Environment, Resource and Ecology Journal (2025)
Clausius Scientific Press, Canada

DOI: 10.23977/erej.2025.090111
ISSN 2616-3756 Vol. 9 Num. 1

Horticultural Nurseries in Urban Landscapes in Sub-Saharan African Cities

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Keywords: GIS techniques, Nursery size, educational level, employment, ornamental plants

Abstract: Nurseries are a major feature in urban landscapes in Sub-Saharan Africa providing plants for amenity and food and a barometer for the extent of private estate development. However, the nursery industry has not received sufficient recognition for urban transformation and sustainability because it lacks data on its activities. This research was developed to, 1) provide information on nurseries, and 2) determine how nurseries could enhance green infrastructure in urban areas. Data-gathering instruments like a content-validated questionnaire, GPS handset, and digital camera were used to survey 51 nurseries. The analysis of the data using GIS techniques and SPSS statistical software showed that nurseries had no standards to guide their operations, 50% of respondents had only up to basic level education with 84% having up to secondary school education. The average age of respondents was 38 ±1 with 88.4 % of the nurseries being self-financed, making it a good start-up for the youth. Nurseries were located along major roads without land ownership rights and relied on foreign sources to replenish their plant stocks. Nurseries were small in size averaging 1228.9 m^2 but could be given more land to operate to enhance green infrastructure development. Most nurseries (87.5%) depend on unreliable and expensive water sources. These findings could inform policy on the gap in education, the development of nurseries as startups for the youth, and the need for a more sustainable water supply system to enhance agricultural activities in urban areas. The findings can help start discussions on the standardization of nursery operations, the need for the development of indigenous varieties, and why nurseries should be given more space to affect green infrastructure development. The research contributes to knowledge by expanding the knowledge base on nurseries in cities in Sub-Sahara Africa.

1. Introduction

Horticultural nurseries have become a major feature in the urban landscape in sub–Saharan Africa whilst on the international front container-grown nursery plants either for amenity or cultivation of crops have created a booming market worth over US$ 11 billion [1]. A horticultural nursery or plant nursery is a place where plants are propagated and grown to useable size [1]. They serve as temporary homes for seedlings of different types of plants awaiting transfer and permanent cultivation in gardens,

homesteads, parks, and farms and are distinguished from garden centers as they combine both production and sale. Garden centers market nursery plants through handling, maintenance, and provision of horticultural advice but do little of the production [2]. Nurseries provide avenues for the distribution of ornamental and non-ornamental plants for the landscape industry, garden enthusiasts, and farmers and also help improve biodiversity in the urban setting [3]. Nurseries are very critical in the collection, selection, and subsequent multiplication at the local front of wild species with ornamental potential [4], thus providing an avenue for the domestication of wild-growing indigenous plants. Indeed nurseries are the basic needs and building blocks of the horticulture industry [5] and are a very important means to conserve wild growing plants of ornamental value whose population may be fast dwindling from recurrent bushfires, deforestation, and other devastating land use activities such as “galamsey”. Nurseries are thus an integral part of the horticultural industry, where plants are propagated for conservation, and fruit and vegetable plants, medicinal and ornamental plants are sold [6].

In developed economies, nurseries facilitate the work of landscape architects and landscape contractors by providing standardized planting materials for landscape development [7]. In developing economies, however, nurseries only provide planting materials for landscaping, farmers, and garden enthusiasts and create needed employment for the teaming urban population, especially the youth [8]. Nurseries have also become an integral part of the policy on poverty eradication [9, 10]. Nurseries may specialize in the production, and retail of plants to the general public or wholesale production to businesses where few plants may be produced by the nursery on a large scale and sold to commercial gardeners [1]. However, some nurseries may offer two or all three categories of services [11].

In Sub-Saharan Africa, including Ghana, most nurseries produce and retail plants and are found along major roads, communication lanes, and within communities and have become important in greening and enhancing the outlook of open spaces [9]. The greening is a bi-product of the activities of the nurseries when they create room for propagation activities; where tender propagules are nursed under the shade of existing vegetation, mostly trees and shrubs, ensuring their protection and maintenance. Another positive effect of the activities at the nurseries is that they help keep urban areas clean as their presence on abandoned plots or open spaces within the public right of way along roads and lanes protects and prevents such areas from being used as waste dumps or for some illegal activity. Despite all these positive factors about nurseries, not much has been done to streamline their activities, assess their impact on the provision of amenity value in the developing urban space, and integrate them into the development agenda of urban areas. The perception is that these nurseries are being managed by people with little or no formal education, deepening the erroneous impression that one does not need education to run a nursery business [12]. The objectives of this research were thus to: 1) provide information to help nurseries further improve their productivity, and 2) determine how the nurseries could be used to enhance green infrastructure in urban areas thereby initiating a discussion for the standardization of the operations of the nursery industry.

2. Materials and Methods

The research was conducted in five administrative areas of the Greater Accra Metropolitan Area (GAMA), Ghana, covering an area of 891 km^2. The area lies within the geographical coordinates of latitude -0.527292 and -0.082525dd North and longitude 5.804253 and 5.492637dd West. The metropolis has the highest population density of 1238.8 persons/km^2 and falls within the most urbanized part of Ghana [13]. The vegetation of the area is described as Coastal Savannah with a bimodal rainfall of unequal magnitude [14].

The research made use of boundary maps of the five administrative districts, and data-gathering

instruments including a GPS handset, a camera, and a mix of open and close-ended questionnaires. At each nursery site visited, either the nursery manager or the attendant was interviewed depending on which of them was available. Where the nursery manager was available, he or she became the preferred respondent. The research was conducted between November 2021 and January 2022.

The research adopted the purposeful sampling approach, developed and used a content-validated in-depth questionnaire, which was administered in-person to 51 nurseries out of the estimated 120 nurseries within the five administrative areas. Although no known census of the nurseries exists, informal discussions with some 'thought leaders' of the association provided the basis for the estimated figure. Two languages Twi and English which the researcher was very fluent in and which most respondents could freely speak or understand were used interchangeably in administering the questionnaires. The questionnaire had five main sections meant to collect data on the background of respondents including education, employment, and knowledge of plant materials, the nursery, and types of services offered. An Etrex 10 Garmin GPS handset was used to collect data on the location and land area of each of the nurseries surveyed.

A preliminary survey was conducted to identify the location of the nurseries within the five administrative districts and nurseries were randomly selected based on the availability of the manager or attendant and their willingness to answer questions posed by the researcher. Owing to these factors a fair distribution of selected sites could not be guaranteed as only nursery managers or attendants who agreed to be interviewed were chosen. The questionnaires were administered in person and involved reading out 31 questions in the local dialect (Twi) or English, whichever the respondent preferred. It took between 15-18 minutes to complete each questionnaire; this time frame was based on an analysis of the pre-testing period. This was very important as the pre-testing period showed that people were becoming fatigued with questionnaire administration by researchers and were less likely to respond if they thought it would take too much of their time. In fact, in some instances, prospective respondents were uncooperative and outrightly rejected to be interviewed. One of the key data collected was on the area occupied by each nursery and this was obtained using the Etrex 10 Garmin GPS handset. This data was later loaded and processed in Arcmap software Version 10.7.1 to provide spatial dispersion and coverage in square meters. Further processing was done in Excel, where the data was coded, and analyzed using the SPSS statistical program version 23 and presented in the form of frequencies, percentages, and figures. The significance level was set at 5% for differences between means.

3. Results

3.1 Observations

Several observations critical to an understanding of the present conditions of the nursery industry were made based on informal discussions with nursery managers and attendants and my observations as I engaged with them. Most nurseries start with very few plants out of public view in a place different from the current location of the nursery but expand over time adding to the stock of plants up to a point when they have enough to start displaying them to the public. Several nurseries had constructed propagation chambers (Tunnels) using transparent polythene sheets to create special conditions to root plants like *Thuja orientalis, Ficus benjamina, and Duranta blumei* among others (Figure 1). Some managers conferred how they have over the years accumulated extensive information on the propagation of the different types of plants. With the exception of attendants who receive an arranged monthly salary, most nursery managers did not have a stated salary. The information provided on their salary was thus based on an estimate of how much money they spent to maintain themselves and their families. Respondents showed a general mistrust when it came to finances. Others were simply uncooperative thinking that this was a means for government to gather

information on their activities to tax them.

Figure 1: An Improvised Propagation Tunnel in One of the Surveyed Nurseries.

Figure 2: One of the Surveyed Nursery with Flamboyant Pot Display to attract customers

Although none of the surveyed nurseries have labeled the plants for easy identification nor grouped them based on use, function or water requirement, nursery managers with some level of education seem to put in more effort in arranging plants as a marketing strategy compared with the less educated (Figure 2). There was no standard procedure used to determine the price of plants but generally, prices increased with size. The nurseries were loosely organized based on location with a prime objective of seeking their welfare but were not governed by any organized body. Clay pots have become very popular with some displayed in an array of colors presumed to be glazed as a marketing strategy. The colors created by these painted-over clay pots make an interesting contrast when potted and arranged

alongside potted plants along the usually heavy traffic streets (Figure 3). Pest and disease control was based on advice from friends in the industry and agro-input dealers.

Figure 3: A display of colorful painted-over clay pots at a nursery in Accra.

3.2 Background

The background of the respondents covered areas such as gender, age range, the number of dependents the respondent was supporting, and region of origin among others. Respondents were predominantly males making up 58.8% with females making up 39.2%. The ages of respondents ranged between 17 years and 60+ with 41.2% being between 18 and 33 years, and 29.4% above 49 years (Figure 4). Respondents aged below 18 years were only 2% and the average age was 38 ± 1. The majority of respondents (64.7%) had 4-9 dependents; only 11.8% did not have any dependents. About 98% of respondents had migrated from other regions within the country to the study area (Figure 5) with the dominant migrants being Volta and Oti (45.1%), Eastern (19.6%), Central (9.8%), and Upper East (9.8%) regions.

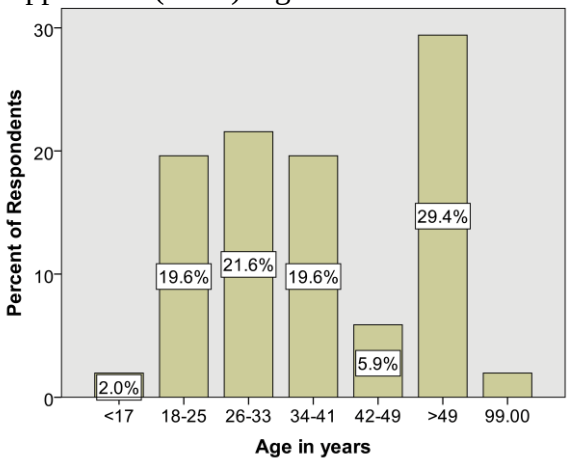

Figure 4. Age Range of Respondents

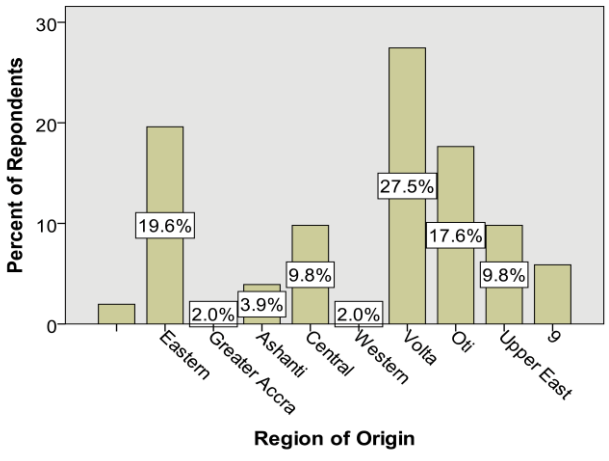

Figure 5. Migration Trends Among Respondents.

3.3 Education

Information on the educational background of respondents included among others level of education, completion status, and interest in further education. The results showed that 10% of respondents had no formal education at all, 40% had Junior High School education, and 36% had secondary school education (Figure. 6). Only 6% had tertiary education with 2% having formal education in Horticulture. For the completion status, 72.5% completed their education while 25.5% did not. Almost all respondents (94.1%) said they would be interested in further education in various fields in Horticulture to enhance their work.

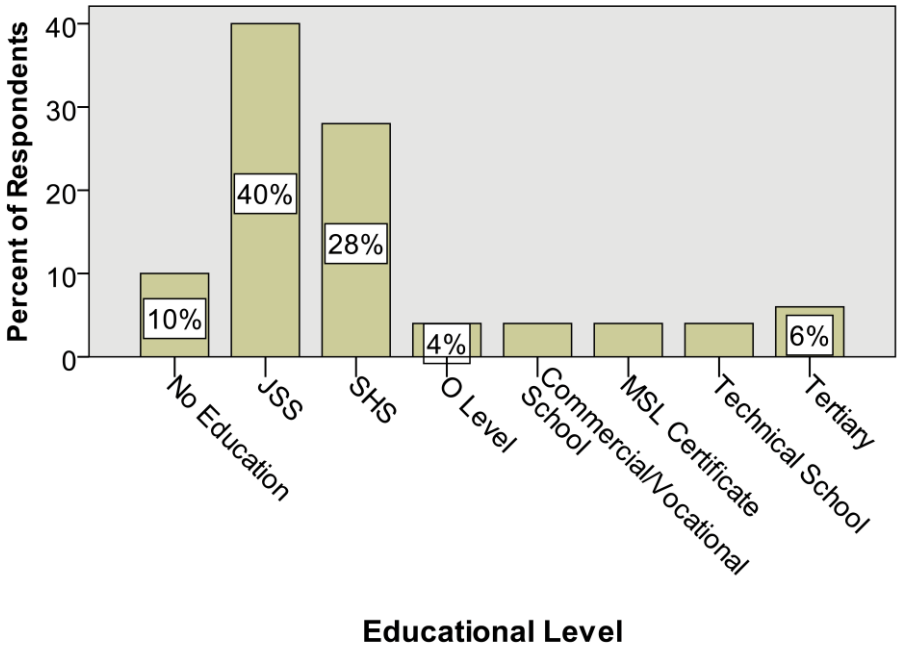

Figure 6. The Educational Level of Respondents.

3.4 Employment

Data on employment included how long the respondents had been in the nursery business, the size of the workforce, monthly salary, and sources of income. Almost half of the respondents (47%) had been in the nursery business for at least 10 years, whilst over 33% had been in the business for >15 years (Figure 7). The majority of the nurseries (60.8%) employ between 1-3 workers, whilst 33.3% employ between 4-6 workers. Only a small fraction (3.9%) had a workforce larger than 6. Almost all respondents (84.6%) indicated that the nursery business was their only source of income whilst 12.8% relied on secondary sources to supplement their income. The salary level among respondents ranged between ₵150/month (US$300/year) and ₵5000/month (US$9,378/year) but varied from nursery to nursery (Figure 8). Generally, 43.1% of respondents earned up to ₵1000 per month (US$1875/year) whilst only 13.7% earned more than ₵3000/month (> $6000/year). Except for a few outliers, and depending on location, attendants earned between ₵Gh150-₵800/month, whilst owners earned between ₵2000-₵5000/month.

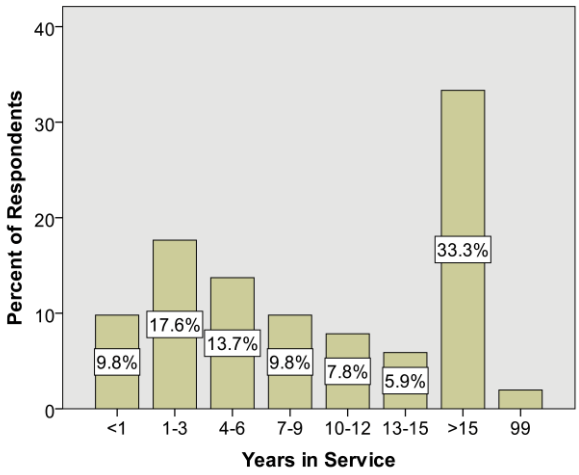

Figure 7. Number of Years in Service

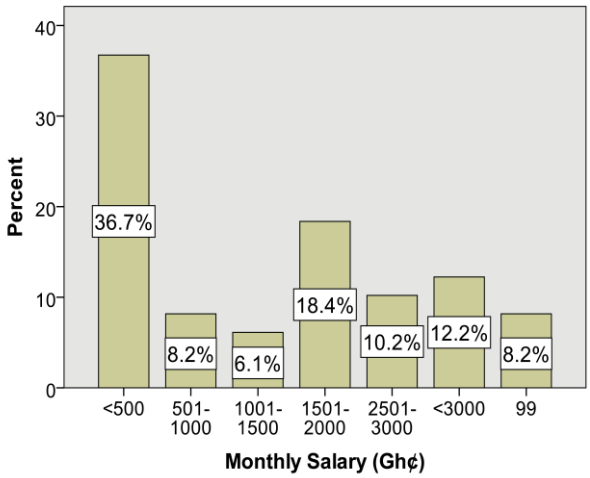

Figure 8. Salary (Gh¢) of Respondents

3.5 Plant Materials

Data on plant materials included the source of plant materials, how knowledgeable respondents are about the plants in terms of identification, usage, and the types of plants distributed by the nursery. Most nurseries produce their plants from propagating mother plants sourced from sister nurseries but rely on external agents to replenish their stock with foreign plants. These external agents import plant materials from other African countries like South Africa, Togo, Benin, Ivory Coast, Burkina Faso, Kenya as well as European countries like France, Spain, United Kingdom. Respondents were able to identify some of the plants and had good knowledge in the uses of the plants. Nurseries distributed mostly ornamental plants (both floricultural and landscape plants) as well as fruit tree plants, and a few medicinal plants. The fruit tree plants ranged from only 2 to as many as 10 with the commonest being sweet orange (*Citrus sinensis*), mango (*Mangifera indica* L), and coconut (*Cocus nucifera* L). None of the nurseries produce or distribute vegetable plants.

3.6 Nurseries

Figure 9. An Advertising Poster at a Nursery.

Information on the nurseries included location, name (Figure 9), size, how the land was acquired, what types of services are offered by the nurseries, how the nursery was financed, ownership of the nursery and registration with the governmental agencies.

Nurseries were mainly distributed along major roads and streets within the metropolis with the most dominant areas being Zorwulu-GIMPA road (33.3%), Spintex-East Legon road (19.6%), Haatcho-Atomic road (19.6%) and Weija Dam – Tetegu - Sakaman road (17.6%) (Figure 10). Nurseries varied in size ranging from the smallest (about 127 m^2) to the largest (11,747 m^2) with an average size of 1228.9 m^2. The majority of nurseries (41%) covered up to 500 m^2, and only 14.3% were more than 1700 m^2 (Figure 11). The total space occupied by all 51 nurseries is 62,674.4 m^2 (~6.3 ha). All the nurseries visited were located on government land with no documentation guaranteeing continued use of the land. Respondents, however, pay some form of tax to respective administrative assemblies. Seven different services (landscaping, landscape maintenance, lawn installation, planting, plants supply, pot supply, potted plants supply) were generally offered by the nurseries but the majority of nurseries (59%) offered between 4-6 different services. The most common service offered by all nurseries is plants supply. The majority of respondents self-financed the operations of their nursery (88.4%), with 9.3% relying on loans from friends and 2.3% from family members. The majority of respondents (51%) owned their nursery, whilst 14.3% were in partnership with their spouses, parents, or friends. Nurseries relied on a variety of water sources to irrigate their plants with the most dominant being supply from private vendors (37.5%) and municipal pipe-borne water (35%) (Figure 12). Only a small proportion (5%) relied on sewerage water. About 20% of the nurseries had registered their businesses with the government.

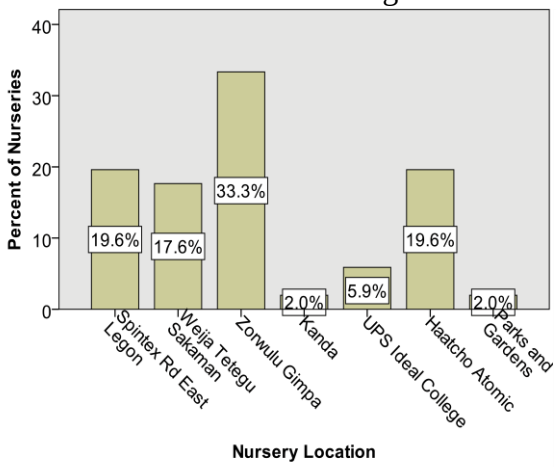

Figure 10. Location of Nurseries

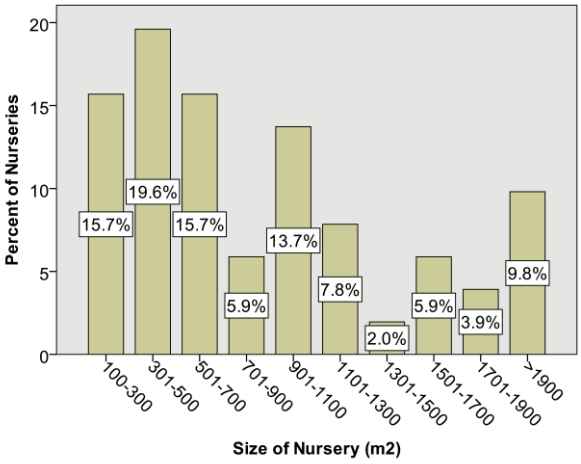

Figure 11. Size Range of Nurseries

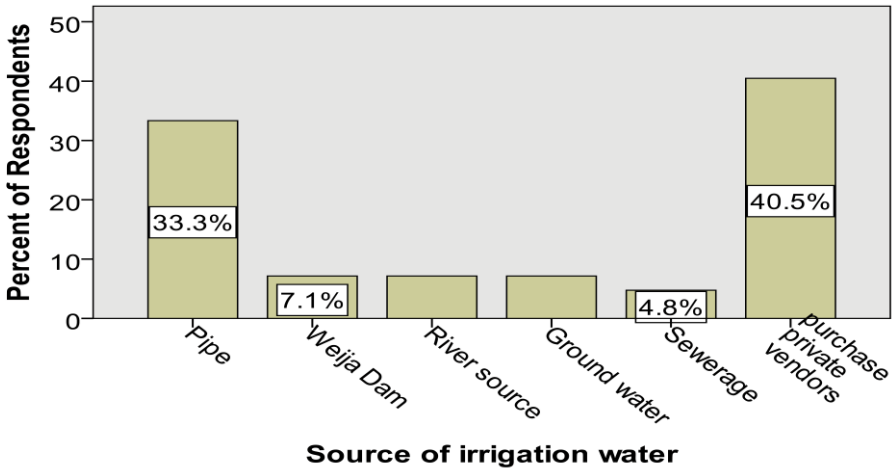

Figure 12. Different Water Sources Used by Horticultural Nurseries

3.7 Correlations

A Pearson correlation (Table 1) showed a weak relationship which was not statistically significant between educational level and years in service (0.028, p=0.845), and educational level and number of dependents (0.106, p=465). There was strong correlation and significant differences between number of dependents and age (0.995, p=0.000), gender (0.996, p=0.000), years in service (0.992, p=0.000) and size of workforce (0.997, p=0.000). Size of workforce was moderately correlated with salary and statistically different (0.463, p=0.001). This means that the smaller the nursery, the smaller the salary with significant differences between nurseries. Salary range was weakly correlated but significantly different from age (0.485, p=0.000), gender (0.481, p=0.000), years of service (0.434, p=0.001) and size of workforce (0.483, p=0.000). There also was a negative and weak correlation which was not statistically significant between nursery ownership and educational level (0.034, p=0.813).

Table 1. Pearson's Correlation Matrix between Some Variables

Correlation Matrix										
	N Loc	N La	Ed Lev	Age	Gen	Y Ser	Work force	Sal	Dep	N Own
N Locat	1									
N Size	.241 .088	1								
Edu Level	-0.008 0.954	0.194 0.176	1							
Age	-0.166	0.279	0.335*	1						
	0.244	0.047	0.017							
Gend	0.171	0.271	0.109	0.993**	1					
	0.230	0.054	0.450	0.000						
Years Serv	-0.176 0.216	0.266 0.059	0.028 0.845	0.993** 0.000	0.984** 0.000	1				
Work force	-0.178 0.212	0.291* 0.038	0.017 0.907	0.993** 0.000	0.998** 0.000	0.988** 0.000				
Salary	-0.196	0.191	0.091	0.485**	0.481**	0.434**	0.483**	1		
	0.168	0.179	0.528	0.000	0.000	0.001	0.000			
Depe	-0.171	0.284*	0.106	0.995**	0.996**	0.992**	0.997**	0.463**	1	
		0.231	0.043	0.465	0.000	0.000	0.000	0.000	0.001	
Nursery Owner	0.304* 0.030	-0.253 0.073	-0.034 0.813	-0.117 0.415	-0.163 0.254	-0.104 0.466	-0.169 0.236	-0.223 0.116	- 0.152 0.288	1
*. Correlation is significant at the 0.05 level (2-tailed).										
**. Correlation is significant at the 0.01 level (2-tailed).										

Note: N Loc – Nursery Location; N La -Nursery Land area; Ed Lev- Educational level; Gen– Gender; Y Ser- Years of Service; Sal-Salary; Dep- Dependents; N Own - Nursery Ownership

4. Discussion

Observations –Starting a nursery at home on a small scale is supported by [15, 16] who noted that it is always best for a nursery to start with a few plants in a small place out of public view, from which the nursery can expand. Respondents worried that despite their years of experience gained in propagation, these experiences are not being documented, and may be lost to the industry at large. An example is the successful use of improvised tunnels to enhance the propagation of some plants with about 90% success (Ms Janet Fosuhene, Personal communication, God is King Horticultural Works. Accra 10/11/2021). The general mistrust shown by managers when asked questions about their finances is not a unique phenomenon but is considered common in private nurseries [15]. The use of pesticides was random and did not follow any laid down rules with pesticide containers

disposed off indiscriminately. The absence of any organized body to spearhead the industry may not help in the growth of the industry as the establishment of such professional associations are critical for the exchange of knowledge and ideas as well as providing a forum for new entrants to learn the skills of the trade [17]. Also the development of standards to guide production, marketing and provision of services to the public is standard practice across the globe [18, 19] and is critical for the advancement of the industry. Plants had not been labeled, neither were they grouped into any organized format but were priced based on size; cost increased with size. Although the cost of plants may vary greatly with species, new introductions from foreign suppliers are usually very pricey but this changes once the plant has lost its initial euphoria. But the absence of any form of standard protocols to guide production in the nursery industry could negatively impact the quality of planting materials produced; a situation which unfortunately may strengthen observations that nurseries in sub-Sahara Africa are not capable of producing high-quality seedlings [20].

Background - The male-female ratio of 1.53:1 follows closely a similar trend in various aspects of the economy in the country including education, where males dominate females to a ratio of 2:1. The drive by the government and various NGOs to change this narrative is yet to see the level of success seen in developed economies. The average age of 38 ±1 for respondents indicates a relatively youthful age compared to the national average of 55 years for farmers [21] which means the industry is an economic field that is very attractive to the youth.

Education among respondents where 50% had up to basic education and 84% had up to secondary school education (with 72.5% completion status) conforms with the generally low literacy level in the country [22]. The tertiary educational level of (6%) among respondents is at par with the 6% for Africa [23]. This trend in education among respondents may be influenced by the generally held but erroneous belief among the population that one does not need high level education to be successful in the environmental horticulture industry [12]. But low level of education is also reflected in other sectors of agriculture as reported by Donkoh *et al*. [21] where rice farmers had an average of only 4.05 years of formal education. Work by Oduro *et al*. [24] involving cocoa farmers showed a similar trend where 52% had up to middle school leaving certificate whilst 21.5% were illiterate. The results showed that only 36% of respondents have a secondary school level of education and this is despite the fact that the research is located within GAMA, an area considered to have the best improvement in secondary education in the country [25]. This though could be attributed to the fact that almost all respondents (97%) had migrated to the study area from other regions to find work and that this might have cost them the opportunity to receive assistance from their local communities to further their education [25].

Basic and secondary education is early level education where students are provided with "merely basic knowledge … through rote memorization of a limited number of subjects" which does not allow students to develop skills in "problem solving, critical thinking" and innovation development [26]. Work by Takyi *et al.* [22] has emphasized that education up to the Junior high school produces students "without any skills" to be able to influence such a vibrant industry. Basic and secondary education together with those who had no formal education made up 90% of respondents. This level of education may not be enough to support a vibrant, innovative knowledge-based nursery industry that is sustainable [27]. Indeed, it may impact negatively on the industry by causing it to under-perform relative to national development goals [22, 28]. Level of education could be used as a measure of influence and impact to advance an industry [26], thus a low level education will mean less impact in terms of technical innovation, ability to transform, and use limited resources effectively to improve productivity [24, 29]. This could negatively impact the drive to expand the industry to reduce poverty and increase productivity by 6%, as projected for sub-Saharan Africa [27]. Indeed, the current thinking among financial institutions favors giving loans to more educated people with higher education who are considered less of a risk compared to the less educated. Thus, a low level

of education will even limit the ability of the industry to attract capital to expand. A low level of education will also affect the development of the landscape industry where various standards of production of ornamental plants for landscaping must be met in addition to varietal development and the ability to develop detailed information on all plants produced for sale to the public. Indeed, as the nursery industry grows with high demand from an increasingly wealthy population there will naturally be a corresponding increased demand for product diversity [16], thus the need to adopt avenues for continued varietal diversity. Over-dependence on foreign sources will kill the local drive to innovate in producing new varieties to drive the industry. The majority of respondents (94.1%) indicated their interest in further education in the area of horticulture and this is important as an investment in higher education promises far higher returns on investment than a basic level or even secondary education will provide [23]. To this, the various Higher Educational Institutions of learning in the country should position themselves to provide "skills development" and training tailored to the needs of the industry. This can be in the form of informal education, short training programs or week-end training programs, radio training programs which could be critical in the development of the next generation of "innovative agents" who will be able to use available technical information to invest and expand the industry [29].

The two main salary clustres of ₵1000/month (₵12,000/annum or about USD $2017.9/annum) and more than ₵3000 per month (₵36,000 or > US$10,089/year) is within range of the average annual salary for farmers in Ghana (₵35,799 or US$5,595) (Farmer | GH | Average Salary Survey 2022). It is however far lower when compared with US$100,000 and over US$1,000,000 reported for more developed economies [30]. This rather wide difference could be attributed to the extent of the activities of the nurseries and their sizes. The nurseries surveyed are extremely small in size, averaging 1228.9 m^2 (0.3037 ac) and rely on a limited window of services, primarily; sale of container grown plants, compared with nurseries in developed economies that operate as garden centers with a wider range of services, combining field growing with container growing over a more extensive area [31]. The data on employment shows the nursery industry has been a reliable source of employment for more than 53% of respondents who earn up to Gh₵1000 per month (US$1,875/year) and above 12% of respondents who earn more than Gh₵3000 per month (> US$5,625/year). Almost half (45%) of correspondents had been operating their nurseries for at least 10 years which is an indirect measure of successful economic performance of the industry. It affirms the industry as a reliable means of employment which is also indicative of a combination of favourable economic conditions allowing urban dwellers to spend extra income on indoor and outdoor plants and landscaping [30, 32]. It is also suggestive of an industry that is expanding and thriving as seen in the fast-growing construction industry [16]. The years in service place the industry as young [30]. The observed >10 years of service provision by 45% of respondents is comparable to the 10 years reported by Florkowski and Landry [30]. It shows that nursery managers are highly experienced and have accumulated knowledge over their working years which could be harnessed to improve productivity as was found by Donkoh *et al*. [21] who worked with rice farmers, most of whom had had more than 10 years of working experience. The employment of 4-6 people by 33 percent of the nurseries is similar to figures quoted by Florkowski and Landry [30], but that notwithstanding, the majority of nurseries (61.5%) had a small (1-3) workforce. This could be attributed to the negative impact of the COVID-19 pandemic, which impacted most parts of the economy including the built industry in which nurseries play a critical role.

The location of nurseries along major roads and communication lanes confirms similar findings by [9] in other African countries. Nursery sizes averaged 1228.9m^2 (0.3ac), and are considered small as they are less than 5 acres [31]. The small size of nurseries may be because they are container based and this production system is considered the most popular, making up about 80% of all nurseries and generating 10 times more sales than bare-rooted systems [31]. It also requires small land sizes to

operate compared with bare-rooted systems of production because the containers can be arranged to achieve high densities and can be adapted to marginalized land considered too poor for agricultural purposes [31, 33]. The high percentage of respondents (84%) who had started their nurseries using their own resources is collaborated by [17] who indicated that "most nurseries" are "started with no money". This also suggests a heavy reliance of the sector on informal sources of credit [34]. Although this could be a plus to encourage more start-ups as one does not need to worry about capital to start a nursery, it echoes the challenge of poor access to finance to expand agricultural enterprises in most developing countries [35]. Indeed, a number of respondents confided that they could be doing far better in terms of employing more people if they could get financial assistance, especially for infrastructure development and land acquisition. Poor access to finance for small scale businesses such as nurseries though is not limited to developing countries, indeed research has shown that interest rates given to large firms is far lower (7%) even in developed countries, compared to small scale enterprises (10-12%), the premise being that such enterprises have a far higher risk of failure [4]. Relying on sister nurseries and friends to obtain planting materials for multiplication is a common practice among nursery operators [2]. To introduce variety into their collections, nursery operators relied on third parties who import the plants from other African countries and Europe and sell them directly to nurseries at very high prices. Also occasional exhibitions organized by members of the association and various collaborators were the main means to replenish their stocks with new plants. This approach though may not be sustainable for an industry that is seeking to expand its plant resource base. Rather, nurseries could adopt other sources of plant supply such as hunting germplasm collections for wild-growing plants of ornamental value [2]. Indeed, the selection and cultivation of promising species from wild populations and the development of breeding programs to improve existing cultivars to help reduce dependence on foreign introduced materials as well as help conserve biodiversity in an era of fast-depleting biodiversity resources could be a more viable approach [2, 4, 15]. The services provided by the nurseries surveyed, which is basically container-based plant supply could be expanded to include field-based system of production in addition to supply of hardware and materials such as basic garden tools, seeds, potting and bagging materials, mulches, fertilizers, garden aides like plant stakes, trellis wires, among others as a means to expand the industry to operate as garden centers [36]. Harvesting and storage of rainwater for functional use in ponds and dams is being promoted as one of the means for storm-water management and this could be very beneficial to nurseries especially as over 87% rely on municipal water sources, private sources, streams and groundwater which are expensive and highly unreliable especially during the harmathan dry season. Nurseries go through a shock period during the dry season when the drying effect of the harmathan winds makes operating a nursery nearly impossible without a reliable source of water.

5. Conclusion

The nurseries are not guided by any form of standards and this could affect the quality of materials produced by the nurseries. The educational level of nursery managers and attendants is very low with about 84% having only up to secondary education. This has adverse implications on the industry's ability to attract funding, be innovative, expand, ensure varietal diversity and develop standards for production. An investment in training and further education will be the best option for the industry as was afirmed by about 94% of respondents.

Nurseries were established on very small plots of land ranging from 127 m^2 to 11747 m^2, the average being 1228.9 m^2. Nurseries by their activites can enhance the green infrastructure base of communities but this they can achieve if they are given larger tracts of land to operate on within the urban setting.

Nurseries were self financed by 88.4% of respondents whilst only 11.6% started with a loan,

showing low capital mobilization.

The industry is attractive to the youth as the average age of respondents was 38±1 compared with the national average of 55 for agricultural workers and this combined with the low capital mobilization could make it a good start-up to reduce unemployment.

Correlation analysis showed that level of education did not impact salary, the size of nursery, number of dependants supported by respondents and size of the workforce.

Implications and applications of these findings – the findings of this research could inform policy on how nurseries could be developed to impact green infrastructure development in urban areas. The findings provide grounds to support youth employment by facilitating the development of the nurseries. It also shows the education gap which must be filled if the industry is to achieve its full potential. Over reliance of exotic species to replinish nursery stock will not help develop local varieties of plant species which are of ornamental value. The research provides a baseline information upon which to do further studies on how nurseries as an important subsector of the horticulture industry can be enhanced to impact development. The limitation of this research is that it was not extensive enough to cover all nurseries within the research area, however the researcher is of the view that the observed trend may not be too different.

Acknowledgement

This project was made possible through the annual research grant to lecturers in public universities received from the government of Ghana and I am exceedingly grateful for the government's continuous support for research.

Authors Contribution

The author initiated and developed the research, collected data, and processed and analyzed the data as well as the preparation of the manuscript.

Data Availability

Data on the research will be made available upon request; however, boundary data can only be made available upon direct request to the responsible government agency.

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