

**EXPLORING THE EXTENT OF REFUSE USE ON URBAN CROPPING IN ZONGO OF THE  
WA MUNICIPALITY, GHANA**

ID: GJDS-UBIDS-102312

**Alfred Beyuo Naamwintome**[abeyuo@ubids.edu.gh](mailto:abeyuo@ubids.edu.gh)Simon Diedong Dombo University of Business and Integrated Development Studies,  
Wa, Ghana*Doi//https://dx.doi.org/10.4314/gjds.v20i2.3***ABSTRACT**

Refuse heaps are common scenes in cities in developing countries amidst the springing up of urban cropping but with low yields. However, the linkages between refuse generation and use in urban cropping appear to be little addressed in the existing literature. This paper sought to explore the separation of refuse into biodegradable and non-degradable and the use of the biodegradable portion as compost in urban cropping to improve crop production often linked to urban food availability. Hence, refuse generation at the household levels and refuse at the dumping sites were determined and sorted out using Wa Zongo as a study area. By combining convenience and simple random sampling, fifteen respondents from fifteen houses within a 150-metre radius of a dumping site were interviewed. Descriptive statistics, connecting and classifying, were employed in the data analysis. Findings revealed that more refuse is generated; a greater portion is decomposable; 93.3% of the respondents do not know the use of refuse for cropping; and, 53.3% prefer inorganic fertilizers for farming. To reduce refuse and eliminate the heaps, this study recommends refuse segregation at home and dump sites, biodegradable refuse for the production of compost and the use of public education to achieve this feat.

**Keywords:** Refuse, Urban, Gardening, Relationship, Compost**INTRODUCTION**

Urban communities in Africa and elsewhere are known for large production of municipal solid waste and the reuse of waste/refuse for farming (Asomani-Boateng

**CC-BY License**

GJDS, Vol. 20, No. 2, October, 2023

and Murray, 1999; Nanda and Berruti, 2021). This has the potential to contribute to poverty reduction, social inclusion of urban poor and women and the productive reuse of urban waste (World Bank, 2013). Globally, urbanization has been rapid, with challenges in the areas of urban poverty, environmental degradation, and food insecurity (UN, 2018). Urban poverty has been on the rise and the Multidimensional Poverty Index (MPI) indicates that 85% of the poor live in rural areas globally and in South Asia and Sub-Saharan Africa, it is 39.3% and 46.3% respectively (Alkire et al., 2014). The urbanization process in Africa is not associated with falling overall poverty even though the majority of the world's poor reside in rural areas (Ravallion et al, 2007; Alkire et al., 2014). It is documented that half of the world's population is residing in cities, and this figure is estimated to be two-thirds by 2050, the impact of this, on the food and nutrition needs of the expanding population will be great in Asia and Africa where the urbanization is projected to be the fastest (Cochrane, 2014; UN, nd) and the former is the most urbanizing (McGranahan and Satterthwaite, 2014).

Urbanization is an ongoing transition that provides economic, social, and environmental opportunities if harnessed (McGranahan and Satterthwaite, 2014; GSS, 2014). It is the growth of cities, stemming from the movement of people from rural areas to urban areas, usually in search of jobs and what is hoped to be a better life. Cities which generate 70% of global carbon emissions can respond to the threat of climate change, through mixed land uses (UN-Habitat, 2020), which has the potential to ensure carbon sequestration from urban farming/gardening-cultivation, of mainly crops, in and around urban centres (Brandhøj, 2015). The world is becoming increasingly urbanized with the most urbanized areas having 68%-82% of their population residing in urban centres (UN, 2018; UN, nd). Urban growth is expected to slow down except in the less developed regions (UN-Habitat, 2020). The pressures of rapid urbanization and the influence of colonization, have culminated in the majority being in poverty in the cities (Sawio, 1993; Asomani-Boateng and Murray, 1999). In Ghana, the urban population has grown from 50.9% to 56.7% in 2010 and 2021 respectively (GSS, 2021). Rapid urbanization results in large volumes of refuse of all kinds being generated and their management has become a big problem in these areas/urban areas (Efe, 2013; Asomani-Boateng and Murray, 1999). All societies do produce waste but urbanization and industrialization in urban areas have compounded this problem, with Wa township being no exception.

The need to convert wastes, which has become a management challenge, into useful products, cannot be overemphasized, since organic materials from refuse influence the physical, chemical, and biochemical characteristics of soil, and also influence the growth and development of plants (Hauck, 1978). Organic matter naturally improves the physical structure of soil and hence the workability of the soil. Chemical effects include increased cation exchange capacity and a decrease in the fixation of phosphorus. Biologically, soil micro-organisms depend upon a supply of

#### **CC-BY License**

decomposable organic matter for their activity, and thus, all the above amount to restoring soil fertility (Ayilara et al., 2020). Before the introduction of mineral fertilizers, organic materials in the forms of compost and farmyard manure were the only recognized source of crop nutrients, with the exception that legumes were used to increase the nitrogen supply, thus, composting is long-used technology and even though shortcomings, its disadvantages outweigh the chemical fertilizer's and hence farmers reversion to the use of compost (Ayilara et al., 2020).

The effect of poor planning is a shrinkage/non-use of land use type (GNA, 2005; Wang et al., 2018). This situation and hence the non-availability of land for urban farming/gardening, serves as a disincentive for backyard gardening/urban farming. Urban agriculture (UA) is not only necessary for urban survival but also an income provider, a means of securing family food security, boosting children's interest in agriculture, stimulating the local economy and as a market for organic waste (WASTE, 1996; Dekolo et al, 2015). There is a need for more attention on urban food security since UA provides employment and increases income tremendously. Global prices for agricultural commodities which have risen dramatically in recent years, make agriculture an attractive investment and thus, contribute to food security (Tacoli et al, 2013).

As an indirect effect of climate change, low-income people everywhere, are at risk of food insecurity (FAO, 2008) and thus require immediate attention. With the soaring rate of unemployment according to the ILO report (2016), and Wa municipality holding the largest share (22.3%) of the total population of the Upper West Region (GSS, 2021), UA provides the most viable option to the present predicament and can be a 'sink' to waste reuse (Asomani-Boateng and Murray, 1999). Thus, if the use of refuse is integrated into urban farming/gardening, there is the prospect of promoting and sustaining urban gardening due to the large quantities of refuse that are generated in urban areas (Amoah and Kosoe, 2014; Asomani-Boateng and Murray, 1999). According to UNDP (1976), suitable refuse is a potential source of fertilizer, and it maintains the soil structure. It further points out that millions of people in Asia depend on waste/refuse to recycle for soil nutrient supply and fish protein, and effective policies from governments need to be in place to address urban food insecurity holistically, especially for the residents who earn low and irregular income and are the poorest in the urban centres (Tacoli et al, 2013).

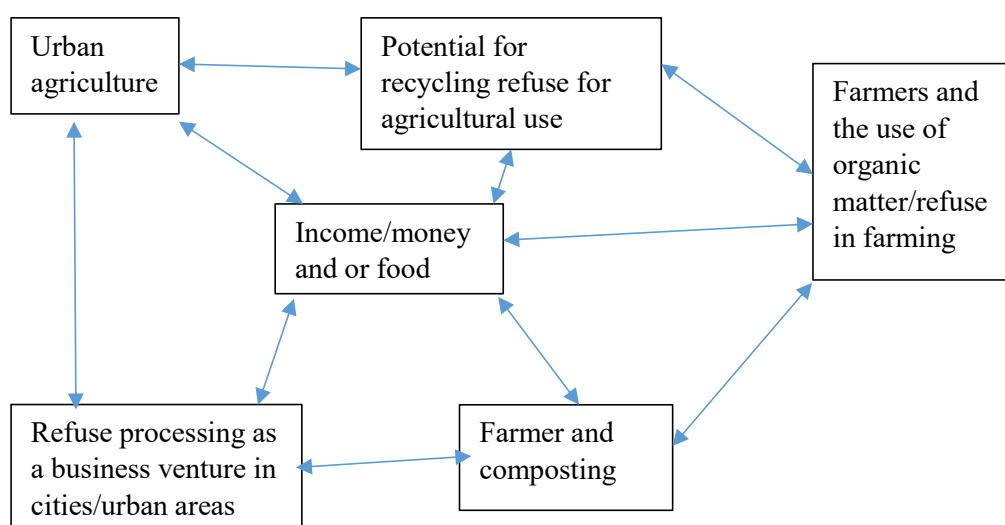
Being an indirect but better method of waste disposal, the use of urban refuse as organic manure will also help solve the urban sanitation problem even though this has to be well thought out, since land hither-to-occupied by waste could be made available for other developmental use, and thus provide self-employment for the ever-increasing urban population especially through migration, through backyard gardening (Offei and Boachie, 2019). Conventional wisdom/thinking is being increasingly challenged because investments in favoured areas face diminishing

#### **CC-BY License**

returns, and increased social and environmental problems and also, rapid population growth in less-favoured areas continues (Pender and Hazell, 2000). Urban poverty, food insecurity and malnutrition are on the increase in urban areas, and it is imperative an alternative strategy or strategies be sought for improving urban livelihoods and waste management, and for urban food security and nutrition (FAO, 2007). In line with this, many citizens have turned to urban gardening as a livelihood strategy and also as a source of income and it has been estimated that 200 million urban residents produce food for the urban market, providing 15 to 20 percent of the world's food (Armar-Klemesu 2000 as cited in FAO, 2007).

This paper aims to explore the extent of refuse use through the determination of the composition of refuse generated. This will make it possible for the separation of the refuse into decomposable and non-decomposable parts as the basis for determining refuse suitability/manuring value. The determination of the level of refuse generation was also coupled with the assessment of the knowledge/perception of backyard gardening. The use of refuse in urban gardening was also determined and from which, a good picture could be derived for potentiating urban cropping or agriculture which is estimated that 15 to 20 percent of the world's food is produced in urban areas. This form of agriculture is being increasingly recognized by international organizations because of its contribution to food security and supportive nutrition for the urban poor and only 16% of the world's population is involved in UA (Gunjal, 2009).

The paper focused on relevant concepts or themes that pertain to refuse generation, separation and use as compost in urban cropping. It thus, borders on research, critical appraisal and the writing to explain what is found concerning themes or concepts as indicated below and relevant to this study or topic and preceding is the conceptual framework (Figure 1).



### CC-BY License

**Figure 1: The conceptual framework**

**Source:** based on literature from (Aryal, 2021; Mougeot, 2000; World Bank, 2013; McDougalla, Kristiansena and Radera, 2018).

Urban agriculture is an economic activity located within or on the fringe of a town, a city or a metropolis and utilizes wastewater and decomposable solid waste emanating from the domestic area/houses (Aryal, 2021) and the outcome is both food and income as in Figure 1.

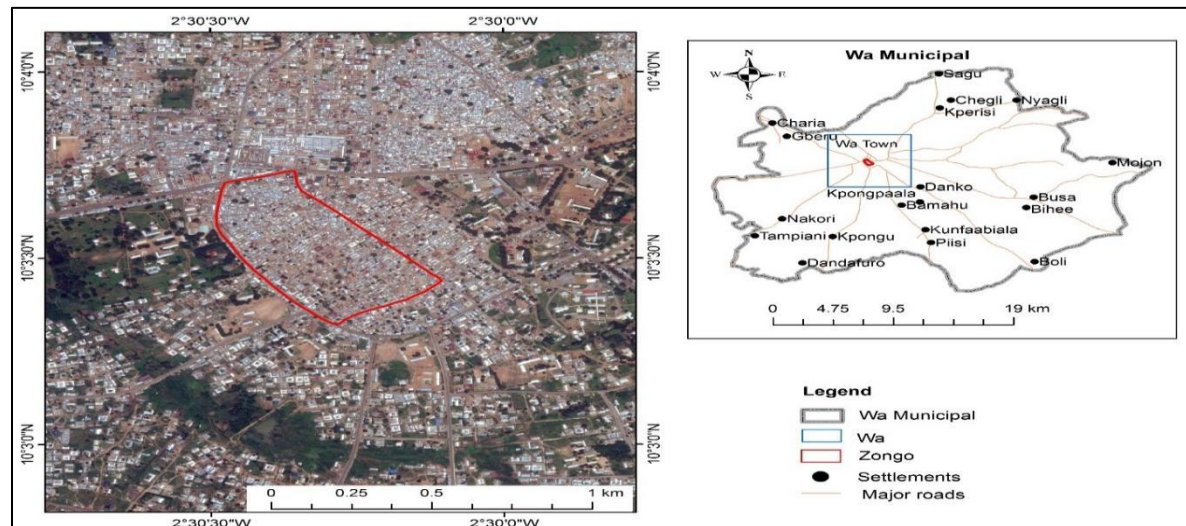
This activity is the growth/raising, processing, and distribution of a diversity of food and non-food products, (re)using largely human and material resources, products and services found in and around the urban centre, and in turn supplying human and material resources, products, and services largely to the area (Mougeot, 2000; World Bank, 2013). In addition to solving the severe problem of many municipalities in the area of utilizing waste, UA enhances access to and distribution of food in urban areas (Aryal, 2021). UA can be highly productive but productivity comes with many trade-offs, as well as care to ensure its sustainability (McDougalla, Kristiansena and Radera, 2018). In this context, UA is thus, an economic activity, with various orientations and scales and variously practised by urban residents with different backgrounds with derived benefits thereof within or around the urban areas.

**METHODOLOGY**

The methodology is centred on the limits or interests as well as the location of the study and how the study was done/conducted. This was intended to give the study/research legitimacy and provide scientifically sound findings, concerning the methodology. The socio-spatial marginalization within Ghana's urban space does not exclude the Zongo settlements (Williamson, 2014). According to Williamson (2014), residents of Zongo call it a "travellers' camp" or "stop-over" and this area used to be predominantly occupied by people who profess the Islamic faith but now denotes/has become a vast network of settlements of various faiths and livelihoods, with at least one Zongo in every urban centre in Ghana. Despite the limited access to social amenities by residents in Zongo areas in Ghana, population density within Zongo communities continue to increase (Owusu, 2010) partly because of the survivalist livelihood strategies resident adapt to make a living. Nevertheless, scarce scholarly works make attempts to unpack how agricultural activities impact the lives of residents and how domestic waste, which is decomposable, is problematic in Zongo areas and or influences crop cultivation within the immediate environment. This study attempts to fill this gap by exploring the extent of refuse use by residents of Wa Zongo and the potential of this waste on agricultural production in the Wa

**CC-BY License**

municipality (Figure 2). This study was carried out from November 25, 2021, to December 4, 2021, with a focus on Wa township Zongo, a section of Wa municipality in the Wa township. As a vast network of settlements (Williamson, 2014), with residents being more heterogeneous concerning livelihoods and faiths, it fits best the selection for the investigation since agriculture has the potential to address both poverty and food insecurity which are features of urban centres or these areas which have multiple livelihood opportunities.



**Figure 2. Map of the study area**

**Source:** Adapted from GSS, 2013, September 2022

The study area is located south of the Central Total Fuel Station (CTFS) and to the left of Main Street from the Central Police Station (CPS) to the traffic light towards Dorimon. The study area is boarded by the road, from Alhaji Tahiru Street (ATS) from the east, which is adjacent to the CTFS and left of the CPS street to the traffic light. The ATS to the traffic light towards Dorimon is the northern border of the study area. The street from the traffic light to Alhaji Slam Moshi Street (ASMS), borders the west and the ASMS to link up with ATS, borders the south of the study area. In this study area, which is heterogeneous concerning faith and livelihood and with high population density, residents engage/adapt survivalist livelihood strategies including pito brewing, sale of cakes and porridge, artisanal works and gardening, to make a living. Five refuse dumping sites have been allocated to the area for the heaping of refuse to be collected whenever the containers are full. One was purposefully selected because it met the requirement of the study namely the required number of houses around it as well as the required radius/distance for the three houses to be purposefully selected. The refuse at these dumping sites is usually carried by

### CC-BY License

trucks to landfill areas outside the urban areas. This study employed mixed methods, a mixture/combination of quantitative and qualitative techniques/methods, and approaches that aim at drawing on the strengths of quantitative and qualitative data gathering techniques, and an intentional application of rigorous quantitative research assessing the magnitude and frequency of constructs, and rigorous qualitative research exploring the meaning and understanding of the constructs (Johnson and Onwuegbuzie, 2004). It is the use of both quantitative and qualitative approaches in combination for a better outcome. As a design, the exploratory and explanatory design in the sequence was employed with the first phase centred on quantitative data collection and this was intended to determine the quantity and characterization of the refuse which fed into the last phase which was both quantitative and qualitative and this phase was used to explain the quantitative data, especially the open-ended interviewing. The mixed methods approach informs philosophically or theoretically, the design of the study but works concerning postpositivist and social constructivist worldviews, especially in the transformation of tension between them (Greene, 2007; Creswell, 2016) and thus, the researcher ensured that the open-ended questioning spoke to or explained the quantitative figures and thus, making the outcome more composite. The mixed methods approach with its internal integration, which is merging data, connecting data, and embedding data enhances the strengths and minimizes the weaknesses of the perspectives rather than keeping them separate (Creswell & Clark, 2011; Almalki, 2016) and these forms of integration are influenced or determined by the explanatory design. The merging and embedding of data are influenced by convergent and exploratory designs respectively and the merging of the data sets did not only establish comparison but a better understanding of the phenomenon as embedding involves gathering, analyzing, and utilizing qualitative results for the building of an intervention (Creswell, 2016). These forms of integration (merging and embedding) could not be used because they were not informed by the design of this study. The explanatory design is associated with the connecting of data (Creswell, 2016) and from participants of the same population (Fetters et al, 2013) as a form of integration and this was suitable and employed in the first phase of quantitative data collection which helped to plan for the last phase. This type of integration was adopted given its suitability, with the last phase coming after the first phase, even though it is time-consuming. The first phase of the quantitative data set informed the second phase, and this phase helped the researcher clarify issues and also worked at contextual factors for a better outcome, and this was presented in the forms of tables and verbatim statements. The employment of this approach was fueled by the need for contextual understanding, the contextualization and illustration of context and cultural influence of the study as required by mixed methods, which draw on the strengths of rigorous quantitative assessment, and rigorous qualitative explanation of, perspectives of participants in the study area. The approach also facilitated a more complete or better understanding of the problem in addition to the triangulation of results from the data sets. The

#### **CC-BY License**

employment of this approach was given its great potential to strengthen the rigour of procedures and enrich the analysis (Creswell, 2016) for a better outcome even though it is very demanding with respect to time.

The target population was residents/houses within a one hundred and fifty metres (150m) radius of the dumping site. In line, three houses dictated by distance were also purposefully sampled (at specific distances 50metres, 100metres and 150metres) from the Dumping/Heaping Site-DS provided by the Wa Municipal Assembly-WMA and this was intended to check the influence of distance. Also, fifteen (15) houses using the adaptive sampling technique, were sampled due to the number of households (more than two 2) in these houses (Thompson-Hayes and Webb, 2017), out of the one hundred (100) houses which surround the DS within one hundred (150) metres radius. The fifteen (15) houses were also considered enough because of the rigour of the qualitative data collection and analysis that was intended. The representatives (15) of the fifteen (15) houses which were both men (5) and women (10), were accessed through convenience sampling (Nonprobability Sampling Technique-NST) that a researcher uses to choose a sample of subjects/units from a population (Etikan et al., 2016), and this was dictated by limited resources as well as the study not being aimed to generate results that will be used to create generalizations about the entire population. Out of the five dumping sites, one was purposefully selected because it met the requirement of the study; the required number of houses around it, and the required radius/distance for the three houses to be purposefully selected.

In this study, the data collection centred on refuse, both at the household level and at DS and these were determined/weighed and sorted out into constituents. The representatives/individuals of the fifteen houses were interviewed using a semi-structured questionnaire that was developed by the researcher. The quantity of refuse at the DS serving as a collection point, was weighed using a scale and metal-container. In fetching the refuse with the container and hanging it on the scale with the weight of the container known, the weight of the generated/heaped refuse was determined. The contents of the main container were weighed five (5) times within the 10 days of study. As a cross-check, the three houses that were purposefully sampled were provided with refuse bags whose contents were weighed each day within the 10 days of study using the same scale and sorted out into constituents. The researcher weighed a sample of 50kg of refuse generated/heaped and this was done five (5) times within the study period of ten (10) days. This (weighed sample of 50kg refuse) was then separated into components; decomposable/biodegradable parts-BD and non-decomposable/non-biodegradable parts-NBD. On a weight basis, the researcher determined the percentages of each in the composition to arrive at the refuse's suitability as organic manure. In cross-checking, a semi-structured questionnaire was designed for the target community (representatives/individuals in the 15 houses) to get information as to the type of refuse generated on the

### **CC-BY License**



individual houses. These houses were visited, and their representatives accessed/identified (10 women and five men) and interviewed centring on the perception of refuse generated, the level of knowledge of gardeners about the use of refuse and the usage of refuse in urban backyard gardening/urban farming. Representatives were all adults and engaged in informal work as a source of livelihood in the study area. Concerning data analysis, the study describes and summarizes the data, identifies relationships and puts data into its constituent components quantitatively and qualitatively. Quantitatively, the study transformed numbers employing descriptive statistics into meaningful information and presented this information in tables. Qualitatively, the stated experiences of the participants, and stated meanings they attach to issues, were the focus and thus, direct quotations from participants were captured since they are very revealing.

## RESULTS AND DISCUSSION

Table 1 shows the method of refuse disposal, composition of the refuse, agricultural activity, source of fertilizer, use of refuse from dumping site, knowledge about, and improving the use of refuse, fertilizer preference and profitability of urban-farms/gardens.

Table 1. Refuse generation, contents, disposal and various fertilizers

<b>i) Method of refuse disposal</b>	<b>Method</b>	<b>Frequency</b>	<b>Percentage (%)</b>
	Pit	3	20
	Main dump (MD)	12	80
<b>ii) Highest proportion/component of refuse</b>	<b>Components</b>		
	Ash	8	53.3
	Ash/leaves	1	6.7
	Leaves	2	13.3
	Crop residues	2	13.3
	Animal droppings	1	6.7
	Others (plastics,	1	6.7

### CC-BY License

	glasses, etc)		
<b>iii) Households with gardens</b>	<b>Garden/farm</b>		
	Garden	5	33.3
	Farm	10	66.7
<b>iv) Source of fertilizer</b>	<b>Fertilizer type</b>		
	Animal droppings (AD)	8	53.3
	Animal droppings with refuse	1	6.7
	Poultry manure (PM)	1	6.7
	Black soil	2	13.3
	None	3	20
<b>v) Use of refuse from main dump</b>	<b>Use</b>		
	Yes	2	13.3
	No	13	86.7
<b>vi) Knowledge about, and improved use of refuse</b>	<b>Response/use</b>		
	Yes	1	6.7
	No	14	93.3
<b>vii) Fertilizer preference</b>	<b>Fertilizer type</b>		
	Organic fertilizer	5	33.3
	Chemical fertilizer	8	53.3
	undecided	2	13.3

CC-BY License

GJDS, Vol. 20, No. 2, October, 2023

viii) Urban gardens/farms are profitable	Response		
	Yes	7	46.6
	No	1	6.7
	Undecided	7	46.7

Table 1 sequentially, revealed that the methods of disposal (bullet i) of the refuse in the Zongo community showed that, the majority of the households (80%) (12) sent their refuse to the main dumpsite, while only a few (20%) (3) of the houses disposed of their refuse into pits which they created. This disposal method agrees with (Wang et al, 2018 as cited in Viljoen et al, 2021) and with a study which reports that waste practices such as burying, burning, or dumping of waste in open spaces near dwellings, are embarked on by households living in low-income settlements with attendant environmental and health impacts (Haywood et al., 2021). A respondent has this to say:

*We as a house, we created space to dump the refuse. There were instances when we were taken to task by the sanitation officers and thus we tried to avoid them. (Female-respondent, interview, Zongo, 27/03/21).*

Land availability for residents to create space and the distance to the main dump site were the main determinants of their disposal methods. Most respondents 53.3% (8 out of the 15) answered that ash was the highest component of the refuse generated and this agrees with a study in households living in low-income settlements, that wood is a crucial source of fuel used for heating/cooking (Haywood et al., 2021). This could be attributable to houses inhabited by indigenous and relatively poor families who depend solely on firewood/charcoal as their fuel. Also, 40% of the respondents answered that organic materials (ash/leaves, leaves, crop residues and animal droppings) are the highest component of the refuse and this supports (Fadhullah et al., 2022), who reported in a study, main component of solid waste generated at home is largely organic/food debris. A large proportion of refuse generated in homes of poor urban settlements such as zongos is organic and has the potential to be composted for agricultural production.

Even though in every house, the response is, either a farm or garden only 33.3% (5 out of 15) interviewed said they have gardens and 66.6% (10) do not have gardens but farms in distant lands outside the township and this is in support of study which

#### CC-BY License

reports that urban agriculture holds good since it contributes to urban resilience, and to the strengthening of the local economy as well as creating social capital due to its multiple dimension (Rojo et al, 2015). A respondent, with respect to (Table 1), declared:

*Our houses are so congested that there is no 'breathing space' for us to do gardening/farming in the house. (Male respondent, interview, Zongo, 27/03/21)*

This low percentage (33.3%) of participants engaging in urban gardening could be attributed to a lack of adequate space as Figure 3 is within a yard, protect from animals and water round especially in the dry season.



**Figure 3: Home garden with maize**

**Sources:** Field data, August, 2022

On the source of fertilizer or fertilizer type, the study has revealed that 60% of the houses reported using animal and poultry droppings which according to them can easily be collected using bicycles to their farms as against 20% which employed animal droppings and refuse as well as black soil on gardening since urban gardening enhances residents' wellbeing and the environmental sustainability of urban areas (Harding et al., 2022). This could be attributed to organic fertilizer providing primary nutrients to crops and thus providing a more sustainable farming system. Also, 20% of the participants do not use any of the above for farming and this could be attributed to lack of space as well as preference. More people are into the use of animal droppings, poultry droppings and refuse in farming/gardening but the ease of conveying the refuse as well as the means available dictates its location of use in the farming activity. Regarding the use of the refuse from the dumping site, most respondents (86.7%) did not use it as against 13.3% of the respondents. This lower

### CC-BY License

percentage of respondents said they are aware of their husbands carting refuse from the dumping site to their distant farms. A respondent had this to say:

*The yield of the crops where the refuse is dumped on the farm is usually very different from the non-dumped site except that it costs a lot of money and labour to have on the farm* (Female respondents, interview, Zongo, 27/03/21).

The position of this respondent agrees with the study of Xu et al., (2022), that refuse or agricultural waste is a source of crop fertilizer but the raw dumping of refuse on farms without treatment, is inappropriate and has the potential to cause contamination and pollution and does not ensure healthy, safe and productive farming enterprise (Environment Protection Authority Victoria, 2019).

Almost all the respondents of the houses interviewed 93.3% (14) admitted having no knowledge about, and improved use of refuse especially in gardening as against 6.7% (1) that had the knowledge and this supports a study which revealed that due to lack of knowledge about, and on the improved use of refuse, the disposal has been on burying, burning which reduces soil acidity and increases the liming (Chungu et al, 2019), or dumping of waste in open spaces (Haywood et al., 2021) rather than converting refuse into form/compost that is agriculturally productive. This could be attributed to the heterogeneity of the participants as well as their background and exposure to farming. Thus, it can be said that participants in the study area did not know about refuse and its use as organic manure in urban gardening or farming. This sole respondent added:

*Lack of transport and the weighty nature of refuse, militate against my use of it in farming especially in the distant farms.* (Male respondent, interview, Zongo, 27/03/21).

Few people have knowledge about, the improved use of refuse but this is being challenged by lack of transport and also the refuse being a weighty material. Thus, the benefits of refuse can be realized if these challenges are mitigated or worked at. On fertilizer preference, more respondents (53.3%) however, said they prefer chemical fertilizers and this could be attributed to the immediate and increased yields from the inorganic fertilizer even though the negatives of this fertilizer are the soil physical degradation, increased soil acidity and soil nutrient imbalance which are now being alerted (Iderawumi, 2020). Also, 33.3% of the respondents prefer organic fertilizer and the reasons advanced were that the organic fertilizer is difficult to convey to the farms and equally involves spreading in the farms and even with these challenges, organic fertilizer 'makes the soil good' and from which more is derived from the soil. This revelation agrees with Wijeratna (2012), that agro-ecology/ecological agriculture which is the employment of ecological science in the management of sustainable agriculture, and is based on recycling biomass,

#### **CC-BY License**

intercropping, and minimizing or non-use of chemical fertilizers, herbicides and pesticides, increases yields, improves food and nutrition security, reduces poverty, builds resilience, has multiple benefits, increases climate resilience, mitigates climate change, and empowers small-scale producers. Also, 3.4% of the participants could not decide their preference and this is attributable to indecision. This revelation the majority of the respondents (86.6%), agree with Jaja and Barber (2017), that the single most efficient and cost-effective input that increases the productivity of land is fertilizer in the form of organic or inorganic and the greatest yield occurs when the fertilizers are in combination (Kakar et al., 2020) but a long-term application, especially the inorganic form alone alters the physicochemical properties of the soil (Liu et al., 2019). The more respondents (53.3%) preferring inorganic fertilizer agrees with the study of Naeem et al., (2006), that inorganic fertilizer application gives higher yield. A respondent had this to say:

*The results of the application of the inorganic fertilizer are "quick to see"-realized immediately. (A male respondent (27/03/21) in Zongo during the interview).*

As much as this could be true, it could also be due to a lack of knowledge about the long-term effect of the inorganic fertilizer on the soil on the part of some farmers/gardeners. Most of them, however, agreed that if they had the means of transport, they prefer the organic fertilizer to the inorganic fertilizer. Most farmers/gardeners appreciate the importance of fertilizers but overcoming the challenges of converting refuse into an agriculturally productive form, carting and spreading on the farm, are the factors that dictate farmers' preference and also lack of knowledge about the long-term effect on the soil. On the part of the profit, 46.6% said that backyard gardening or farming is profitable 6.7% said it is not profitable and 46.7% could not decide. A respondent has this to add:

*The profit is not only in monetary terms but includes social networking and even investment-vegetables given to fellow women in need of cock for their families and this does not only bind you together but earned better or the same treatment from such beneficiaries. (Female respondent, interview, Zongo, 27/03/21).*

The above findings and the position of the respondent, disagreed with a study by Lesole, et al., (2017) which reported that there is no profit in backyard gardening. This could be attributed to the perception and quantification of profit by the respondents since one based profit solely on monetary terms and the other includes dimensions of social relations. Thus, profit is context-oriented.

The refuse generation and measurements at the house level and the community level or dumping site focused on the quantity generated and composition of the refuse generated as in Tables 2a & 2b.

#### **CC-BY License**

**Table 2a: Refuse generation and measurements at the house and community levels**

Date	House A(kg)			House B(kg)			House C(kg)			Total WT of RG per IM in (kg)	Sample of 50kg		Percentage	
	T	NB	BD	T	NB	BD	T	NB	BD		BD	ND	BD	ND
25/11	8.6	.2	8.4	5.3	.2	5.1	6.7	.2	6.5	1022	46.3	3.7	92.6	7.4
26/11	8.6	.6	8.0	3.9	.1	3.8	7.3	.4	6.9					
27/11	5.6	.6	5.0	4.9	.1	4.8	5.5	.1	5.4	1092	46.0	4.0	92	8.0
28/11	11	.2	10.8	5.1	.2	4.9	4.5	.1	4.4					
29/11	6.8	.4	6.4	3.6	.3	3.3	6.3	.3	6.0	1095	45.7	4.3	91.4	8.6
30/11	8.0	.6	7.4	6.2	.3	5.9	4.8	.2	4.6					
1/12	9.8	.8	9.0	4.9	.4	4.5	7.0	.3	6.7	1105	46.3	3.7	92.6	7.4
2/12	10.5	.5	10.0	3.6	.2	3.4	4.5	.2	4.3					
3/12	7.8	.4	7.4	5.2	.3	4.9	6.7	.3	6.4	1015	45.1	4.9	90.2	9.8
4/12	5.4	.7	4.7	3.6	.1	3.5	4.4	.2	4.2					
T	82.6	5	77.1	46.3	2.2	44.1	57.7	2.3	55.4	5329	229.4	20.6	91.8	8.2
$\bar{x}$	8.26	0.5	7.71	4.63	0.22	4.41	5.8	0.2	5.54	1065.8	45.9	4.1	91.8	8.2

Source: November/December, 2021

Key: T=Total, NB=Non-Biodegradable, BD=Biodegradable,  $\bar{x}$  =Average/mean,

WT=Weight, RG=refuse generated, IM=instance measured

**Table 2b: Refuse generation, measurements and sorting at the house level**

House	Total amount of refuse generated by 3 houses (A, B, C) for 10 days (kg)	Average house generation per day(kg)	Total quantity of BD per day(kg)	Total quantity of ND per day(kg)	Percentage (%) BD ND

CC-BY License

GJDS, Vol. 20, No. 2, October, 2023

A	82.6	8.3	7.7	0.6	93.3	6.7
B	46.3	4.6	4.4	0.2	95.7	4.3
C	57.7	5.8	5.5	0.3	94.8	5.2
T	186.6	18.7	17.6	1.1	94.1	5.9
$\bar{x}$	62.2	6.2	5.9	0.4	95.2	4.8

Source: November/December, 2021

The study revealed the total average refuse generation during the period (10 days) as 18.7kg for the three houses (A, B and C) per day. This figure equates to 6.2kg per house, per day (Table 2a). Therefore, with 10.7 persons per house (GSS, 2014) in the study area, refuse generation per person per day in the study area comes to 0.58kg compared to WHO's estimation of 1.4x10<sup>-3</sup>kg to 8.2x10<sup>-3</sup>kg person<sup>-1</sup> day<sup>-1</sup> according to UNEP (2009) as cited in Puopiel and Owusu-Ansah (2014). This per capita generation is also higher than the national figure of 0.09kg person<sup>-1</sup> day<sup>-1</sup> according to Kawai and Tasaki (2015). This indicates that large quantities of refuse are being generated. An informant had this to say:

*Refuse is dirty and 'occupy space' in the homes and we have to discard it so as to stay away from the law of sanitation officers who are always 'on our necks' (Female respondent, interview, Zongo, 27/03/21).*

According to a study by the African Development Bank on waste management in 2002, Ghana generates about 3.6 million tons of solid waste in a year which is characterized as mainly organic compostable such as food, yard and wood wastes as well as paper, plastic, glass and metal according to Addaney and Oppong (2015). Also according to Amoah and Kosoe (2014), organic, plastics and others are the main components of the waste generated in the case of Wa with organic being the highest component.

- Ash 53.3%
- Ash/leaves mixture 6.7%
- Leaves 13.3%
- Crop residues 13.3%

#### CC-BY License



- Animal droppings 6.7%
- Plastics 6.7%

The ash, ash/leaves mixture, leaves, crop residues and animal droppings constitute the useful components which in the study area is quite high (93.3%) even though the ash concentration of 53.3% plus (+), in the refuse so generated would affect the quality of compost generated relative to urban agriculture even though ash enhances soil PH, plant nutrients status and plant performance (Wiklund, 2017; Iderawumi, 2020). Thus, urban refuse has high decomposable components of 95.2% and 91.8% at the house and community levels respectively (Table 2a & 2b) as above and this picture may be deceptive since the presence of rubbers/plastics (non-biodegradable) cannot be overlooked since it's mean generation is 8.2% and 4.8% of the total generation at the dumping site and the house respectively (Table 2a & 2b). This requires a critical look if the refuse is to be of any better use to agriculture in urban areas.

## CONCLUSION

The refuse generated in the study area is quite substantial (0.58kg person-1 day-1 compared to WHO's estimation of 1.4x10-3kg to 8.2x10-3kg person-1 day-1 according to UNEP (2009) as cited in Puopiel and Owusu-Ansah (2014) and this per capita generation is also higher than the national figure of 0.09kg person-1 day-1 according to Kawai and Tasaki (2015). The generated refuse has a higher useful proportion or decomposable component which is above 90% which is indicative of the ash, ash/leaves mixture, leaves, crop residues and animal droppings constituting the useful components which in the study area is quite high-93.3%, even though the ash concentration of 53.3% plus (+), in the refuse so generated would affect the quality of compost generated relative to urban agriculture even though ash enhances soil PH, plant nutrients status and plant performance (Wiklund, 2017; Iderawumi, 2020). However, participants due to lack of knowledge of its use, as well as challenges, indicative of 'lack of transport and the weighty nature of refuse, militate against my use of it in farming especially in the distant farms' and also few people being knowledgeable about, and on the improved use of refuse but this is being challenged by lack of transport and also the refuse being a weighty material, are not making use of this abundant resource either in farming or gardening. It is also revealed from the study that space for urban farming/gardening is lacking indicative of 'Our houses are so congested that there is no 'breathing space' for us to do gardening/farming in the house' and some are doing it within the yard which are watered in the dry season, and thus, constraining interested people or residents in gardening.

## CC-BY License

## RECOMMENDATIONS

It is recommended that education of farmers and the general public can be stepped up to help change the perception of the refuse for it is more a resource in farming than a problem concerning sanitation. Households should be encouraged to start sorting out their refuse into useful and non-useful components as done elsewhere such as e.g Egypt, Cameroon and Britain. There should be well-planned and spaced buildings to create room for gardening and holding up refuse for composting and other uses. There should be the promotion of simple means of transport for the carriage of refuse or compost to sites/farms where it is most needed. Communities and colleges of agricultural learning should also be encouraged to go into composting as a means of generating income and as community service.

## REFERENCES

- Addaney, M and Oppong, R., A. (2015). Critical Issues of Municipal Solid Waste Management in Ghana. *JENRM*, Vol. 2, No. 1, Pp. 30-36, Research Article.
- Almalki, S. (2016). Integrating Quantitative and Qualitative Data in Mixed Methods Research—Challenges and Benefits (online). *Journal of Education and Learning*; 5(3); 2016 ISSN 1927-5250 E-ISSN 1927-5269 Published by Canadian Center of Science and Education Available: <http://dx.doi.org/10.5539/jel.v5n3p288> DA: 17/09/20.
- Alkire, S., Chatterjee, M., Conconi, A., Seth, S., and Vaz, A. (2014). Poverty in Rural and Urban Areas Direct comparisons using the global MPI 2014. *OXFORD POVERTY & HUMAN DEVELOPMENT INITIATIVE* (online). Available: <https://www.ophi.org.uk/wp-content/uploads/Poverty-in-Rural-and-Urban-Areas-Direct-Comparisons-using-the-Global-MPI-2014.pdf> DA: 29/01/22.
- Amoah, S. T. And Kosoe, E. K. (2014). Solid Waste Management in Urban Areas of Ghana: Issues and Experiences from Wa (online). Available: <http://pubs.sciepub.com/jephh/2/5/3> Science and Education Publishing DOI:10.12691/jephh-2-5-3. *Journal of Environment Pollution and Human Health*, 2014, Vol. 2, No. 5, Pp. 110-117. DA: 04/08/2016.
- Aryal, U. (2021). Importance of urban agriculture in developing countries like Nepal. *Academia Letters*, Article 2881. <https://doi.org/10.20935/AL2881>.
- Asomani-Boateng, R and Murray, H. (1999). Reusing organic solid waste in urban farming in African cities: A challenge for urban planners. International Development Research Centre, Canada and Technical Centre for Agricultural and Rural Cooperation, Netherlands.
- Ayilara, M. S., Olanrewaju, O. S., Babalola, O. O. and Odeyemi, O. (2020). Waste Management through Composting: Challenges and Potentials (online). Available: [www.mdpi.com/journal/sustainability](http://www.mdpi.com/journal/sustainability) DA: 10/6/21.

## CC-BY License

- Brandhøj, M. (2015). Practice theoretical perspectives on urban gardeners' and foragers' motivations. – A qualitative multiple-case study on the contemporary everyday life performativity of urban gardening and foraging practices. Master Thesis Integrated Food Studies Aalborg University, Copenhagen.
- Chungu, D., Ng'andwe, P., Mubanga, H., Chileshe, F. (2019). Fire alters the availability of soil nutrients and accelerates growth of *Eucalyptus grandis* in Zambia. *J. For. Res. (2020) 31(5):1637–1645*<https://doi.org/10.1007/s11676-019-00977-y>
- Cochrane, L. (2014). Agricultural Intensification in Ethiopia: Review of recent research. *African journal of agricultural research. Vol. 9(31), pp 2377-2390, 31 July, 2014*
- Creswell, J. W., & Clark, P. V. L. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). London: Sage Publications Ltd.
- Creswell, J. W. (2016). *Advances in mixed methods research*. Webinar-Mixed Methods international research association, May 10, 2016.
- Dekolo, S., Oduwaye, L and Nwokoro, I. ( 2015). Urban Sprawl and Loss of Agricultural Land in Peri-urban Areas of Lagos. *Regional Statistics, Vol 5, No 2. 2015: Pp. 20–33; DOI: 10.15196/RS05202.*
- Efe, I., S. (2013). Waste Disposal Problems and Management in Ughelli, Nigeria (online). Available: <http://www.scirp.org/journal/jep> Pp. 4-11 DA: 07/04/2016.
- Environment Protection Authority Victoria, (2019). Farm waste management. Publication IWRG641.1. Victoria State Government
- Etikan, I., Musa, S. A., Alkassim, R. S. (2016). Comparison of Convenience Sampling and Purposive Sampling. *American Journal of Theoretical and Applied Statistics. Vol. 5, No. 1, 2016, pp. 1-4. doi: 10.11648/j.ajtas.20160501.11*
- Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H. and Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC Public Health (2022) 22:1* <https://doi.org/10.1186/s12889-021-12274-7>
- FAO, (2007). Profitability and sustainability of urban and peri-urban agriculture. *Agricultural management, marketing and finance occasional paper 19.*
- FAO, (2008). *Climate change and food security: A framework document*. Food and Agriculture Organization of the United Nations Rome, 2008. Pp iii
- Fetters, M. D., Curry, L. A. and Creswell, J. W. (2013). Achieving Integration in Mixed Methods Designs—Principles and Practices. *Health Services Research. 2013 Dec; 48(6 Pt 2): 2134–2156. Published online 2013 Oct 23. doi:*

### CC-BY License

- 10.1111/1475-6773.12117. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4097839>. DA: 29/08/19.
- GNA, (2005). VEEP calls for urgent amendment of Cap 84 (online). Available: [www.ghanaweb.com](http://www.ghanaweb.com) . General news, Monday. DA: 06/06/2005.
- Greene, J. C. (2007). *Mixed methods in social inquiry*. Jossey-Bass.
- GSS, (2013). 2010 Population and Housing Census: Regional Analytical Report, Upper West Region. Pp. 13-122
- GSS, (2013). 2010 Population and Housing Census: District Analytical report, Wa Municipal, Accra, Ghana.
- GSS, (2014). 2010 Population and Housing Census: Regional Analytical Report, Upper West Region. Pp. 51-52
- GSS, (2014). 2010 Population and Housing Census: urbanization. Pp1-108
- GSS, (2021). Ghana 2021 Population and Housing Census General Report Volume 3A. Populations of Regions and Districts.
- Gunjal, S. (2009). Resource book on city farming in South India. Hyderabad, India: Resource Centres on Urban Agriculture and Food Security (RUAF); Hyderabad, India: International Water Management Institute (IWMI). 125p. doi:10.5337/2011.212. Pp. Iv-131
- Harding, D., Lukman, K.M., Jingga, M., Uchiyama, Y., Quevedo, J.M.D., Kohsaka, R. (2022). Urban Gardening and Wellbeing in Pandemic Era: Preliminary Results from a Socio-Environmental Factors Approach. *Land* 2022, 11, 492. <https://doi.org/10.3390/land11040492>
- Hauck, F. W. (1978). Organic recycling to improve soil productivity. In: *organic materials and soil productivity in the East*. Bulletin. Pp 10-15. FAO, Rome
- Haywood, L.K.; Kapwata, T.; Oelofse, S.; Breetzke, G.; Wright, C.Y. (2021). Waste Disposal Practices in Low-Income Settlements of South Africa. *Int. J. Environ. Res. Public Health* 2021, 18, 8176. <https://doi.org/10.3390/ijerph18158176>
- Iderawumi, A. M. (2020). Effects of Ash on Soil Properties and Yield of Crops. *Agriculture Observer Volume :1 Issue :3 A*
- ILO, (2016). Global unemployment projected to rise in both 2016 and 2017 (online). Available: [www.ilo.org/global/about-the-ilo/newsroom/news/WCMS\\_443500/.../index.htm](http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_443500/.../index.htm). DA: 02/08/2016.
- Jaja, E. T. and Barber, L. I. (2017). Organic and Inorganic Fertilizers in Food Production System in Nigeria. *Journal of Biology, Agriculture and Healthcare* Vol.7, No.18, 51-55. [www.iiste.org](http://www.iiste.org)

#### CC-BY License

- Johnson, R. B., Onwuegbuzie, A. J. and Turner, L. A (2007). Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research*, 1; 112 DOI: 10.1177/1558689806298224.
- Kakar, K., Xuan, T. D, Noori, Z., Aryan, S., and Gulab, G., (2020). Effects of Organic and Inorganic Fertilizer Application on Growth, Yield, and Grain Quality of Rice (online). Available: [www.mdpi.com/journal/agriculture](http://www.mdpi.com/journal/agriculture) DA: 11/6/21
- Kawai, K and Tasaki, T., (2015). Revisiting estimates of municipal solid waste generation per capita and their reliability. *J Mater Cycles Waste Manag* 18:1–13
- Kristiansen, P., Taji, A. and Reganold, J. (Eds), (2006). *Organic Agriculture A Global Perspective*. Collingwood Victoria 3066, Australia, CSIRO PUBLISHING.
- Lesole, T., Madisa, M. E., Marumo, D. S. (2017). The Effectiveness of Backyard Gardening Initiative in Poverty Eradication: The Case of Beneficiaries in Ramotswa Village, Botswana. *Journal of Poverty, Investment and Development, an international Peer-review Journal vol. 33, 2017 ISSN 2422-846X*
- Liu, L., Li, C., Zhu, S., Xu, Y., Li, H., Zhen, X and Shi, R. (2019). Combined Application of Organic and Inorganic Nitrogen Fertilizers Affects Soil Prokaryotic Communities Compositions. *Agronomy* 2020, 10, 132; doi:10.3390/agronomy10010132
- McDougalla, R., Kristiansena, P. and Radera, R. (2018). Small-scale urban agriculture results in high yields but requires judicious management of inputs to achieve sustainability. December 2018 Proceedings of the National Academy of Sciences 116(1):201809707 DOI: 10.1073/pnas.1809707115
- McGranahan, G. and Satterthwaite, D. (2014). *Urbanisation concepts and trends*. IIED Working Paper. International Institute for Environment and Development, London.
- Mougeot, L. J. A. (2000). *Urban Agriculture: Definition, Presence, Potentials and Risks, and Policy Challenges*. Cities Feeding People Series Report 31
- Naeem, M., Iqbal, J., Ahmad, M., Haji, A. and Bakhsh, A. (2006). Comparative Study of Inorganic Fertilizers and Organic Manures on Yield and Yield Components of Mungbean (*Vigna radiat L.*). *JOURNAL OF AGRICULTURE & SOCIAL SCIENCES* 1813–2235/2006/02–4–227–229 <http://www.fspublishers.org>
- Nanda, S., and Berruti, F. (2021). Municipal solid waste management and landfilling technologies: a review. *Environmental Chemistry Letters*, 19, 1433-1456.
- Offei, M. B. and Boachie, J. (2019). Africa’s Urban Waste Management and Sanitation Challenges: Are Transfer Stations the Solution? (online). Available: : <https://doi.org/10.5539/ep.v9n1p1> DA: 10/6/21. *Canadian Center of Science*

#### CC-BY License

*and Education Environment and Pollution; Vol. 9, No. 1; 2020 ISSN 1927-0909  
E-ISSN 1927-0917*

Owusu, G., (2010). Social effects of poor sanitation and waste management on poor urban communities: a neighborhood-specific study of Sabon Zongo, Accra, *Journal of Urbanism*, 3:2, 145-160, DOI: 10.1080/17549175.2010.502001

Pender, J. and Hazell, P. (2000). Overview. In Pender, J. and Hazell, P. (Eds.), *Focus 4 Promoting Sustainable Development in Less-Favored Areas (p3)*. Copyright © 2000 International Food Policy Research Institute.

Puopiel, F and Owusu-Ansah, J. (2014). Solid Waste Management in Ghana: The Case of Tamale Metropolitan Area (online). Available: [www.iiste.org](http://www.iiste.org). *Journal of Environment and Earth Science*. ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online) Vol.4, No.17, 2014. DA: 04/08/16.

Ravallion, M., Chen, S and Sangraula, P. (2007). New Evidence on the Urbanization of Global Poverty. World Bank Policy Research Working Paper 4199.

Rojo, M. S., Recasens, X., Callau, S. and Vejre, H. (2015). From urban food gardening to urban farming. In Lohrberg, F, Timpe, A., Licka, L. and Scazzosi, L. (Eds). *Urban agriculture Europe*. Jovis

Sawio, C. J. (1993). *Urban Agriculture Research in East & Central Africa: Record, Capacities and Opportunities*. Cities Feeding People Series Report 1.

Tacoli, C., Bukhari, B., and Fisher, S., (2013). Urban poverty, food security and climate change (online). Available: <http://pubs.iied.org/10623IIED.html> DA: 10/6/21

Thompson-Hayes, M. and Webb, L. M. (2017). Representation/Representativeness (online). Available: <https://www.researchgate.net/publication/320928193> DA: 9/02/22

UN, (2018). Population facts (online). Available: [https://population.un.org/wup/Publications/Files/WUP2018-PopFacts\\_2018-1.pdf](https://population.un.org/wup/Publications/Files/WUP2018-PopFacts_2018-1.pdf) DA: 10/6/21

UN, (2018). The world's cities in 2018 (online). Available: [https://www.un.org/en/events/citiesday/assets/pdf/the\\_worlds\\_cities\\_in\\_2018\\_data\\_booklet.pdf](https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf) DA: 11/6/21

UN, (nd). Press release (online). Available: <https://population.un.org/wup/Publications/Files/WUP2018-PressRelease.pdf> DA: 22/09/21

UNDP (1976). *Proceedings on Workshop on Organic Recycling in Asia*, in Bangkok.

UN-Habitat, (2020). *World Cities Report 2020 The Value of Sustainable Urbanization*.

Viljoen, J.M.M.; Schenck, C.J.; Volschenk, L.; Blaauw, P.F.; Grobler, L. (2021). Household Waste Management Practices and Challenges in a Rural Remote

## CC-BY License

- Town in the Hantam Municipality in the Northern Cape, South Africa. *Sustainability* 2021, 13, 5903. <https://doi.org/10.3390/su13115903>
- Wang, Y., Li, X., Li, J., Huang, Z, and Xiao, R., (2018). Impact of Rapid Urbanization on Vulnerability of Land System from Complex Networks View: A Methodological Approach. *Hindawi Complexity Volume 2018, Article ID 8561675, 18 pages* <https://doi.org/10.1155/2018/8561675>
- WASTE, (1996). Wasted agriculture the use of compost in urban agriculture. Composting of Organic Household Waste. UWEP Working Document 1
- Wijeratna, A. (2012). FED UP NOW'S THE TIME TO INVEST IN AGRO-ECOLOGY. INTENT [www.intentdesign.net](http://www.intentdesign.net)
- Wiklund, J. (2017). Effects of wood ash on soil fertility and plant performance in southwestern Kenya. Master's thesis in Soil Science, Uppsala
- Williamson, E. (2014). Understanding the Zongo: processes of socio-spatial marginalization in Ghana (online). Available: <https://www.semanticscholar.org/paper/Understanding-the-Zongo-%3A-processes-of-in-Ghana-Williamson/7aeac6db7d7ffd45beb3e3a4316420708fc20f29> DA: 11/6/21
- World Bank, (2013). Urban Agriculture Findings from Four City Case Studies. World Bank's Urban Development and Resilience Unit of the Sustainable Development Network, Washington, DC
- Xu, X., Mola-Yudego, B., Selkimäk, M., Zhang, X., Qu, M. (2022). Determinants of farmers' waste generation and disposal in rural areas of central China (online). Available: <https://www.researchgate.net/publication/365366753> DA: 6/4/23