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The Role of Urban Agriculture in Enhancing Nutrition Security Among Households in Embakasi Sub County, Kenya

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***Abstract* – In an effort to ensure that their nutritional needs are satisfied, urban dwellers have gradually embraced the practice of urban agriculture. Nutrition security is a multidimensional concept that encompasses other aspects like dietary diversification, nutritional standards, micronutrient availability, protein quality and food safety. There is an increasing tendency for urban households to consume foods with a greater energy density but potentially fewer micronutrients, thus leading to the 'double burden' of malnutrition whereby overweight and obesity co exist with under nutrition. This study sought to investigate the contribution made by urban agriculture in achieving nutrition security by examining the impact of the practice on household dietary diversity. The specific objective of the study therefore was to examine dietary diversity achieved through urban agriculture in the study area. The target population for the study constituted of households located in Embakasi, Nairobi County. Correlation research design was applied to achieve the objective of the study. Embakasi Sub County is divided into five constituencies each with its own set of wards. Stratified random sampling was used to sample the household population based on the administrative partitions that exist. Out of a target population 286,494 households in the area, a sample of 400 households was used. Questionnaires and document content analyses were used to collect the required data. To analyze the data obtained, chi square testing and descriptive statistics were applied. The relationship between urban farming and dietary diversity based on the food group range that people consumed from their farm produce was noted to be weak. According to the chi square test, a relationship does exist between the source of food and the food group range that the respondents consumed. This relationship favors the market as compared to the farm source as most respondents identified the market as the source of majority of the food items they consumed.This study illustrated how urban agriculture is yet to be given sufficient recognition as a means to the nutritional wellbeing of the urban population and as a driver of sustainable development.**

***Keywords* – Urban Farming, Nutrition Security, Diet Diversity, Food Groups.**

I. INTRODUCTION

A. Background to the Study

Nutrition security is a concept that arose out of the need to accentuate aspects of nutrition in food security. Nutritional security and food security are closely related but distinction emerges from the fact that nutrition security goes beyond the basic understanding of calorie consumption and food availability, concepts initially used to define food security. It recognizes the importance of consuming sufficient essential nutrients obtained from different food groups [6]. Dietary diversity is recognized by nutritionists as a key element of high quality diets. It has been recommended internationally by the World Health Organization /Food Agricultural Organization that increasing the variety of foods across and within food groups is essential for ensuring adequate intake of essential nutrients and thus to promote health [17].

The world's population is expected to grow from 6.7 billion to 9.2 billion between 2007 and 2050. Virtually, the 2.5 billion increase will occur in the developing world's urban areas [21]. The current rapid urbanization has been accompanied by increased incidence of poverty making the residents susceptible to the impacts of volatile food prices. They are therefore directly affected by variations in food and fuel prices [24]. It has also been observed that all countries whether low, middle or high income are experiencing the burden of nutrition insecurity and malnutrition stemming from poverty and inequality [23].
Urban agriculture is a common practice in some countries in Africa like Kenya and Tanzania. It mainly takes place as an informal activity with limited assistance from government authorities and acts as a source of food and income to the farmers. It has been particularly beneficial to low income earners and slum dwellers in Kibera, Kenya to counter the rising costs of living [7].

Kenya's first food policy was developed in 1981 and reviewed in 1994 with the objective of supporting self sufficiency in major foodstuffs while ensuring equitable distribution of good nutritional value to the population. The National food and nutrition security policy of 2011 recognizes the need to support urban and peri-urban agricultural production activities in an effort to improve food access and overall food security and nutritional conditions in urban and peri-urban areas [15].

Given the comprehensive nature of urban agriculture, its link to the concept of nutrition security is yet to be properly established. This is evident from the arguments raised by proponents of urban agriculture who point out that there is insufficient detailed empirical evidence on urban agriculture's impact on nutrition levels [9] While nutrition security can be measured across a number of indicators, this study will attempt to analyze the concept through the indicator of dietary diversity [5].

B. Statement of the Problem

Urbanization results in shifts in dietary behaviour, physical activity, food consumption, the types of food available and the reliance on imported and processed foods. Urban households are said to consume distinct diets compared to their rural counterparts who consume foods with a lower fat and sugar content and higher nutritional value [10]. An outcome of this is the rise in prevalence of overweight and obesity [18] and an increase in chronic and non communicable diseases such as diabetes and coronary heart disease among the urban population. While studies

have been carried out and measures have been implemented in an effort to increase quantity of food production that translates into higher calorie intake for people, little attention has been given to the issue of nutrition insecurity which is also termed as the "hidden hunger".

Lack of consideration for both dimensions accurately renders food provision efforts counterproductive because although there would be enough quantities to fulfil people's calorie/energy intake they may still lack essential nutrients needed to live healthy and active lives. A considerable number of people practice farming in Embakasi based on the data provided by the [11]. This contradicts the norm given that inhabitants of urban settings are believed to be dependent on food sold in shops and roadside vendors. However, there is lack of sufficient evidence and facts to show that these farming practises impact the nutritional well being of the population. The relationship between this practice of farming and the state of nutrition security among the households in the area formed the basis of this study.

C. Specific Objective

To examine dietary diversity achieved through urban agriculture in Embakasi, Nairobi Kenya.

II. Literature Review

Nutrition security is achieved when individuals are able to obtain proper sanitation, adequate health care facilities and an appropriate nutritious diet that fulfils their biological requirements [22]. Urban agriculture is just one of the channels through which the requirement for an appropriate nutritious diet can be achieved. Households that practice urban farming have control over the types of crops and livestock they domesticate for food which plays a role in influencing the diet diversity of the meals they consume.

According to a study done in 2014 [19], the main types of green vegetables grown in back yard farms are the traditional varieties which are mainly used in stews. The survey which was performed on 1000 households, showed that a large number of households with gardens worked in the civil service as they occupied government buildings constructed in the 1950s and 60s which had ample open space. Both men and women are engaged in backyard cultivation depending on the type of crop or livestock [24]. Many farmers using open space for cultivation grow either vegetables or maize as both provide the highest profit margin [2]. While open space cultivation is more dominated by men, the marketing is controlled by women [2, [3]. It has been estimated that every day about 200,000 consumers of street food in Accra eat vegetables produced within urban areas [1].

In Kenya, a survey conducted in Kibera, Kahawa and Wangige regions of Nairobi County [1] revealed that the majority of producers (82%) were of the opinion that consumption of self produced food enabled them to reduce expenditure on certain foods while giving them more access to other types of food. When considering the different types of food groups consumed, the survey results indicated a very low consumption of animal based products, except for high levels of milk consumed, but this was reasoned to be primarily used in tea preparation thus was utilized in very small quantities. There were no significant differences in household dietary diversity between producers and non producers, however when analyzed against the individual food groups, there are statistical differences in the consumption of yellow/orange vegetables (pumpkins, carrots, sweet potatoes) with a higher proportion being consumed by producers (18%) to non producers (12%).

D. Conceptual Framework

The success of urban agriculture is determined by a number of natural and human induced factors which in turn influences the quantity and quality of food produced. A study done previously [20] identified a number of factors that impinge on agriculture within the Nairobi slums. Among these included: uncontrolled movement of birds and animals; inadequate extension services; farming on contaminated land; lack of inputs e.g. soil, manure, seeds; vandalism by hooligans; land grabbing; pests and diseases; lack of cooperation from land lords; high cost of crop improvement products e.t.c. In this example, the factors identified undermine the conditions under which urban agriculture is carried out which may in turn affect the quality of produce cultivated by the farmers unless corrective measures are taken.

According to the Global Food Security Index, the nutritional quality of average diets can be measured across five composite indicators. Among these is diet diversity which measures the share of non starchy foods in total dietary energy consumption. Study done by [5] revealed that diets with the highest levels of diversification tend to be from well developed European countries while low income Sub Saharan African and Asian countries dominate the bottom ranks. The remaining indicators crucial but not central to this study include protein quality, micronutrient availability, nutritional standards and food safety.

Given the comprehensive nature of urban agriculture, together with the effect of the below intervening factors, the link of this type of farming to the concept of nutrition security is yet to be properly established. This is evident from the arguments raised by other researchers who point out that there is insufficient detailed evidence on urban agriculture's impact on the nutrition levels of individuals [9]. Based on this understanding, this study attempted to unravel the outcome of the gradually growing practice of urban agriculture in Embakasi Sub County on the inhabitants' nutrition security using dietary diversification as the yardstick.

III. Research Methodology

A. Research Design

Correlational research design was used to achieve the objective of the study. In general, Correlational research involves the collection of data to determine the extent to which two (or more) variables are related [14]. In this case the design applied as the researcher attempted to establish

the relationship between urban agriculture and the diversity of meals consumed by farming households in Embakasi Sub County.

B. Study Area

This study was conducted in Embakasi Sub County of Nairobi County, Kenya. The county's coordinate location is approximately $1^0$17' south of the Equator and $36^0$49' east of the Prime Meridian. Embakasi Sub County is a residential and commercial suburb located 15km east of the Central Business District. It borders Langata Constituency and parts of industrial area to the south. The vast suburb houses low income and higher middle income residents. Embakasi Sub County's coordinate location is 1^0 18' 0'' South of the Equator and 36^0 55' 0'' East of the Prime Meridian [10]. Embakasi Sub County is the fourth largest out of the nine in Nairobi County with an area of 52.1 km^2. It is divided into five constituencies each with its own set of wards.

C. Study Population

The study population consisted of households located within Embakasi Sub County. This area is populated with a diverse array of people with different income levels and living standards. A number of the wards are classified as informal settlements or slums which differ from the rest of the households whose occupants' have slightly better or higher standards of living. Embakasi has a total of 286,494 households. A sample of 400 households was obtained from this target population.

D. Sampling Strategy

An ordered sampling frame of all the households within the study area was used to randomly select the units required for the study sample. Stratified random sampling was applied to select the households from each of the constituency proportionately until the sample of four hundred households was achieved. The formula below was used to calculate size of the sample [13].

$n=N/(1+N(e)^2)$
n=sample size
N = size of population
e = Margin of error
N = 286,494 households
e = 0.05

$$n = \frac{286,494}{(1+286,494\ (0.05)^2)}$$

n = 399.44
n = 400 households

E. Data Collection

A research permit was first sought from the National Commission for Science, Technology and Innovation. Each of the research assistants was assigned a particular ward to cover and clarifications were made on how to go about selecting the households given that the process was supposed to be random. Some of the respondents asked for more time to answer the questions while other questionnaires were returned back incomplete or not returned at all. Document content analysis was also carried out from secondary data to verify and support material obtained through fieldwork.

F. Limitations

To circumvent the challenge of developing an instrument that included all possible items that could be used to measure the concept of nutrition security, the researcher carried out sampling validity [16] whereby dietary diversity, an indicator of nutrition security, out of the five identified in a previous study [5] was used to measure the concept.

To measure dietary diversity, food group indicators were applied. A study done in Vietnam [9] confirmed that a measure of individual foods and food groups was significantly associated with nutrient adequacy. Food items consumed in very small quantities were to be included in the study. Their quantities might not have offered a significant contribution to nutrient intake but they provide a picture of the variety of foods that the households consumed.

G. Data Analysis

The study applied the Statistical Package for Social Scientists and Excel Spreadsheets to analyze the quantitative data. Descriptive statistics which involves calculating mean and percentages was used while inferential statistics in the form of chi square testing was also applied to test association between the variables.

IV. Results and Discussion

The findings were grouped into three sub-parts:

a) Production from vegetables
b) Production from animals and poultry
c) Relationship between urban agriculture and the dietary diversity of households

A. Production from Vegetables

The study sought to establish the types of vegetables grown in Embakasi Constituency. The researchers found that a wide variety of vegetables were grown during the period between June 2014 to June 2015 as shown in Figure 4.1 below.

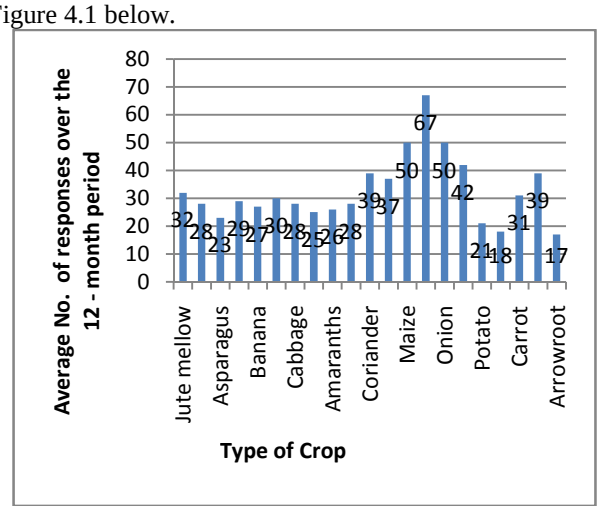

Fig. 4.1. Annual pattern of crops grown in Embakasi County

Kale, tomatoes, onions and maize crops recorded the highest average activity during the study period. The long and short rains occur in March - May and November - December respectively. During these periods, irrigation is supplemental. The findings concur with those of [8] who established that the four most widely grown crops were

kale, tomatoes, cabbage and spinach. These crops were grown continuously while others identified in the study were grown in specific times of the year.

B. Production from Livestock and Poultry

The study sought to establish the nature of production from livestock and poultry. Figure 4.2 below summarizes the data.

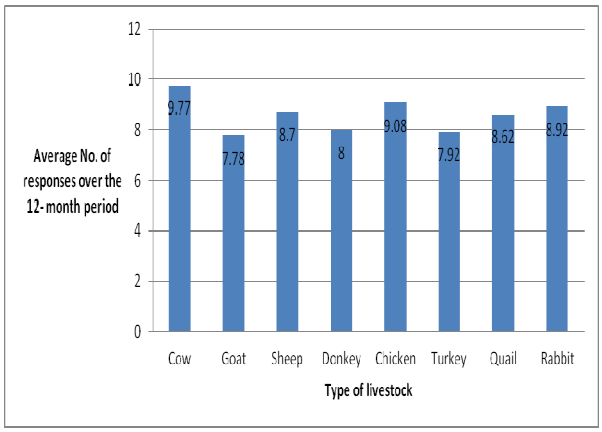

Fig. 4.2. Annual pattern of livestock reared in Embakasi Sub County

Livestock keeping remained fairly stable over the twelve month period for all the livestock identified as shown in Figure 4.2. On average, a slightly higher number of the respondents reared cows and chicken when compared to the other types of livestock. Poultry farmers reported experiencing decline in numbers of their birds due to diseases which quickly ravaged their stock when veterinary services where not sought in time. Similar study done by [4] revealed no clear trend in terms of the livestock kept in the cities visited. Whereas in Nairobi the most common livestock types were goats, followed by chicken, ducks and sheep, in Kampala, cattle were the most common livestock type found. In Dar es Salaam and Kisumu chicken seemed to be the most important livestock type followed by cattle, goats and sheep. In Addis Ababa, sheep were kept by more than 50% of the households whereas goats by only 13%. Rabbits, geese, bees and other small species were uncommon in most of the cities.

C. Relationship between urban agriculture and the dietary diversity of households in Embakasi Sub County

Chi square goodness of fit was used to test the association between the dependent variable (food group, the diet diversity measure) and independent variable (ingredient source). The sample satisfied all three of the chi square 'goodness of fit' requirements; both the dependent and the independent variables were mutually exclusive, the minimum expectation of five occurrences was not met in only 5.6% of the cells which was way below the 20% maximum and the sample was randomly drawn from the population.

Using the chi square statistic, the p – value obtained was 0.00 which is below the study's significance level of 0.05. The alternate hypothesis is therefore true and it was concluded that there was an association between the source of food and the diet diversity of the urban farmers. From the descriptive statistics table shown below, markets provide a wider range of food items than farming activities in urban areas. In other words markets enhance the diet diversity of farming households as compared to urban backyard farms. It could be further interpreted to imply that urban farming serves to supplement market sources rather than act as a standalone source of food for urban farmers.

X^2 (8) = 0.00, $p \leq 0.05$

Urban agriculture practitioners however, argue that the practice has continued to grow over the years from being a basic survival strategy among the poor to being a reliable source of food and livelihood especially for the urban poor [20].

		Food Group								
		Confections	Dairy	Egg	Food additive	Fruit	Grain	Meat	Root vegetable	Vegetable	Total
Ingredient Source	Bought	154	175	15	77	100	598	102	43	163	1427
	Farm	0	9	6	8	15	47	21	11	40	157
Total		154	184	21	85	115	645	123	54	203	1584

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	72.071[a]	8	.000
Likelihood Ratio	79.406	8	.000
N of Valid Cases	1584		

A.1 cells (5.6%) have expected count less than 5. The minimum expected count is 2.08.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.213	.000
	Cramer's V	.213	.000
N of Valid Cases		1584	

V. Summary, Conclusions and Recommendations

A. Summary of Findings

The farmers grow a wide variety of crops but certain types like kale and tomatoes seem to dominate the practice probably due to their short growth cycle and high market demand. A small trace of farmers were noted to grow certain strains of African Leafy Vegetables like Jute mellow and spider plant which they said were usually overpriced in supermarkets. Quite a number of urban dwellers also keep livestock but the number of livestock owners is not as widespread as that of crop growers.

The relationship between urban farming and dietary diversity based on the food groups that people consumed from their farm produce was noted to be weak from the chi square test performed. People were able to obtain a wider variety of food types from the markets than from farming activities. Even the indigenous crops were not as popular in urban farms considering the fact that they may not be readily available in the town markets.

E. Conclusion

Urban agriculture does not play a significant role in enhancing the nutrition security of households in Embakasi Sub County. Based on the study results, for those who opt to consume the food that they produce, it constitutes a small proportion of the variety of food items that they eat. It was noted however, that practicing agriculture in the urban areas provided people with the opportunity to rear indigenous crops and livestock especially those that may not be readily available in the markets.

F. Recommendation

The relationship between urban agriculture and the diet diversity of households in Embakasi Sub County is constrained by the fact that people in the area would rather sell than consume their produce. In addition, markets are still the dominant source of food even for farmers. To reverse the situation, farmers can take strides to get more information on how to improve the productivity of their land especially since land sizes are continuing to diminish. Organic manure, fertilizer and chemicals could be made more readily available and cheap to farmers. This would result in higher produce part of which can be eaten at home while the surplus sold in markets.

VI. Acknowledgment

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