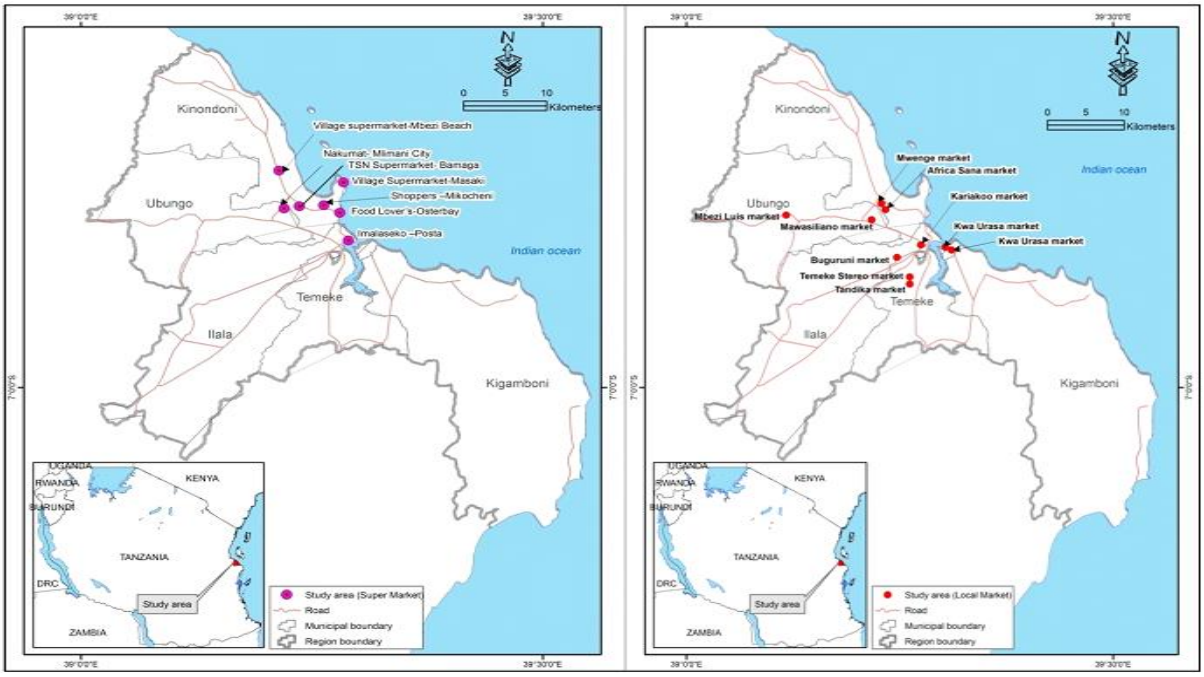

Fig. 2. Map showing the location of studied local markets and supermarkets.

Ten local markets namely Temeke Sterio, Tandika, Buguruni, Kariakoo, Kwa Urasa, Kigamboni-Feri, Mwenge, Afrika Sana, and Mbezi Luis local markets were selected as avenues where urban farmers sold their products. Also, seven supermarkets namely Village, TSN, Food Lovers, Shoppers Plaza and Nakumat were studied (Figure 2).

Primary data were collected using questionnaires, structured interviews and focus group discussions with the agriculturalists and local authorities in Dar es Salaam city on the contribution of UPA on food security. Additionally, direct observations were conducted in the study area to identify different crops and livestock raised. Secondary data were collected through the documentary review.

Table 1. Distribution of Respondents by Age and Sex (%).

Age (Years)	*Gender*	
	Male	Female
18-30	61.5	38.5
31-40	44.4	55.6
41-60	43.9	56.1
Over 61	55.6	44.4
Mean	45.8	54.2

Table 2. Reasons for livestock keeping (%).

	Reasons for Livestock Keeping	
Education Level	Income	Both income and food
No formal education	100	0.0
Primary education	70.8	29.2
Secondary education	63.6	36.4
Tertiary education	70.6	29.4
Mean	70.5	29.5

The survey sample consisted of 201 participating farmers (109 women, 92 men) and included 5 focus group discussions (FGDs). Also, 100 local market traders from 10 local markets were interviewed as well as 7 supermarket managers. The Statistical Package for Social Sciences (SPSS) version 20 was used to analyze the data.

Table 3. Sources of agricultural products in the studied local markets (%).

District	*Local market name*	*Sources of Agricultural products sold*			
		Urban Farmers	Other regions	UPA & other regions	From my own farm
Kigamboni	Kwa Urasa market	60	10	10	20
	Kigamboni Ferry market	50	10	20	20
Temeke	Temeke Stereo market	60	20	10	10
	Tandika market	20	20	40	20
Ubungo	Mawasiliano market	30	30	40	00
	Mbezi Luis market	50	0	40	10
Kinondoni	Mwenge market	30	40	30	00
	Afrika Sana market	20	30	50	00
Ilala	Buguruni market	20	40	30	10
	Kariakoo market	30	20	40	10
Mean		37	22	31	10

The respondents were aged between 18 and 61+ years averaging between 41 to 60 years as shown in table 1.

The contribution of urban and peri-urban agriculture on food security in Dar es Salaam city

The concept of food security can best be explained using four dimensions which are food availability, accessibility, utilization and stability.

In this study, the contribution of urban and peri-urban agriculture (UPA) on four dimensions was investigated. The dominant crops grown were vegetables, both leafy and fruit vegetables (76.2%), followed by fruits (23.9%) and rice (18.9%) as seen in figure 3. Other crops such as maize, cassava, tomatoes, carrots and potatoes were grown to an insignificant exert.

Table 4. Income earned from vegetable production per year (%).

Amount	*Percentage*
Between Tshs 20,000-200,000	17.0
Between Tshs 300,000-500,000	15.4
Between Tshs 500,000-2 million	33.3
Between Tshs 3-5 million	28.4
More than 5 million	5.7
Total	100.0

*Based on those who sold vegetable surpluses only.

Table 5. Quantity of vegetables sourced from UPA in the surveyed supermarkets (%).

Quantity	Percentage
Between 41-60%	14.3
Between 61-80%	71.4
Between 81-100%	14.3
Total	100.0

Vegetable production dominated due to the fact that, vegetables are perishables and the fresh ones are therefore easily obtained nearer the market (cities) than if they were to be transported from upcountry some of which are rugged and not easily accessible. Also, most of the crop growers had small pieces of land which could not be enough to grow other crops.

Table 6. Sources of Eggs in the surveyed supermarkets (%).

Source of Eggs	Percentage
Urban farmers	57.1
Urban farmers and other region in Tanzania	42.9
Total	100.0

Table 7. Unit of milk produced per day in Liters (%).

Number of Cattle	Unit of milk produced per day in liters				
	Between 3-5 liters	Between 5-10 liters	Between 10-20 liters	Between 21-30 liters	Between 30-50 liters
Between 1-3	57.1	28.6	14.3	0.0	0.0
between 3-6	45.0	20.0	20.0	15.0	0.0
between 7-10	0.0	28.6	14.3	28.6	28.6
Mean	38.2	23.5	17.6	14.7	5.9

Most of farmers had small areas whereby 61.3% had an area ranging between 0.1-0.2 hectare with only 0.4% having more than 4.05 hectares (Figure 4). Thus, most farmers in urban setting have smaller plots for farming and most of these plots are either rented or open spaces owned by the government. In the peri-urban fringes, a mixed crop-livestock system, fairly rural in character, is often found. Here, fruit and nuts are also produced. Various types of vegetables identified were such as Chinese cabbage, okra, sweet potato leaves, amaranths and pumpkin leaves.

Table 8. Sources of food at the farmer's households.

Sources of Food	*Frequency*	*Percentage*
Urban agriculture	16	8.0
Local markets	3	1.5
Urban agriculture and supermarkets	11	5.5
Urban agriculture and local markets	171	85.1
Total	201	100.0

The results are in agreement with those reported by Hamisi (2012), Ogendi *et al* (2014) and Mhache (2015) who revealed that people involved in UPA normally use small farm sizes as most of areas are built up as opposed to rural areas where large farm sizes can be observed.

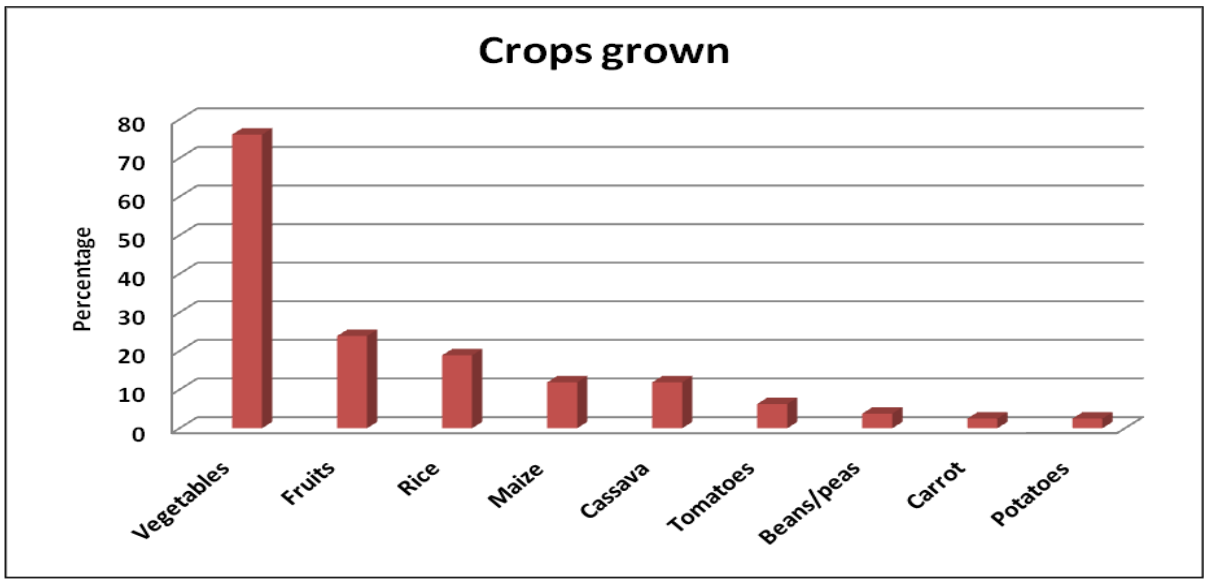

Fig. 3. Crops grown in the study area.

Raising of livestock has often been part and parcel of urban and peri-urban agriculture, livestock keeping now seems to be recognized for the positive role that it can play in urban living conditions across the world. In the study area the dominant livestock kept were dairy cattle (43.6%) followed by layers (21.8%) and broilers (17.9%). Other livestock kept were ducks, pigs, goats, and local fowls (Figure 5). The raised livestock had a positive contribution to food security as their outputs could be consumed at the households and selling the surpluses.

Food accessibility

Urban and peri-urban agriculture (UPA) contributes to food accessibility as home-grown foodstuffs increase the physical and economic accessibility to food. UPA increases access of urban population to fresh and nutritious foods. This study observed that the main aim of 84% of the farmers who engaged in crop production was to get food and income (Figure 6). Through crop production in urban and peri-urban setting, growers could have physical access to food

specifically the vegetables; also they could get income by selling part of their products and be able to buy other food stuffs which they could not produce and thus ensuring food security. Similar results were also observed by Onyango (2010) in South Africa who identified that UPA enhanced food accessibility to the families by producing food which could be consumed at their family level and some of it being sold, hence saving money for use on other livelihood obligations.

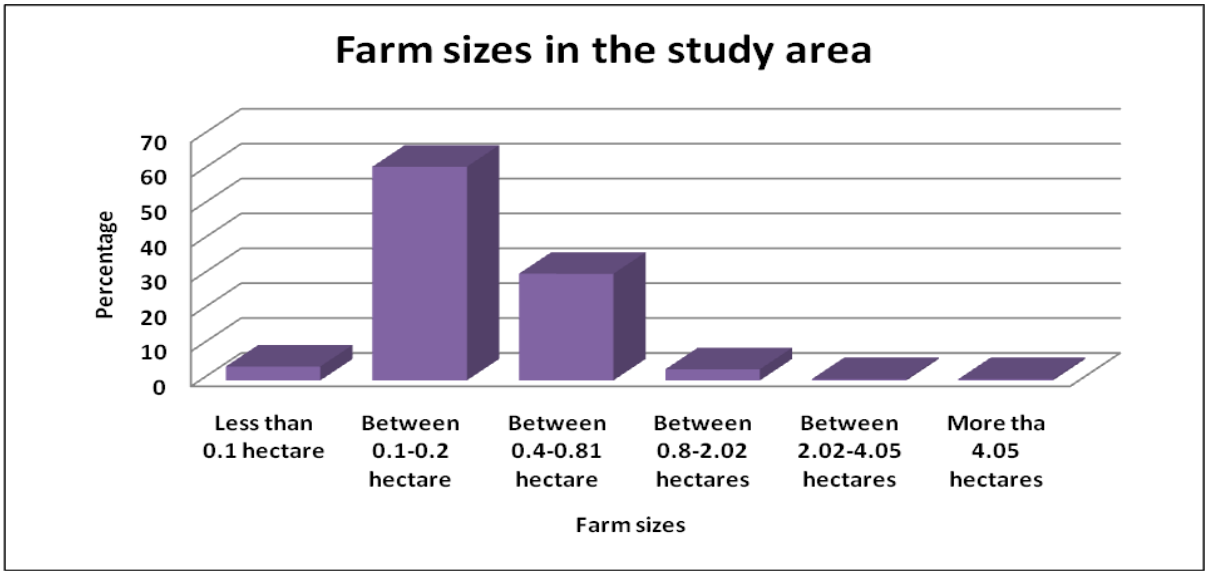

Fig. 4. Farm sizes for crop production in the study area (%).

Livestock keeping in urban setting is solely for income generation as opposed to food production whose primary purpose was to get food. In the study area 70.5% admitted to being involved in livestock keeping for income generation regardless of education level while 29.5% mentioned that they engaged in livestock keeping for both food and income (Table 2). Thus, with this observation in the study area, it can be argued that livestock keeping is more for income generation rather than food.

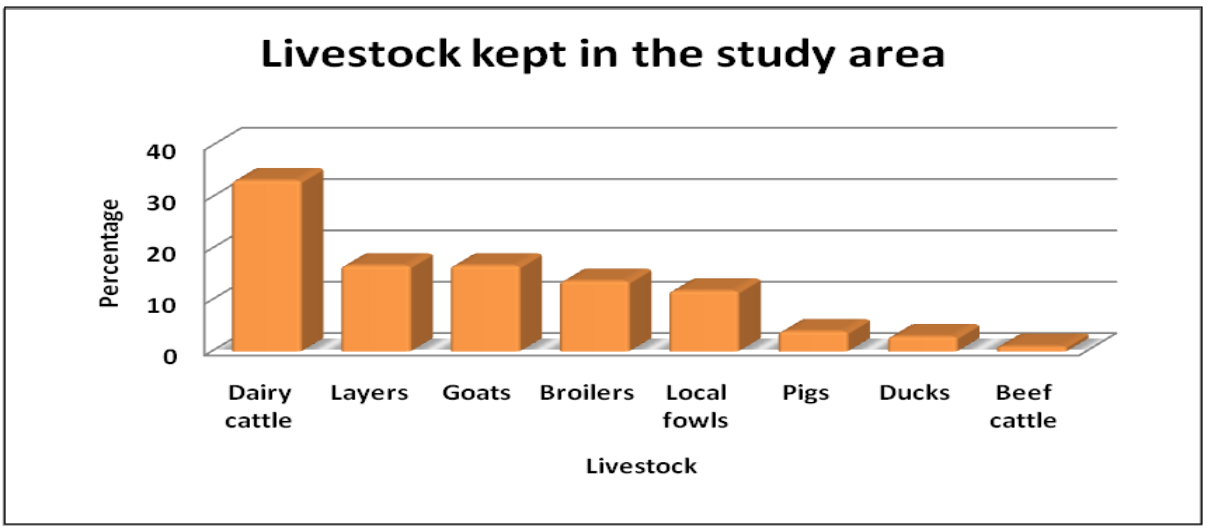

Fig. 5. Livestock kept in the study area.

These results concur with what was observed in Kampala by Lee-Smith (2013) who revealed that households with higher incomes were directly linked to livestock production, resulting from the sale of livestock products such as milk, eggs and meat.

Food Availability

Urban and peri-urban agriculture (UPA) increases the availability of fresh, healthy and affordable food for urban residents as much of the food produced by famers is sold locally in the local markets where consumers can easily access to food they need. In the surveyed local markets, food products investigated were vegetables, fruits, spices and grains.

These products came from different sources, of which about 47% were sourced from urban farmers (Table 3 & Figure 7). The sources of food in the studied local markets was determined by the location of the local market, if the market is located near to the urban or peri-urban agricultural fields, it is likely to source from them than from distant areas.

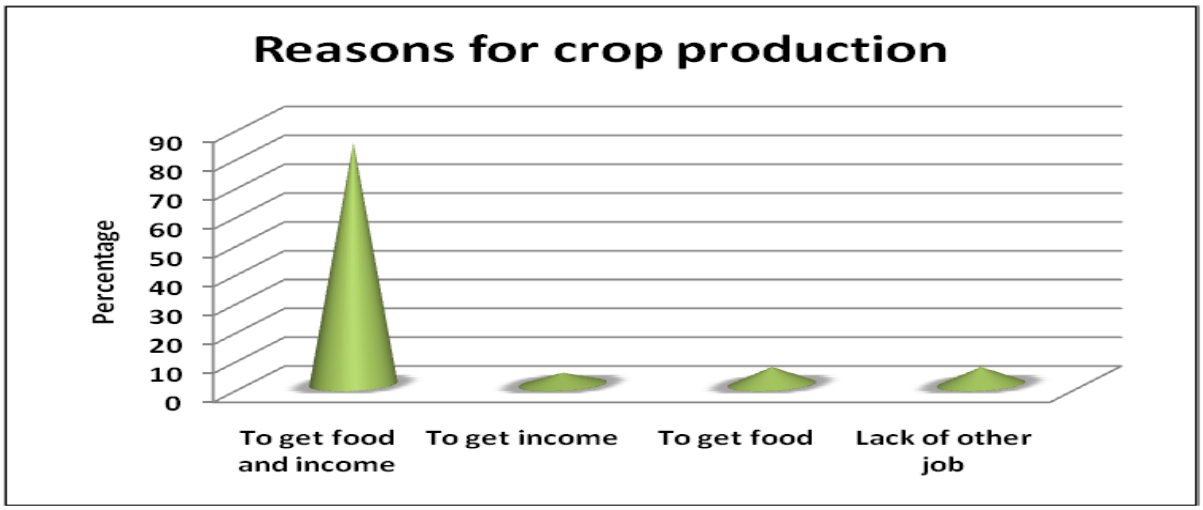

Fig. 6. Reasons for crop production (%).

These findings are in line with those of Yihdego *et al* (2009) who asserted that urban and peri-urban agricultural producers are able to satisfy their food needs and supply the market with agricultural products mainly crops, vegetables, poultry, eggs, milk, livestock and fruits.

Furthermore, in assessing the contribution of UPA on food availability, farmers also provided the quantity of products produced per year for the leading crops, notably vegetables. Results revealed that 34% mentioned to produce between 5-7 tons per year, 27% produced between 3-4 tons. Also, 19% admitted to producing between 1-2 tons followed by 7% who admitted to producing between 8-10 tons and 6% who produced 100-500kgs. Furthermore, 6% mentioned to produce between 501-1000kgs and only 2% mentioned to produce more than 10 tons of vegetables per year. Part of the produced products were consumed by the farmers themselves while selling the surpluses to the local and supermarkets thus contributing to food security (Figure 8).

Vegetable production had also a positive contribution on one's economy as those who produced surpluses could sell and earn some money. In response to this, the farmers indicated the amount of money they received per year whereby, 33.3% mentioned to earn between 500,000-2 million Tanzanian shillings. Also, 28.4% mentioned to earn between 3-5 million Tanzanian shillings and 17% claimed to earn between 20,000-200,000 Tanzanian shillings from selling vegetables annually. Also, 15.4% admitted to earn from 300,000-500,000 Tanzanian shillings. Only 5.7% mentioned to earn more than 5 million (Table 4). From these findings, it is evident that UPA have positive contribution to one's income and food security.

The contribution of urban and peri-urban agriculture (UPA) to food availability, accessibility, stability and utilization was also evidenced in the surveyed supermarkets where by some of the food stuffs were sourced from urban and peri-urban farmers especially vegetables and eggs.

It was revealed that about 61 to 80% of vegetables and 57.1% of eggs sold in the surveyed supermarkets were sourced from urban and peri-urban farmers (Table 5 & 6). From these local and supermarkets, non farming households could have physical access to the food they want instead of depending on food products trucked into the cities from upcountry regions which may not be fresh as those farmed in nearby areas (cities).

Fig. 7. Vegetables and fruits sourced from urban and peri-urban farmers at Kigamboni Feri Local market.

Milk production was also found a major source of income to the majority of the urban livestock keepers in Dar es Salaam city. The income obtained improved their purchasing power for other foodstuff and provided them with the ability to meet other basic social services. In the current study, dairy cattle kept by individuals contributed between 3-50 liters of milk per day depending on the number of dairy cattle kept and the standard of upkeep (Table 7).

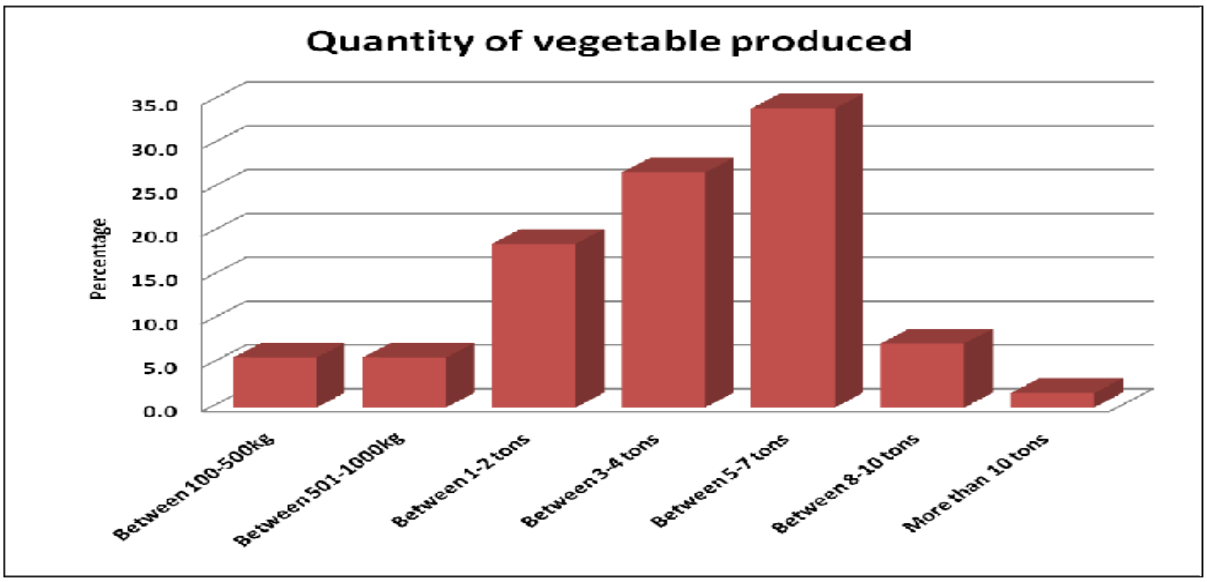

Fig. 8. Quantity of vegetables produced in the study area per year (%).

The national livestock policy of 2006 states that the government should strengthen technical support and encourage urban and peri-urban livestock keeping that is environmentally friendly, and that livestock keeping in the cities should be zero grazing. With this limitation, dairy cattle kept by the household members ranged from 1-10 dairy cattle.

Other reasons for low numbers were scarcity of pastures as an outcome of climate change as well as limited space at the residence. Likewise, the national Agricultural policy of 2013 identifies and recognizes the presence and significance of urban and peri-urban agriculture. It states UPA as a vital tool to food security as well as creation of employment, broadening of tax base, beautification of cities and serves as a supplementary source of income to the urban dwellers.

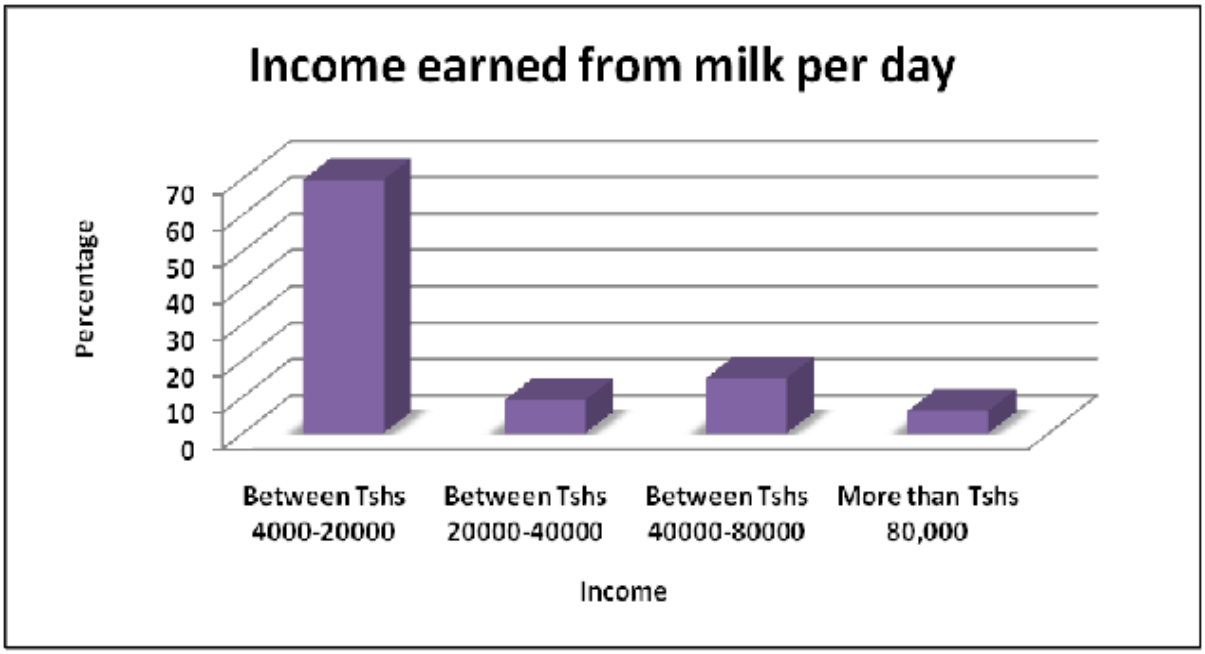

Fig. 9. Income earned from milk in the study area per day.

The income earned from milk production ranged from 4,000-80,000 Tanzanian shillings per day. About 69.7% reported to earn between 4000-20,000 Tanzanian shillings per day, also 15.2% mentioned to earn between 40,000-80,000 Tanzanian shillings per day as shown in figure 9. This income earned enabled the farmers to meet their basic necessities. These findings correspond with the observations done by Mhache (2015) in who also found that some livestock keepers earned about 30,000 Tanzanian shillings per day from milk production.

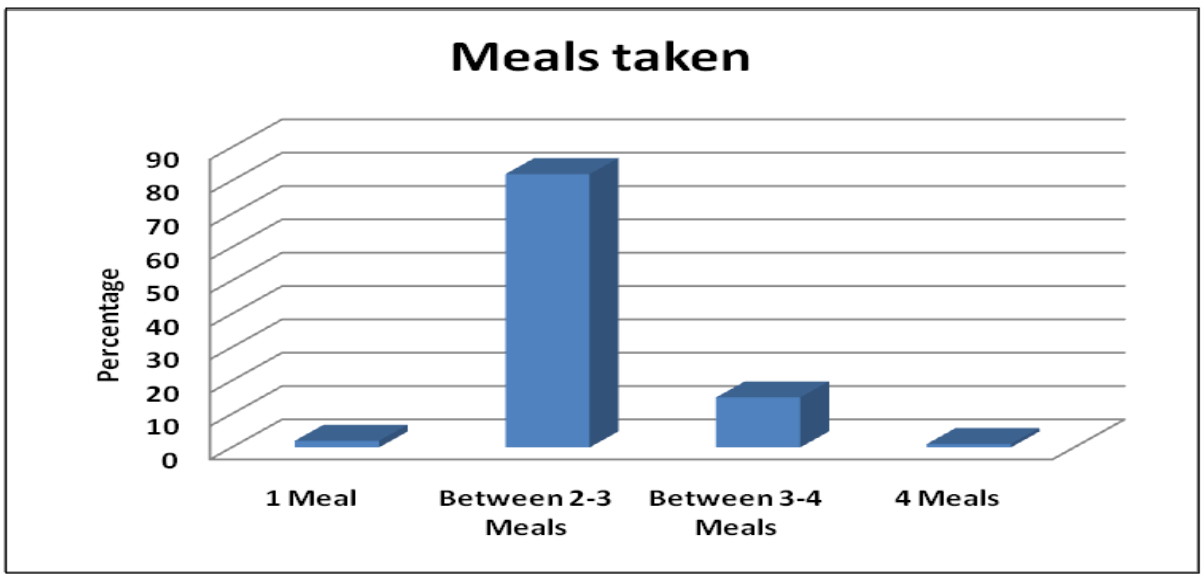

Fig. 10. Number of meals taken by the respondents.

Food Stability

The involvement in UPA becomes of important to food stability. In this study, 85% of urban and peri-urban farmers sourced their food stuffs from UPA and local markets affirming for the positive contribution of UPA to food stability; since the food produced could either be used at households or sold of which the money obtained from selling agricultural products supported them in buying other food stuffs they could not produce (Table 8). Urban and peri-urban agricultural products complement to rural agriculture in Dar es Salaam city. During the focus group discussion with the urban and peri-urban farmers, it was revealed that UPA had reduced dependence on food from rural areas as food is available from nearby sources. UPA also contributes to availability of food to the markets during dry seasons when rural areas are not engaging in production. UPA activities particularly vegetable growing depends on irrigation using water from different sources including river streams, ground water, taps and bore holes making constant production throughout the year as opposed to rural farming which depends on rain water.

Food Utilization

Urban and peri-urban agricultural activities contribute positively to food utilization by providing diversity of food products which increase body nutrients. In this regard, the farmers indicated the number of meals taken per day and the findings revealed that about 82% admitted to have 2-3 meals per day. Also, 15% mentioned to take between 3-4 meals per day. Furthermore, 2% mentioned to having only one meal per day on the grounds that they spent most of their day struggling to get their fields irrigated due to water scarcity and therefore high competition with fellow farmers. Only 1% mentioned to taking 4 meals a day.

This group involved those who are well off economically who normally use laborers in their fields so they have ample time to themselves as shown in figure 10.

In each meal, different food varieties were reported to be taken as some of them were produced by the farmers themselves thereby instigating the required body intakes.

Conclusion

It is evident that urban and peri-urban agriculture contributes positively to food accessibility, availability, stability and utilization in the fast growing cities including Dar es Salaam city which face enormous challenges associated with food security. Engagement of people in either crop production or livestock keeping should be taken positively due to its role it plays in assuring food security in cities.

Recommendations

The study has shown that urban and peri-urban agriculture plays a vital role towards food security. Thus, the study recommends that the available policies supporting urban and peri-urban agriculture should be taken into practice for the sustainable development of UPA.

Lead ministries (Agriculture, Livestock, Lands, Water Irrigation) should link with private entities in systematic planning of UPA within the cities, provisioning of utilities, expertise and harmonizing with other city activities for smooth running of the entities. Also, vertical farming should be introduced and promoted for the better output with the use of limited land and water resources

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