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Home gardens in dry lands: factors influencing residents' engagement in semi-arid Ghana

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Abstract

Purpose – Domestic gardens constitute an important component of sustainable living, contributing to environmental sustainability and community well-being. This study aims to examine and classify the factors influencing residents' engagement in domestic gardening in semi-arid regions of Ghana.

Design/methodology/approach – A mixed-methods approach was adopted, combining household surveys, field observations and a review of relevant literature. Data were analysed using descriptive and inferential statistical techniques. The Relative Importance Index (RII) was used to rank 16 factors influencing engagement, while Exploratory Factor Analysis (EFA) was used to identify the underlying components of these factors.

Findings – This study revealed that engagement in domestic gardening is primarily driven by food provision and income generation, with fresh produce emerging as the most influential factor. Environmental functions, including soil maintenance and flood mitigation, were also identified as important but secondary considerations. The factors were grouped into two components, Eco-Livelihood Benefits of Domestic Gardens and Socio-Functional Enablers of Domestic Gardening, highlighting the multifunctional nature of domestic gardens.

Research limitations/implications – The findings have implications for urban planning and community development, suggesting that promoting domestic gardening requires improved access to resources, strengthened environmental education and enhanced community engagement strategies.

Originality/value – This study provides an integrated classification of factors influencing domestic gardening, which strengthens the role in supporting livelihoods, environmental management and resilience in semi-arid regions.

Keywords Domestic gardening, Eco-livelihood benefits, Socio-functional enablers, Food security, Community resilience, Semi-arid Ghana

Paper type Research paper

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1. Introduction

Globally, domestic gardens vary widely in their prevalence and utilisation. For instance, the proportion of domestic gardens in Europe is 29% of the total urban green space in European cities, as noted by Camps-Calvet *et al.* (2016). In cities such as London, Berlin and Amsterdam, domestic gardens provide habitats for diverse plant and animal species and contribute to urban ecological networks (Dullinger *et al.*, 2017). Similarly, in countries like Japan and India, initiatives such as rooftop gardens in Tokyo and kitchen gardens in Bengaluru illustrate how domestic gardens can enhance urban resilience, food security and environmental sustainability (Osiri, 2023). North America is home to large-scale domestic gardening practices, as indicated by Klee (2023), who reports that up to 77% of households in cities such as Chicago and Toronto engage in gardening activities, with many focusing on food production and ornamental plants. These practices contribute to multiple environmental and social benefits, including moderating urban temperatures through shading and evapotranspiration, as well as improving local air quality, relaxation, stress reduction and social interaction. Domestic gardens can help prevent flooding by enhancing soil infiltration and reducing surface runoff through vegetation cover and permeable soils, which allow rainwater to be absorbed rather than rapidly accumulated on the surface. This process supports stormwater regulation and reduces flood risk, particularly in urban and semi-arid environments where natural drainage is often limited (Codjoe *et al.*, 2020; Hess *et al.*, 2020).

In Africa, domestic gardens have been shown to contribute to food security and support climate resilience, particularly in areas facing constraints in commercial food supply systems (Hansen *et al.*, 2022). In Africa, domestic gardens tend to emphasise practical livelihood functions, particularly food production and income generation, compared to settings where gardens are more commonly associated with ornamental or recreational purposes. This is evident in cities such as Accra in Ghana and Nairobi in Kenya, where domestic gardens play an important role in supporting household food supply and supplementary income activities (Cilliers *et al.*, 2013). Examples from semi-arid regions include Bolgatanga in Ghana and Dodoma in Tanzania, where domestic gardens have successfully improved food security and household income (Osei Boateng *et al.*, 2024). In Bolgatanga, small-scale gardens thrive despite limited rainfall, showcasing the adaptability of domestic gardening to harsh climates. Similarly, in Dodoma, these gardens are pivotal in supplementing food needs and promoting economic resilience among households.

In Ghana, domestic gardening is widely practised, a notable example in cities such as Kumasi, Tamale and Bolgatanga, where gardens are typically small-scale and located within or around household compounds. These gardens commonly cultivate vegetables (e.g. tomatoes, okra and leafy greens), staples (e.g. maize), herbs and sometimes fruit trees, and are often maintained using low-input methods such as organic manure with limited use of chemical fertilisers and pesticides. In semi-arid areas like Bolgatanga, households adapt through manual irrigation, greywater reuse or reliance on seasonal rainfall, enabling gardens to support food needs, supplementary income and resilience to climatic variability (Adjei Mensah *et al.*, 2017). Puplampu and Boafo (2021) asserted that the lack of access to affordable food is worse in Ghana because of the high food prices, poor market access and other effects of climate change on agricultural productivity. Domestic gardens have proven essential, especially in semi-arid regions of Ghana, due to peculiar challenges posed by harsh climatic conditions, as high food prices and poor market access are the major threats to food security. This recognition of domestic gardens as contributing to local climate regulation underscores their role in enhancing community resilience and well-being, particularly in Ghana. However, these benefits are more pronounced in tropical and semi-arid regions,

where climatic conditions amplify the relevance of small-scale vegetation in moderating temperature and supporting adaptive capacity.

There has been a growing body of literature that has examined the drivers, practices and socio-environmental dimensions of domestic and urban gardening (Glavan *et al.*, 2018; Jehlička *et al.*, 2020; Varga-Szilay *et al.*, 2024, 2025). These studies demonstrate that gardening is shaped by an interplay of socio-economic conditions, cultural values, environmental motivations and access to resources. However, existing research remains largely fragmented, often examining these factors in isolation or within specific thematic lenses such as food security, environmental benefits or social cohesion. As a result, there is limited effort to systematically integrate and classify these diverse drivers into a coherent analytical framework that captures the multidimensional nature of domestic gardening. Although studies have examined the benefits of domestic gardening (Kourdounouli and Jönsson, 2020), recent work by Varga-Szilay *et al.* (2024, 2025) further emphasises the importance of socio-economic and environmental drivers but stops short of offering a unified classification framework. Similarly, Glavan *et al.* (2018) and Jehlička *et al.* (2020) explored motivations and practices of gardening, particularly in European contexts, yet do not systematically categorise the full range of factors influencing participation. Most existing studies, therefore, tend to emphasise outcomes and benefits, with comparatively less attention given to developing a structured classification of the drivers shaping engagement (Cobbinah *et al.*, 2020; Cobbinah, 2021; Zhang *et al.*, 2021; Du Toit *et al.*, 2022). Consequently, there remains a gap in the literature regarding a comprehensive and empirically grounded classification of factors influencing domestic gardening, particularly in underrepresented contexts such as semi-arid regions of sub-Saharan Africa.

Against this background, this study seeks to examine the importance of and classify the factors influencing residents' engagement with domestic gardens in the semi-arid regions of Ghana. The findings of the study provide a valuable opportunity for strengthening the domestic gardens practice in semi-arid regions and highlight the importance of the benefits of engaging in domestic gardens. It also provides a unique characterisation of the drivers for engaging in domestic gardens in semi-arid regions, using Ghana as a case study. In this study, a domestic garden is defined as a deliberately managed space where plants are cultivated for food, medicinal, ornamental, cultural or environmental purposes within or around residential environments. The gardens represent small-scale, multifunctional land-use systems that integrate ecological processes with household needs and socio-cultural practices (González-Ball *et al.*, 2022; Pelekamoyo and Bwalya Umar, 2019; Shimeles *et al.*, 2018). Domestic gardens are typically located within household compounds and serve as important sites for food production, biodiversity conservation and social interaction. A domestic garden is a small-scale gardening practice typically established within privately owned residential spaces, where individuals or households cultivate a variety of plants for personal consumption, aesthetic value and other household needs, including vegetables, fruits, herbs and flowers (Dupras and Alam, 2015).

2. Literature review

2.1 Factors influencing engagement with domestic gardens

According to Kourdounouli and Jönsson (2020), factors such as environmental sustainability, health benefits and economic motivations will influence an individual's decision to establish and maintain a domestic garden. Space availability, watering access and knowledge of specific gardening practices also affect decision-making (Sang *et al.*, 2021). Mensah *et al.* (2021) reported that community norms and local infrastructure influence urban

gardening practices. This has also demonstrated that social networks and community support were necessary conditions for the participation of residents in domestic gardening towards improved well-being. Huho and Muriuki (2021) indicated the factors inducing house residents into domestic gardening in Kenya, noting the significance of economic, environmental and social drivers. The study, which surveyed 35 urban households, reported food security needs, cost-saving benefits and improved health as motivators for domestic gardening. However, Zhu *et al.* (2022) accounted for social and psychological motivations for domestic gardening in China and found social networking and personal well-being as key motivations. This study revealed that accessibility to the garden, local climate and family traditions were important considerations for practice in gardening.

Studies on domestic gardens have focused mainly on the environmental impacts or general benefits of gardening; little research has been done on the personal factors that motivate residents to participate in domestic gardening (Castañeda-Navarrete, 2021; Niles *et al.*, 2021; Campbell, Lugones and Gomez, 2024). However, recent contributions have expanded this focus by examining the socio-economic, cultural and environmental drivers influencing participation in domestic gardening (Varga-Szilay *et al.*, 2024, 2025). Despite these advances, the literature remains conceptually fragmented, with limited efforts to systematically integrate individual motivations into a coherent analytical framework that explains residents' engagement in domestic gardening. Campbell *et al.* (2024) disregard socio-cultural, economic and infrastructural factors in determining how people garden, as this may vary from one region to another. Urban agriculture in Africa is increasingly recognised as contributing to climate resilience, rather than having been originally established for this purpose, with studies highlighting its role in mitigating extreme temperatures, enhancing food security and improving water retention in semi-arid regions (Galhena, Freed and Maredia, 2013; Hansen *et al.*, 2022). However, the functions, motivations and outcomes of urban agriculture, including domestic gardening, vary significantly across regions and socio-economic contexts. For instance, Varga-Szilay *et al.* (2025), drawing on evidence from European countries, demonstrate how gardening practices are shaped by local socio-economic conditions, cultural norms and resource availability. The socio-ecological resilience theory suggests that domestic gardens contribute to urban climate adaptation by fostering biodiversity, reducing ecological vulnerability and strengthening community-based resource management (Derbile, Jarawura and Dombo, 2016). This study also situates domestic gardening within the discourses on food security, local resource management and community-driven climate adaptation strategies.

The factors influencing residents' engagement in domestic gardening are summarised (Table 1). These factors were chosen based on previous research; for instance, domestic gardens are a reliable source of fresh produce for better nutrition (Ayoni *et al.*, 2023). Furthermore, gardens contribute to environmental sustainability in the ways they improve soil quality, reduce the quantity of water used and mitigate the urban heat island effect (Lal, 2020). Lal (2020) argued that gardens promote biodiversity and encourage ecological balance by ensuring pollinators' population while reducing chemical pesticide use. However, the extent to which domestic gardens reduce pesticide use remains contested, as evidence suggests that home gardeners may still apply chemical pesticides, sometimes in less regulated ways compared to large-scale agriculture (Varga-Szilay and Pozsgai, 2023). This indicates that while domestic gardens have the potential to support ecological sustainability, their environmental outcomes depend significantly on management practices adopted by gardeners. In addition, domestic gardens would produce income from the sale of excess crops, thus improving the local economy and food security.

Table 1. Factors for engaging in domestic gardens and the practical manifestations

Factors for engaging in domestic gardens	Practical manifestation	Sources
Medicinal purposes	Cultivation of medicinal plants (e.g. herbs and shrubs) used for treating common ailments within households	Zhang, Zhang and Zhai, 2021; Gbedomon *et al.*, 2017; González-Ball *et al.*, 2022
Resource for income generation	The sale of surplus produce, such as vegetables, fruits or herbs, in local markets for supplementary income	Park *et al.*, 2019; González-Ball *et al.*, 2022
Provide quality food	Production of fresh, diverse and nutritious food for household consumption	Al-Kodmany, 2020; Tsige *et al.*, 2020
Environmental education and research	Use of gardens as informal learning spaces for sustainable practices and agricultural experimentation	Sam *et al.*, 2017; Hsu, 2018; Hansen *et al.*, 2022
Access to land, water, gardening tools and seeds	Availability of essential resources enabling the establishment and maintenance of gardens	Pelekamoyo and Bwalya Umar, 2019; Shimeles *et al.*, 2018
A place for enhancing social network	Interaction among neighbours, sharing of seeds, knowledge and labour	Wilhelm and Smith, 2018; Taylor *et al.*, 2017
Reduce heat	Provision of shade and evapotranspiration that lowers surrounding temperatures	Miralles *et al.*, 2019
Prevent flooding	Absorption and infiltration of rainwater through vegetation and soil, reducing surface runoff	Hess *et al.*, 2020; Codjoe *et al.*, 2020
Hobby	Engagement in gardening as a leisure or recreational activity	Mngumi, 2020; Nesbitt *et al.*, 2017
Aesthetic features	Enhancement of the visual appeal of residential spaces through ornamental plants and landscaping	Zasada *et al.*, 2020
Fresh produce	Continuous supply of freshly harvested crops for daily consumption	Vinceti *et al.*, 2022; Kabir *et al.*, 2020
Maintain the natural soil	Use of composting, mulching and organic inputs to improve soil fertility and structure	Lal, 2019; Hess *et al.*, 2020
Improve the local climate	Regulation of microclimate conditions, such as humidity and air circulation	Osei Boateng *et al.*, 2024; Alam and Mallick, 2022
Resources for decoration and worship	Cultivation of plants used for cultural, ceremonial or religious purposes	Bantihun Mehari and Abera, 2019; Ayoni *et al.*, 2023
Connection with spiritual feelings	Personal and cultural attachment to nature and use of garden space for reflection or rituals	Hutchinson *et al.*, 2015
Fodder and green manure	Growing plants used as animal feed or for soil enrichment through decomposition	Huho and Muriuki, 2021; Mensah *et al.*, 2021

2.2 Challenges of domestic gardening in semi-arid regions

Domestic gardens in semi-arid regions face significant challenges, particularly concerning water scarcity and limited access to appropriate tools, which hinder their sustainability and productivity. Water availability is a critical constraint in semi-arid regions, where low and erratic rainfall necessitates irrigation, which is often inaccessible due to high costs, inadequate infrastructure and limited access to efficient technologies such as drip systems, thereby forcing gardeners to rely on inefficient and labour-intensive watering methods (Tsige *et al*., 2020). In addition, the lack of appropriate gardening tools and inputs, such as quality seeds, compost and fertilisers, limits productivity and discourages engagement in domestic gardening (Opoku Mensah *et al*., 2023).

The extremely high temperatures and arid conditions in such regions exacerbate challenges related to heat stress and soil degradation, which affect the ability of domestic gardens to contribute to heat reduction and natural soil maintenance (Korpelainen, 2023). Moreover, while gardens have the potential to prevent flooding by enhancing soil absorption and reducing surface runoff, inadequate knowledge of proper gardening techniques and climate-resilient practices weakens their effectiveness in mitigating such environmental risks (Hess *et al*., 2020) and (Codjoe *et al*., 2020). The aesthetic and recreational benefits of domestic gardening, including its role as a hobby and a place for relaxation, are also threatened by resource constraints and the labour-intensive nature of maintaining gardens in harsh climatic conditions (Zasada *et al*., 2020) Therefore, while promoting water-efficient irrigation methods and improving access to essential tools and inputs can enhance the viability of domestic gardens and support ecological sustainability, their effectiveness depends on the availability of adequate water resources, which may remain a limiting factor in semi-arid environments.

3. Methods

3.1 Study area

The study was conducted in the semi-arid region of Ghana, particularly in the Bolgatanga municipality. The Bolgatanga Municipality, Ghana, covers a total land area of 729 sq km and shares boundaries with other Metropolitan, Municipality and District Assemblies like Bongo District (north), Talensi and Nabdam District (south and east), Kassena and Nankana East and West Districts (west) (Figure 1). The municipality is known for its semi-arid climate and its vulnerability to climatic variations and changes (Bolgatanga Municipal Assembly, 2021). Agriculture constitutes the basis of the economy in the Bolgatanga municipality, with a large part of the population engaged in subsistence agricultural cultivation (Bolgatanga Municipal Assembly, 2021). This municipality experiences wet and dry seasons, with variations in precipitation that pose serious challenges to agriculture and food security. For administrative and planning purposes, the municipality is structured into three zonal councils, which are Sumbrungu, Zuarungu and Bolgatanga (Figure 1), which also served as the primary spatial units for this study. Within this study area, domestic gardening presents a potential strategy for enhancing residents' food security and building resilience to climate variability.

In Bolgatanga Municipality, domestic gardens are typically small, multifunctional spaces located within resident compounds and characterised by mixed cropping systems (Plate 1). These gardens often include a combination of staple crops (e.g. maize and millet), vegetables (such as okra, tomatoes and leafy greens), medicinal plants and occasionally fruit trees, arranged in informal and adaptive layouts (Bolgatanga Municipal Assembly, 2021). They are usually maintained using low-input practices, relying on residents' labour, organic waste and locally available resources such as compost and greywater.

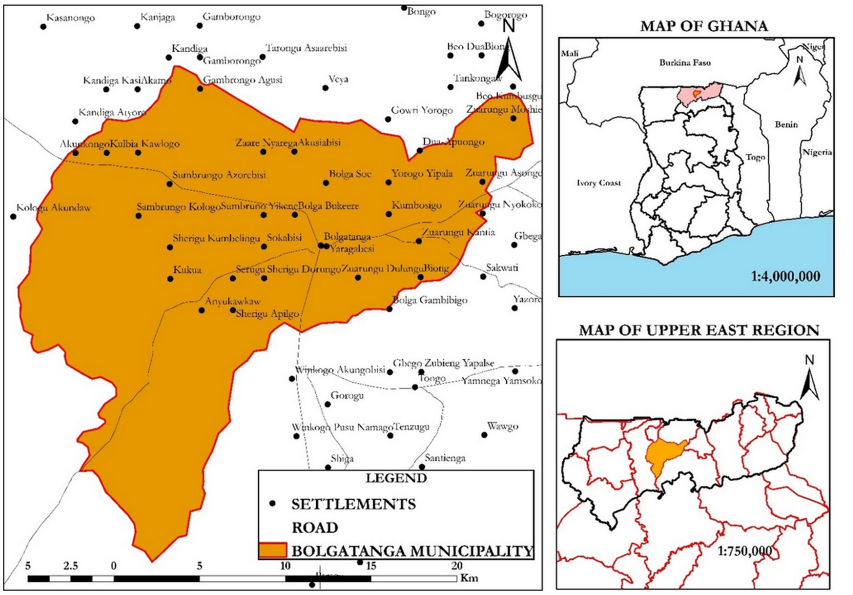

Figure 1. Context map of Bolgatanga Municipality
Source: Authors' own creation

Plate 1. Domestic gardens in Bolgatanga Municipality, Ghana
Source: Authors' own creation

3.2 Study design

This study used a mixed-methods design, integrating quantitative and qualitative approaches to examine the importance of and classify the factors influencing residents' engagement with domestic gardens. The quantitative component was derived from the closed-ended responses from the semi-structured questionnaire to determine the factors influencing the adoption of domestic gardening, looking at the level of importance, and the classification of the factors

affecting residents' engagement with domestic gardening. The target population comprised residents aged 18 years and above, including both homeowners and renters. The study will measure the factors influencing the adoption of domestic gardening, such as socio-demographic characteristics, the level of importance and the classification of the factors affecting residents' engagement with domestic gardening. Qualitative data were collected through the open-ended responses within a semi-structured questionnaire to capture the participants' lived experiences regarding the factors associated with residents' engagement in domestic gardening.

3.3 Sampling

Taherdoost (2018) defined sampling as the process of selecting study subjects. The study adopted a multi-stage sampling approach to ensure representativeness across the municipality. Firstly, stratified sampling was applied based on the three zonal councils (Sumbrungu, Zuarungu and Bolgatanga), ensuring proportional representation across the study area. Secondly, within each stratum, simple random sampling was used to select respondents, providing each eligible individual with an equal probability of selection. Thirdly, snowball sampling was applied selectively to identify respondents who were not easily accessible through conventional sampling techniques. Snowball sampling is a non-probability sampling method in which initial participants (seeds) refer the researcher to other potential respondents within their social networks. This approach was particularly useful in locating individuals actively engaged in domestic gardening, whose activities are often informal, dispersed and not captured in official records or sampling frames. The sampling techniques aided in the selection of 370 residents who were 18 years and above from the Bolgatanga municipality. This sample size was drawn from a total resident population of 3,700 residents identified in the preliminary survey conducted in the Bolgatanga municipality. The determination of this sample size complied with Jensen and Shumway's (2010) methodology helped to ensure robustness and reliability in the sampling process. The procedure for sample size determination, as prescribed by Jensen and Shumway (2010), is detailed below:

$$n = \frac{N}{1 + N(e)^2}$$

where:

n = sample size;
N = target population (resident population); and
e = margin of error (0.05) was used. The calculation is shown below:

$$n = \frac{3700}{1 + 3700(0.05)^2} = 360.975. \text{ Thus, } n = 361$$

To draw a sample size for all three study zones (Sumbrungu Zonal Council, Zuarungu Zonal Council and Bolgatanga Zonal Council), the proportional stratification method was used (Ozturk, 2019). The study initially intended to sample a total of 360 respondents. The computed sample size was 361; however, this was increased to 370 to account for non-response and incomplete questionnaires (Bender and Benner, 2000). This strategy helps in composing a sample such that the results are valid and statistical significance is assured. The proportional stratification method was also used to distribute respondents into the three communities, where 90 respondents were sampled from the Sumbrungu Zonal Council, 110 respondents from the Zuarungu Zonal Council and 170 respondents from the Bolgatanga

Zonal Council. The purpose of this sampling technique was to facilitate a representation of the study population across the different areas of study in proportion to their sizes within the overall population (Ozturk, 2019). Proportional stratification was subsequently used to allocate respondents across the three zones based on population size, resulting in 90 respondents from Sumbrungu, 110 from Zuarungu and 170 from Bolgatanga. This ensured that the sample accurately reflected the spatial distribution of the study population. The formula used for the proportional stratification method is indicated below by Ozturk (2019):

$$p = \frac{number\ of\ residents\ 18\ years\ in\ the\ zone}{total\ number\ of\ residents\ 18\ years\ in\ all\ the\ study\ zones} \times sample\ size$$

Respondents were allocated proportionally across the three study zones based on the number of residents aged 18 years and above in each zone relative to the total eligible population.

3.4 Data collection

The study adopted a quantitative analytical approach, complemented by qualitative insights, to examine the importance of and classify the factors influencing residents' engagement with domestic gardens in the semi-arid regions of Ghana. The primary data were collected using a semi-structured questionnaire with quantitative data derived from the closed-ended responses and supported by qualitative insights from the open-ended responses. The questionnaire captured socio-demographic characteristics and factors influencing residents' engagement in domestic gardening. A pilot study involving 30 respondents from Kpemale was conducted to test the reliability and validity of the instrument, and necessary revisions were made accordingly. The questionnaires were administered to 370 respondents aged 18 years and above. Interviews were conducted in local dialects (Frafra, Hausa and Nankani) and subsequently translated into English for analysis. Each interview lasted approximately 20–25 min over one month. The KoboToolbox was used for digital data collection, while printed questionnaires were retained as backup to minimise data loss and ensure consistency during fieldwork.

3.5 Analytical framework

The analytical framework was based on quantitative data derived from the closed-ended responses from the semi-structured questionnaire and supported by qualitative insights from the open-ended responses within a semi-structured questionnaire. The questionnaire consisted of two main sections. Section A captured socio-demographic characteristics of respondents, including gender, age, level of education, marital status, ethnicity, religion, residential status, employment status and ownership of domestic gardens. These variables were measured using closed-ended categorical questions to facilitate statistical analysis. Section B focused on assessing the perceived importance and functions of domestic gardening using a five-point Likert scale ranging from "Strongly Disagree" (1), "Disagree" (2), "Undecided" (3), "Agree" (4) and "Strongly Agree" (5) (Table 2). All items in this section were structured statements designed to capture environmental, socio-cultural and economic dimensions of domestic gardening. The variables measured included medicinal purposes, income generation, provision of quality food, environmental education and research, access to land and resources (water, tools and seeds), enhancement of social networks, heat reduction, flood prevention, recreational (hobby) value, aesthetic benefits, access to fresh produce, soil conservation, improvement of local climate, use for decoration and worship, spiritual connection and provision of fodder and green manure. The questionnaire was predominantly composed of closed-ended questions, with open-ended

Table 2. Relative importance index (RII) ranking of the factors influencing residents' engagement with domestic gardening

Factors	Strongly agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)	Total	Total number (*N*)	A*N	RII (total/A*N)	Rank
Provide fresh produce	945	152	408	2	6	1513	370	1850	0.818	1
Maintain the natural soil	885	176	432	6	2	1501	370	1850	0.811	2
Prevent flooding	885	176	432	6	2	1501	370	1850	0.811	2
Improve the local climate	825	232	429	4	2	1492	370	1850	0.806	4
Availability of gardening resources	895	164	402	0	16	1477	370	1850	0.798	5
Environmental education and research	840	144	456	0	14	1454	370	1850	0.786	6
Enjoyment of garden aesthetic features	835	164	429	0	19	1447	370	1850	0.782	7
Reduce heat	695	164	561	6	0	1426	370	1850	0.771	8
A place for creating and enhancing a social network	735	180	468	6	19	1408	370	1850	0.761	9
Provide fodder and green manure	715	188	480	2	19	1404	370	1850	0.759	10
A resource for income generation	270	744	378	6	1	1399	370	1850	0.756	10
Hobby	680	256	417	2	30	1385	370	1850	0.749	12
Medicinal purposes	230	748	402	4	1	1385	370	1850	0.749	12
Provide quality food	200	764	381	18	3	1366	370	1850	0.738	14
Provide resources for decoration and worship	150	756	417	16	4	1343	370	1850	0.726	15
Serve as a connection with spiritual feelings	465	120	333	6	133	1057	370	1850	0.571	16

Source(s): Authors' own creation

items included to capture additional qualitative insights based on the reason for selecting an answer (Supplementary File 1 – Questionnaires). The ordering of the questionnaire followed a logical progression, beginning with general socio-demographic questions before proceeding to perception-based Likert-scale items to minimise response bias and improve respondent engagement.

3.6 Data analysis

After the data was collected, it underwent four stages for its processing: editing, coding, entry and cleaning. Editing involved checking completed questionnaires for completeness, consistency and accuracy of responses. Coding was done to assign numerical values or categories to responses (e.g. Likert-scale responses and categorical variables) to facilitate statistical analysis. Data entry involved transferring the coded data into statistical software for analysis. In terms of cleaning, errors were identified and corrected such as missing values, inconsistencies or outliers to ensure the reliability and quality of the data set. Daily editing ensured accuracy and consistency. Data was imported into SPSS (v27) for further analysis. Due to the mixed-methods approach, which was adopted as the research design for the study, the data analysis was done both quantitatively and qualitatively. Quantitative methods of the study used both descriptive and inferential statistics. Descriptive statistical techniques were used to analyse the data, including frequency and percentage distributions of study variables such as socio-demographic characteristics (e.g. gender, age, education and employment status) and the Relative Importance Index (RII) of the factors influencing engagement in domestic gardening. Inferential statistical techniques such as Exploratory Factor Analysis (EFA) were used to facilitate factorisation. The open-ended response was analysed using qualitative content analysis (Hall and Valentin, 2005).

3.6.1 Content analysis. A content analysis was conducted for the qualitative analysis. The qualitative component of this study was derived from open-ended responses embedded within the semi-structured questionnaire. However, where respondents provided additional verbal explanations during questionnaire administration, these were captured with consent using an audio recorder, transcribed and translated into English for analysis. The open-ended responses were analysed using qualitative content analysis (Hall and Valentin, 2005). All responses were de-identified to ensure confidentiality and subsequently organised in Microsoft Word for systematic analysis. To ensure analytical rigour, the researchers independently familiarised themselves with the data by repeatedly reading the responses to gain a comprehensive understanding of the content. Through this process, similarities and differences across responses were examined, enabling a structured comparison and interpretation of the data. Themes were therefore developed inductively to reflect the underlying dimensions influencing residents' engagement in domestic gardening. To enhance the reliability and validity of the analysis, all authors independently coded the data and subsequently compared their coding outputs. Any discrepancies were discussed and resolved through consensus, ensuring consistency and reducing subjective bias. Furthermore, methodological triangulation was used by comparing qualitative findings with quantitative results to validate and enrich the interpretation of emerging themes. Specifically, themes derived from open-ended responses were compared with patterns observed in the quantitative Likert-scale results to assess consistency and complementarity. This approach allowed the study to confirm, explain and enrich key findings by examining whether similar trends emerged across both data sources. The findings from the content analysis are presented using anonymised direct quotations to preserve participants' voices and provide contextual depth, thereby facilitating a deeper understanding of the factors influencing residents' engagement in domestic gardening.

3.6.2 Relative importance index. RII is a tool used to assess the relative weight of highly prioritised strategies or elements (Shah *et al.*, 2021). RII is a quantitative technique used to determine the relative significance of variables based on respondents' ratings, particularly in studies involving subjective perceptions. It is calculated as the ratio of the weighted sum of responses to the maximum possible score, allowing variables to be ranked according to their perceived importance. In this study, RII was applied to assess the importance of 16 factors influencing residents' engagement in domestic gardening. These factors included medicinal purposes, income generation, provision of quality food, environmental education, access to resources (land, water, tools and seeds), social networking, heat reduction, flood prevention, hobby, aesthetic value, fresh produce, soil maintenance, local climate improvement, cultural and religious uses, spiritual connection and provision of fodder and green manure. The factors influencing residents' participation in domestic garden activities were measured using a five-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree and 5 = strongly agree. The RII was used to rank the factors hierarchically according to their relative influence on residents' participation. A higher RII value indicates a greater level of importance assigned to a factor by respondents. This method enabled the study to systematically prioritise the key drivers of domestic gardening and their contributions to sustainability in the Sudan Savannah Zone of Ghana. Using the equation below, the RII was derived through:

$$\text{RII} = \frac{\sum W}{(A*N)}$$

where:

W = weighting given to each factor by respondents (ranging from 1 to 5);
A = highest weight (i.e. 5 in this case); and
N = the total number of residents surveyed.

3.6.3 Exploratory factor analysis. EFA was used to reduce the large number of factors influencing residents' engagement with domestic gardening into smaller groups. The reliability of the survey instrument was measured using the Cronbach's alpha test. One of the most widely used tests for determining scale reliability is Cronbach's alpha. This study uses items on a five-point Likert scale for the internal reliability test known as Cronbach's coefficient alpha. According to Mayne *et al.* (2013), values of Cronbach's alpha coefficient of 0.90, 0.80 and 0.70 represent high reliability, moderate reliability and low reliability, respectively. For the 16 factors influencing residents' engagement with domestic gardening, the alpha value was 0.900, which shows that the measurement with the five-point Likert scale is highly reliable. In this study, the principal components analysis extraction technique was used, enabling the evaluation of variables' convergent and discriminant validity. EFA had three major steps, as suggested by Pallant (2013). The first step was to assess whether the data were suitable for factor analysis. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were conducted (Kaiser, 1974), (Strough, 2014) and (Field, 2013). This threshold suggested an excellent sampling adequacy (Tabachnick and Fidell, 1996). Bartlett's test for sphericity gave a significant statistic of $p = 0.000$ ($p < 0.05$), thereby confirming the variables were sufficiently correlated to justify factor analysis. The next step was factor extraction. According to Pallant (2013), the use of Kaiser's criterion (eigenvalues > 1) with Catell's scree test in determining meaningful factors. The next step was the factor rotation, carried out using varimax factor rotation for easy interpretation. The rotated component matrix was examined to identify the pattern of factor loadings across the extracted components. Factors were assigned to the component on

which they recorded their strongest loading, and the retained components were later interpreted based on the conceptual similarity of the grouped variables.

4. Results

4.1 Respondents characteristics

The study surveyed 370 respondents in Table S1, whose demographic and household characteristics provided the background for interpreting residents' engagement with domestic gardening. Male respondents constituted the majority of the sample, representing 60%, while the largest age group was 46–60 years, accounting for 38% of respondents. In terms of educational attainment, 42% had acquired technical or vocational education, while the sample was largely composed of married respondents, who represented 92%. The Grusi ethnic group formed the largest ethnic category, accounting for 44%, and Christians constituted 69% of the respondents. With regard to housing and household characteristics, 51% of respondents lived in rented houses, 58% reported the presence of children in their households and 51% lived in households with fewer than five members. In addition, 33% had lived in their communities for one to five years, while 54% were employed and 46% were not employed. Finally, most respondents, representing 86%, owned domestic gardens, indicating that the sample was largely composed of residents with direct experience of domestic gardening. The detailed respondents' profile in Table S1 is provided as Supplementary Material.

4.2 Factors influencing residents' engagement with domestic gardens

Table 2 presents the ranked factors influencing residents' participation in domestic garden activities based on their RII scores. The results show that "Domestic gardens provide fresh produce" was the highest-ranked factor, with an RII of 0.818, followed by "Domestic gardens maintain the natural soil" and "Domestic gardens prevent flooding", both recording RII values of 0.811. Another notable high-ranking factor was "Domestic gardens improve the local climate", with an RII of 0.806. These results indicate that residents placed greater emphasis on food-related and environmental benefits of domestic gardening. In contrast, "Domestic gardens serve as a connection with spiritual feelings" recorded the lowest RII value of 0.571, suggesting that spiritual attachment was less influential compared with the more practical and environmental factors. The results indicate that environmental factors were ranked higher than spiritual or less direct motivational factors.

4.3 Classification of the factors influencing residents' engagement with domestic gardening

EFA was used to identify the internal factors influencing residents' engagement in domestic gardening. The factors were categorised and further reduced into distinct composite factors.

The data were suitable for factor analysis, as the KMO Measure of Sampling Adequacy recorded a value of 0.924, which indicates excellent sampling adequacy for the factors influencing residents' engagement with domestic gardening. Bartlett's Test of Sphericity was also statistically significant, $\chi^2 = 3{,}292.376$, $df = 120$, $p = 0.000$, confirming that the correlation matrix was appropriate for factor extraction. As presented in Table 3, the total variance explained indicates that two components had eigenvalues greater than 1 and were therefore retained. The first component recorded an eigenvalue of 7.371 and explained 46.066% of the variance, while the second component had an eigenvalue of 1.455 and explained an additional 9.092% of the variance. Together, the two extracted components accounted for 55.158% of the total variance in residents' engagement with domestic gardening. After rotation, the first component explained 29.881% of the variance, while the

Table 3. Total variance explained for the factors influencing residents' engagement with the domestic garden

	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
Component	Total	% of variance	Cumulative (%)	Total	% of variance	Cumulative (%)	Total	% of variance	Cumulative (%)
1	7.371	46.066	46.066	7.371	46.066	46.066	4.781	29.881	29.881
2	1.455	9.092	55.158	1.455	9.092	55.158	4.044	25.277	55.158
3	0.994	6.212	61.37						
4	0.966	6.035	67.405						
5	0.924	5.778	73.183						
6	0.674	4.214	77.397						
7	0.574	3.587	80.984						
8	0.531	3.319	84.304						
9	0.492	3.072	87.376						
10	0.43	2.688	90.064						
11	0.355	2.218	92.282						
12	0.316	1.973	94.255						
13	0.284	1.774	96.029						
14	0.277	1.729	97.758						
15	0.205	1.282	99.04						
16	0.154	0.96	100						

Source(s): Authors' own creation

second component explained 25.277%, suggesting a more balanced distribution of explanatory power across the two retained components (Table 3).

The results in Table 4 show that eight factors loaded strongly on Component 1, with factor loadings ranging from 0.611 to 0.852. The strongest loading was recorded for medicinal purposes (0.852), followed by income generation (0.760), quality food (0.732), maintaining natural soil (0.723), improving the local climate (0.707), resources for decoration and worship (0.683), fresh produce (0.679) and heat reduction (0.611). Component 2 also comprised eight factors, with loadings ranging from 0.190 to 0.817. The highest loading under this component was environmental education and research (0.817); followed by creating and enhancing social networks (0.766); availability of resources such as land, water, sunlight, gardening tools and seeds (0.746); enjoyment of garden aesthetic features (0.688); hobby (0.663); flood prevention (0.524); fodder and green manure (0.299); and connection with spiritual feelings (0.190). These findings suggest that domestic gardening operates through two interrelated dimensions: one linked to eco-livelihood benefits and another linked to socio-functional enablers. While the majority of items exhibited acceptable factor loadings, a few variables, such as spiritual connection (0.19) and provision of fodder and green manure (0.299), fell below commonly recommended thresholds (e.g, 0.30–0.40). Despite the statistical loadings, these items were retained due to their substantive theoretical relevance and contextual significance within the study area, where domestic gardening is embedded in socio-cultural values and agro-ecological practices beyond purely economic or functional dimensions.

4.4 Rotated component of the factors influencing residents' engagement with domestic gardens

Figure 2 shows the rotated component of the factors influencing residents' engagement with domestic gardens. The results highlight that residents' engagement in domestic gardening is

Table 4. Rotated component matrix of the factors influencing residents' engagement with the domestic garden

Factors	Component 1	Component 2
Eco-livelihood benefits of domestic gardens		
Medicinal purposes	0.852	
Serve as a resource for income generation	0.76	
Provide quality food	0.732	
Maintain the natural soil	0.723	
Improve the local climate	0.707	
Provide resources for decoration and worship	0.683	
Provide fresh produce	0.679	
Reduce heat	0.611	
Socio-functional enablers of domestic gardens		
Environmental education and research		0.817
A place for creating and enhancing a social network		0.766
Availability of resources		0.746
Enjoyment of garden aesthetic features		0.688
A hobby		0.663
Prevent flooding		0.524
Provide fodder and green manure.		0.299
A connection with spiritual feelings		0.19

Source(s): Authors' own creation

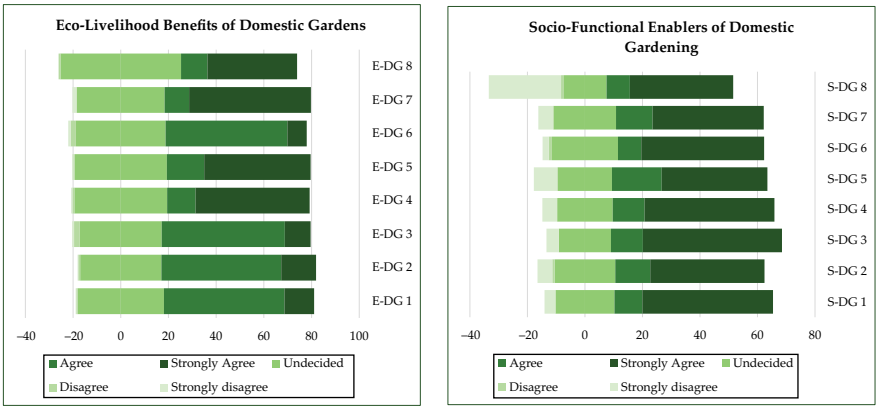

Figure III: Divergent bar graph on the rotated component of the factors influencing residents' engagement with the domestic garden

Eco-Livelihood Benefits of Domestic Gardens	Socio-Functional Enablers of Domestic Gardening
E-DG 1: Medicinal purposes	S-DG 1: Serve as environmental education and research
E-DG 2: A resource for income generation	S-DG 2: Serve as a place for enhancing the social network
E-DG 3: Provide quality food	S-DG 3: Access to land, water, gardening tools, and seeds
E-DG 4: Maintain the natural soil	S-DG 4: Enjoyment of garden aesthetic features
E-DG 5: Improve the local climate	S-DG 5: A hobby
E-DG 6: Provide resources for decoration and worship	S-DG 6: Prevent flooding
E-DG 7: Provide fresh produce	S-DG 7: Provide fodder and green manure.
E-DG 8: Reduce heat	S-DG 8: A connection with spiritual feelings

Figure 2. Divergent bar graph on the rotated component of the factors influencing residents' engagement with the domestic garden
Source: Authors' own creation

shaped by two interrelated dimensions: eco-livelihood benefits and socio-functional enablers. Qualitative responses from the residents complement the results on the engagement in domestic gardening.

The residents' responses indicate that engagement in domestic gardening is strongly influenced by its eco-livelihood benefits, particularly those linked to food provision, environmental improvement and cost savings. A majority of respondents (51%) strongly agreed that domestic gardens provide fresh produce, while 48% strongly agreed that they help maintain natural soil, and 45% agreed that they improve the local climate. One resident said, "The vegetables I grow in my garden save me money and come from healthier soil in my backyard". This statement shows the cost-saving potential of homegrown produce, which reduces dependence on stores as an alternative. Similarly, 38% of respondents strongly agreed that domestic gardens contribute to heat reduction, reinforcing their perceived ecological functions. In contrast, aesthetic and symbolic functions were less emphasised, with only 8% strongly agreeing that gardens provide materials for decoration and worship, indicating that practical benefits outweigh ornamental considerations. One resident said, "The ornamental part of my garden buzzes in beauty, but I consider it primarily as the growing ground from which I harvest food and enrich the area". While the visual appeal of a garden can create a sense of pride and joy, the resident's primary focus is on its functional benefits, such as food production and environmental enhancement. Regarding the medicinal value of domestic gardens, 12% of residents strongly agreed about it. One of them explained, "I gather my herbs from my garden to prepare herbal remedy solutions for very common ailments, like colds and headaches". The use of homegrown herbs not only supports wellness but also reduces reliance on commercial pharmaceuticals, fostering a sense of self-sufficiency.

In addition, residents identified several socio-functional enablers that facilitate participation in domestic gardening, particularly those related to resource access, social interaction and everyday utility. Access to essential resources such as land, water and sunlight was identified as a critical enabling factor, with 48% of respondents strongly agreeing. From the data, 45% strongly believed that domestic gardens have educational roles, especially in environmental awareness. One female respondent said, "Gardening becomes for me a very practical way to teach my children about sustainability and caring for the environment". This response shows the educational value of domestic gardening, particularly in fostering environmental awareness among younger generations. The aesthetic values of domestic gardens were counted on, with 45% strongly agreeing that gardening brings enjoyment. As one resident put it, "Spending time in my garden helps me relax and feel connected to nature". Networking benefits through gardening were moderately acknowledged, with 40% strongly agreeing that domestic gardens provide opportunities to meet and socialise. However, only 36% strongly agreed that gardens are avenues where a spiritual feeling can be reached by someone; some responses from respondents had a different focus. One male resident noted, "For me, gardening is more about practical benefits than spiritual connections". This emphasises the functional aspects of gardening over its intangible or spiritual qualities.

5. Discussion

This study seeks to examine the importance of and classify the factors influencing residents' engagement with domestic gardens in the semi-arid regions of Ghana. The RII and EFA were used in analysing the 16 factors influencing residents' engagement with domestic gardening, which were based on a five-point Likert scale.

5.1 Domestic gardens provide fresh produce

In the results, the provision of fresh produce emerged as the highest-ranked factor influencing residents' engagement with domestic gardening. This finding suggested that residents valued domestic gardens primarily for their contribution to household food access and reduced dependence on external food sources. In the context of this study, domestic gardens appeared to provide residents with access to fresh fruits and vegetables, thereby supporting household food security and dietary diversity. Empirical evidence supports the assertion that domestic gardens have improved food availability, where access to fresh produce generally has high market prices and is limited (Kabir *et al.*, 2020; Mellisse *et al.*, 2018). Domestic gardening may not replace formal food supply systems, but it contributes meaningfully to food access, dietary diversity and household resilience (Jehlička *et al.*, 2020; Vávra *et al.*, 2022). These findings suggest that the contribution of domestic gardens to food provisioning is context-dependent, varying in scale and intensity but consistently reinforcing resident-level food security. These highlight sustainable food initiatives in developing regions, but contradict studies like Vinceti *et al.* (2022) that ranked urban agriculture as being less significant. It shows the importance of individual domestic gardens, which have the possibility of addressing food insecurity issues in different communities.

5.2 Domestic gardens maintain the natural soil and domestic gardens prevent flooding

The results also showed that soil maintenance and flood prevention were among the highly ranked environmental factors influencing residents' engagement with domestic gardens. This finding indicated that residents perceived domestic gardens as important for improving water infiltration, reducing surface runoff and protecting soil from erosion. In the context of semi-arid Ghana, this perception is important because domestic gardens can function as small-scale green infrastructure within household spaces. Darkwah *et al.* (2018) and

Nag *et al.* (2023) support these functions, where the tendency is towards increased incidence of both soil degradation and flooding. However, the extent to which domestic gardens contribute to soil health depends significantly on management practices, particularly the use of fertilisers and pesticides. Evidence suggests that chemical inputs in domestic gardens may be applied in unregulated or excessive ways, potentially undermining soil quality and ecological balance (Varga-Szilay and Pozsgai, 2023). In some cases, domestic gardens may exhibit higher relative use of pesticides compared to larger-scale agricultural systems, thereby limiting their environmental benefits. This indicates that domestic gardens should only be considered effective green infrastructure when managed using sustainable practices, such as reduced chemical inputs and soil-enhancing techniques. This aligns with the global effort towards integrating green infrastructure for environmental sustainability. However, Hess *et al.* (2020) and Codjoe *et al.* (2020) have placed more focus on engineered flood control means, giving low priority to natural solutions. Yet, this indicates that domestic gardens are important in maintaining natural soil and in flood mitigation, which shows the environmental benefit.

5.3 Domestic gardens improve the local climate

In this study, residents also ranked local climate improvement as an important factor influencing engagement with domestic gardening. This result suggested that residents recognised the contribution of domestic gardens to microclimatic comfort, particularly through shading, vegetation cover, cooling and improved household environmental conditions. These aspects contribute to comfortable living environments for residents and sustainable living conditions. Asante *et al.* (2021) and Alam and Mallick (2022) found similar findings that point towards the green spaces' favourability in providing an improved local climate. However, it was in contrast to Al-Kodmany (2020) who ranked microclimatic improvements lower, focusing instead on other environmental functions. This recognition of domestic gardens as crucial in their climate enhancement implies their value in promoting environmental resilience and well-being.

5.4 Availability of resources for domestic gardening

The results showed that the availability of resources was an important determinant of residents' engagement with domestic gardening. This finding suggested that access to land, water, seeds, tools, sunlight and gardening information influenced whether residents could participate effectively in domestic gardening. In this study, resource availability appeared to determine not only the possibility of starting a garden but also the ability to sustain it over time. In particular, access to knowledge and information on gardening techniques plays a critical role in shaping how gardens are managed and whether residents can sustain them over time (Wyckhuys *et al.*, 2019). Limited access to these resources can constrain participation, whereas their availability enhances the effectiveness and benefits of domestic gardening. Shimeles *et al.* (2018) pointed out that easy access to resources in the community would enhance members' participation in environmental-based initiatives. In a local context, the availability of resources ensures that individuals can engage actively with sustainable practices in domestic gardening. Pelekamoyo and Bwalya Umar (2019) with contrasting findings, it puts less emphasis on it. The recognition of resource availability as an important determinant strengthens its role in the adoption of domestic gardens.

5.5 Classification of the factors influencing domestic gardening

The EFA extracted components in the domestic gardening statistical analysis accounted for 55.158% of the variance. The first component was classified as Eco-Livelihood Benefits of

Domestic Gardens, whereas the second component was designated as Socio-Functional Enablers of Domestic Gardening. This classification showed that residents' engagement with domestic gardens was shaped by both livelihood-environmental benefits and social-functional conditions.

5.5.1 Eco-livelihood benefits of domestic gardens. The study results show that Component 1 recorded high loadings for medicinal purposes, income generation, quality food provision, maintenance of natural soil, improvement of the local climate, fresh produce and heat reduction. This pattern suggested that residents associated domestic gardens with livelihood support, household welfare and ecological benefits. In this study, domestic gardens were therefore not perceived only as recreational or ornamental spaces but as practical household assets that contribute to food access, income opportunities, health-related uses and environmental regulation. According to Park *et al.* (2019), these results correlate with the domestic gardens that improve biodiversity and a fresh, nutritious supply to the household. González-Ball *et al.* (2022) underlined the psychological and health benefits of domestic gardening, thus testifying to its multifunctionality. Gbedomon *et al.* (2017) documented that household gardens contribute to the regulation of the microclimates, consistent with the way they reduce heat and improve the local climate. These benefits fit within the Sustainable Development Goals (SDG), such as ensuring sustainable consumption and production patterns (SDG 12) and taking actions to combat climate change and its impacts (SDG 13). These also contribute to biodiversity conservation and ecosystem support, particularly through the cultivation of diverse plant species and the provision of habitats for pollinators, which relate to SDG 15 (Life on Land). This suggests that domestic gardens not only support livelihood and climate-related outcomes but also play a role in enhancing local biodiversity and ecosystem functions. These factors indicate the awareness of residents and commitment to living sustainably, which is an important aspect of enhancing resilience to environmental challenges.

5.5.2 Socio-functional enablers of domestic gardening. In this study, Component 2 recorded high loadings for environmental education and research, social networking, availability of gardening resources, aesthetic enjoyment and gardening as a hobby. This finding indicated that residents' engagement with domestic gardens was also shaped by social, functional and experiential motivations. The results suggested that domestic gardens served as spaces for learning, relaxation, social interaction, environmental awareness and everyday household use. These observations have been made by Taylor *et al.* (2017), who identified that community gardening is a key vector of social cohesion and education. The identity generated through aesthetics and collaboration is further emphasised by Wilhelm and Smith (2018) who identify gardens to enhance individual well-being and community identity. Resource allocation issues coincide with the findings of Hsu (2018) and Hansen *et al.* (2022), who identified access to land and gardening resources as key to sustained participation. All these affirmations have woven the role of domestic gardens in entrenching their beneficial effects in enhancing social and resource bases for sustainable living. Moreover, relating to the SDGs, these benefits promote SDG 11 (Sustainable Cities and Communities), thus ensuring green spaces for social inclusion purposely: SDG 4 (Quality Education) through their role in environmental education and SDG 3 (Good Health and Well-being) with mental and emotional well-being. The accessibility of these resources is also in line with SDG 12 (Responsible Consumption and Production), as gardens promote sustainable resource use and production of food within the locality.

6. Limitations of the study

This study has some limitations that should be considered when interpreting the findings. Firstly, the sample was largely composed of residents who already owned domestic gardens,

with 86% of respondents reporting garden ownership. This was consistent with the aim of the study, which focused on residents' engagement with domestic gardening; however, it limits the extent to which the findings can be generalised to non-gardening populations. As a result, the study mainly reflects the experiences, motivations and constraints of residents already involved in domestic gardening, while providing only limited insight into the factors that may explain non-engagement. Finally, the study did not thoroughly assess how existing policy interventions and institutional support mechanisms influence key enabling factors such as access to land, water, tools, seeds, information and technical knowledge. Future research should explore how policy interventions and institutional support can further enhance domestic gardening practices, ensuring their long-term viability as sustainable solutions in climate-vulnerable regions. These studies could also include both gardening and non-gardening populations to provide an assessment of the factors influencing residents' engagement and non-engagement with domestic gardens in the semi-arid regions of Ghana.

7. Conclusion and recommendations

This study examined the factors influencing residents' engagement in domestic gardening and highlighted its multifunctional role in semi-arid contexts. The findings show that domestic gardening is primarily driven by eco-livelihood benefits, particularly food provision and income generation. In addition, socio-functional enablers such as access to resources, knowledge and social interaction play a crucial role in shaping participation. These dimensions demonstrate that domestic gardens function as integrated systems linking livelihood needs with environmental and social benefits. Domestic gardening, therefore, represents a practical, resident-level strategy for addressing food insecurity and supporting everyday resilience in dryland gardens. The study also shows that environmental benefits, including soil improvement and microclimate regulation, are important but secondary to immediate livelihood concerns. This study contributes to a more coherent understanding of domestic gardening beyond fragmented perspectives by developing a structured classification of influencing factors. The findings further suggest that effective support for domestic gardening requires both material resources and access to relevant knowledge and practices.

The findings of the study have significant implications for both practice and theory. Beyond the benefits, domestic gardens serve as crucial adaptation strategies for urban and peri-urban communities, offering food security, improved microclimates and strengthened social cohesion. These align with the broader discourse on nature-based solutions, reinforcing the importance of integrating small-scale green spaces into urban planning frameworks. Theoretically, this study contributes to understanding how local environmental engagement influences sustainable behaviours, supporting theories on community-led resilience and ecological stewardship. Practically, urban planners can use these implications in enticing residents to take on domestic gardening as an option for sustainable living and the future. Implicitly, these two components support the sustainability agenda, such as SDG 13 (Climate Action) and SDG 12 (Responsible Consumption and Production), SDG 11 (Sustainable Cities and Communities), SDG 4 (Quality Education) and SDG 3 (Good Health and Well-being).

The findings highlight the need for policies that enhance domestic gardening participation by improving access to essential resources like water, seeds and tools. The Bolgatanga Municipal Assembly can lead efforts through water conservation initiatives, input subsidies and incentives for sustainable gardening. Local policies should also promote rainwater harvesting and irrigation infrastructure to address water scarcity. Environmental education and social networking can be strengthened through awareness campaigns and school-based programs, with institutions like Bolgatanga Technical University and Senior and Junior High

Schools in Bolgatanga and Northern Ghana playing a key role. The Upper East Regional Directorate of Agriculture can provide training and extension services focusing on improving climatic and soil conditions in the region. Collaboration with community organisations can support demonstration gardens as learning hubs, while municipal governments should integrate green spaces into urban planning. Therefore, a collaborative approach involving policymakers, environmental organisations and educational institutions is crucial in scaling up domestic gardening efforts and maximising their socio-ecological impact. These efforts align with SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production), fostering a resilient and sustainable local ecosystem. International development institutions such as the Food and Agriculture Organization of the United Nations, the United Nations Human Settlements Programme, the United Nations Environment Programme and the World Bank should support domestic gardening in climate-vulnerable regions by funding water-efficient gardening technologies, seed systems, household composting and urban greening programmes that strengthen food security and local climate resilience. These institutions should also collaborate with national and local governments to develop guidelines, training modules and pilot projects that integrate domestic gardens into broader climate adaptation, sustainable cities and household livelihood strategies. These efforts will help refine strategies for promoting domestic gardening as a sustainable solution in climate-vulnerable communities.

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Data availability

The data sets used or analysed in this present study can be obtained from the corresponding author upon reasonable request.

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Supplementary material

The supplementary material for this article can be found online.

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