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Report from Theme 2 -
Multifunctional landscapes for
increased food security

Transforming urban idle spaces into green, productive and aesthetic landscapes

The case of Cape Coast, Ghana

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Today more than 800 million people around the world suffer from chronic hunger and about 2 billion from under-nutrition.

This failure by humanity is challenged in UN Sustainable Development Goal (SDG) 2: "End hunger, achieve food security and improve nutrition and promote sustainable agriculture".

The AgriFoSe2030 program directly targets SDG 2 in low-income countries by translating state-of-the-art science into clear, relevant insights that can be used to inform better practices and policies for smallholders.

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Agriculture for Food Security 2030

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Summary

There are several idle lots and spaces in cities and towns in Ghana due to poor land use and physical planning as well as pressure for privately-built, low density residential houses. This project tested the idea of using idle, unmanaged urban spaces in Cape Coast to produce multiple ecosystem services in the context of multifunctional land use: food, landscape beautification, income, and environmental protection.

Two sites which were bushy and seemingly used for nefarious activities were transformed into greenhouse vegetable production. The greenhouse project generated short term jobs for eight young people of equal gender distribution, and one additional person produced vegetables on a portion of vacant, backyard residential lot in an urban residential area. Premium quality tomatoes were harvested from the greenhouse production, while garden eggs and pepper were harvested from the outdoor production. Production outputs were either sold to nearby eateries and residents, or used by the project members as subsistence. The landscaped spaces around the greenhouses attracted families nearby to bring their children to play in the area while curiously learning about the crop production in the greenhouse. Thus, the project provided greenspace and opportunity for active living and learning for children and families in their neighbourhood on a lot that was previously unused and inaccessible. The project was also visited by the AgriCorps team (USA) who found it promising and worthy of up- and out-scaling.

A highly successful dissemination event brought together stakeholders (local farmers, representatives from the vegetable group of market women association of Cape Coast, Regional and Metropolitan Agricultural Offices, media, academia, local chiefs and opinion leaders, and the general public) who were very impressed by the project. Some were even motivated to start their own production on idle spaces around their homes. The media also showed large interest for the project. Key lessons learned include (i) the need to formalize access to and use of vacant, idle, unmanaged urban spaces for such multifunctional land use purposes, (ii) accurate timing of first production cycle for the dry season to fetch premium price for the produce, (iii) establishing stable markets for the produce, trialling and using different crops to understand what works best and to reduce risks, and (iv) continuous engagement of stakeholders to sustain interest in the projects. Overall, edible urban landscapes could provide food, jobs, beautiful landscapes, environmental protection, and greenspace for active living in cities and towns.

Front picture: Female urban farmer produces garden eggs from idle urban space. Photo: David O. Yawson

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Project Background

The Problem

Two major dimensions of food security are availability of and access to food. These directly relate to production and physical and economic access to food at local level. It is estimated that about 5% of Ghana's population are food insecure and around 2 million people are at risk of becoming so (Darfour and Rosentrater, 2016). Meanwhile, about 24% of Ghana's population live below the poverty line, and urban poverty is rising sharply. The direct link between poverty and food insecurity means that Ghana's poorest regions are also the most food insecure regions (Adu et al., 2018). The Central Region is the 4th poorest region in Ghana and food insecurity abounds in both urban and rural settings (Kuwornu et al., 2013). Increases in biofuel production in the rural forest belt of the Central Region could compete with crop production for resources and thereby exacerbate food insecurity (Kuwornu et al., 2013), especially in the urban areas which largely rely on rural food supplies.

Food production in urban centres can help highlight and address food insecurity and poverty within the urban setting. With poor land use and physical planning, access to land for food production in urban areas in Ghana is a challenge. However, there are several parcels of land in the urban landscape that are either not productively used or are highly degraded. Largely, these lands are weedy, providing spaces for dumping of waste, open defecation, criminal activities or other uses that detract from the aesthetics of the landscape. These parcels of lands are both publicly and privately owned, and in a few cases, the lands are used by squatters or migrants for farming.

There is a pressing need to sustainably manage and use these open spaces in the urban landscape. Urban agriculture and greening are options that can positively impact urban food security, landscape aesthetics, local economic development, environmental management and community building. In the context of multi-functional land use, using such spaces for food production and greening the landscape would amount to edible landscape. Edible landscapes, as conceived here, can potentially provide food, jobs, incomes and even recreational space in urban areas, and thereby support efforts in Ghana for attaining food security.

The Aim

The edible landscapes project sought to test an idea of greening, actively managing and using idle urban spaces to produce vegetables and green landscapes, using greenhouse and open fields. The project sought to demonstrate to policy and decision makers and the general public, that idle spaces, including unmanaged communal or government-owned lands, such as semi-natural areas that resemble parks, family- and private-owned lands, in the urban landscape could be put to productive uses. At least until land owners are ready to develop their lands. In this context, there could be short-, medium- and long-term arrangements regarding tenure, production, and use or disposal of outputs (e.g. commercial or subsistence) depending on land size, ownership and allowable period of use. The project proposed to test an idea that mobilizes regulations, policies and practices to enable productive use and active management of idle urban spaces to serve multifunctional purposes in the urban landscape.

Approach and Design

The project was initiated in Cape Coast (located at latitude 5°11'N and longitude 1°19'W), the Capital of the Cape Coast Metropolitan Authority and the Central Region of Ghana (see Figure 1 below). Cape Coast is a coastal city with a population of 169,894 people (2010 Housing and Population Census) but

current population is approaching 250,000 people. The city of Cape Coast comprises over ten principal settlements or communities, including the University of Cape Coast and its surrounding settlements of Akotokyer, Amamoma, Apewosika-Kokwaado, and Kwaprow.

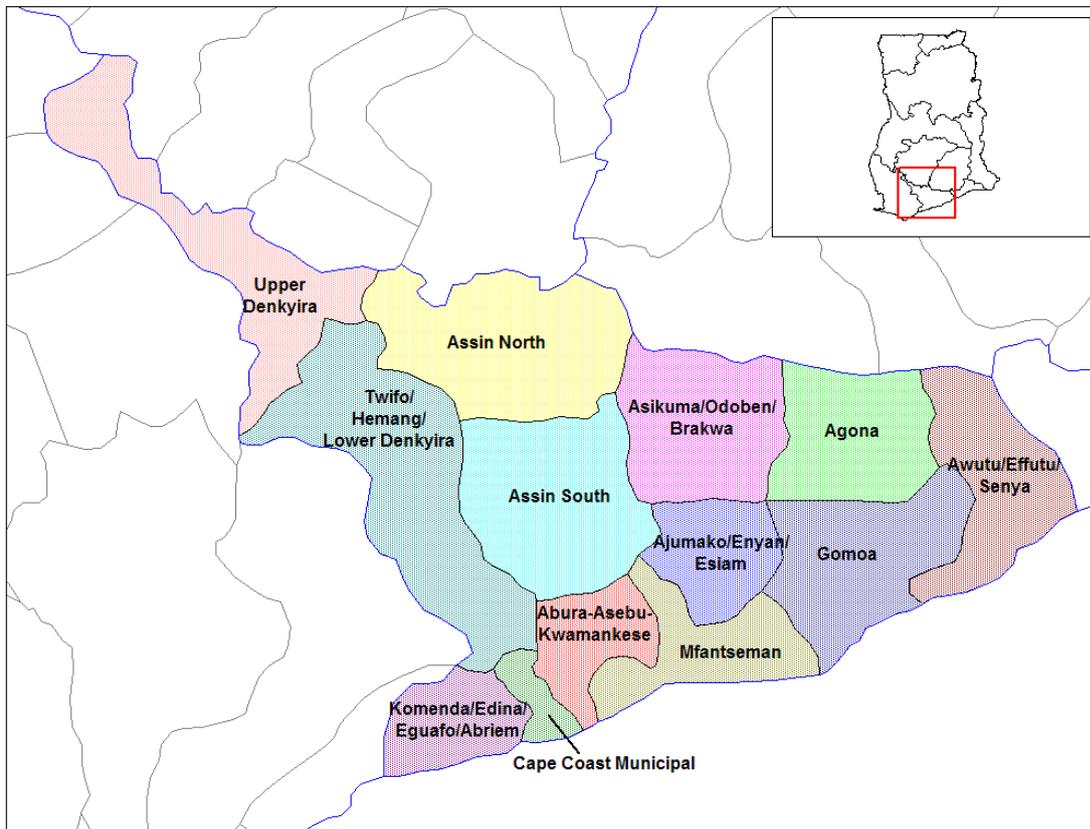


Figure 1: District map of the Central Region of Ghana, showing the Cape Coast Metropolitan area

Based on the proposal, vacant spaces belonging to the local authority, private owners, and other public bodies were identified and targeted for negotiation to secure permission for use for the project. This assessment was based on ground reconnaissance visit by the researchers and there has been no study quantifying open spaces amenable to urban farms or edible urban landscapes in Cape Coast. In these spaces, ranging from single residential plots of around 100 x 100 square feet to multiples of these, the agreement was to install greenhouses measuring 9 x 15 m that were bought from Dizengoff Ghana Ltd., (<http://dizengoffgh.com/>), to produce vegetables. The areas surrounding the greenhouses were to be covered with grasses and other ornamental plants to maintain landscape aesthetics, reduce land degradation and produce food for those involved in the project and for sale to local consumers and eateries. Apart from the greenhouse-production, the project also incorporated outdoor production of vegetables on vacant residential lots. The non-greenhouse production was mainly for subsistence purposes but surplus could be sold for income. The project started with two greenhouses to demonstrate the idea to policy and decision makers, as well as the general public.

Through consultation with the local communities, eight community members between the ages of 19 and 26 years, comprising equal number of male and females, were recruited and trained for the vegetable production in the greenhouses and the maintenance of the landscape around the greenhouses. In addition, one urban farmer was recruited to the project and given financial and technical support to produce vegetables in an open space (non-greenhouse) within the community and to manage idle areas surrounding the garden. Details of the implementation are set out below.

Project Execution

The Project Site

Securing land for the project was hampered by uncertainty regarding tenure, safety and additional costs. Land owners had fears about their ability to reclaim or have recourse to their lands on time without litigation or conflict. The co-development of agreements or contract executable in courts did not help much to ease this constraint due to the protracted and expensive nature of court cases. Since the production of vegetables in the greenhouse requires watering or irrigation, access to reliable supply of water was a key consideration. However, due to preponderance of conflicts around payments of water bills by multiple users of the same water meter, assuring account holders of water meters that the project was prepared to take up the cost of water did not fully convince some land owners. Security of the greenhouses, especially to prevent theft near harvest time, also became a concern. This was addressed by using high security padlocks to lock the greenhouses at night and when workers were not on site. Balancing all these considerations and uncertainties, eventually, two suitable sites in Kwapro and Akotokyir townships, near the University of Cape Coast, were leased to the project team for the project. The proximity of the sites to the University of Cape Coast also made the monitoring of the project easier. Both lands (Figure 2A and B) were unused, bushy parcels of land between high- and low-density residential flats. The sites were ploughed and harrowed (Figure 3A and B) by 03/05/2018 to allow the installation of the greenhouses.



Figure 2: Site acquired for the siting of the two greenhouses (A): site at Kwapro town and (B) site at Akotokyir town.



Figure 3: Prepared lands at (A) Kwapro and (B) Akotokyir, ready for greenhouse installation.

Recruitment and Training of Local Farmers

One greenhouse was installed on each site after land preparation (Figure 4). Eight youth of equal gender distribution were recruited from the Kwapro and Akotokyir communities to work in the greenhouses. The recruits were trained by both the project team and officials from Dizengoff Ghana on the production routines and management of the greenhouses. Four of these recruits were either local urban farmers or had previous experience in (urban) farming. The others were fresh graduates from Agricultural Sciences, and currently unemployed. Due to delays in the project financing and therefore procurement of facilities, the production coincided with the rainy season. In Ghana, the rainy season often comes with low prices of vegetables since most vegetable farmers produce under rain-fed conditions and diversify into other areas during the dry seasons. During the rainy season, supply thus exceeds demand compared to shortages during dry season when few farmers are able to produce vegetables with irrigation. Given challenges with low market prices, the original idea of having recruits for the project working pro bono had to be modified to accommodate the recruits' demands and prevent further delay of the project. In agreement, workers were given a flat monthly payment for the duration of the project.



Figure 4: Installed greenhouses at the two sites. Insert is a signage of the project details erected at both sites

Vegetable Production in the Greenhouses

Installation of the greenhouses was completed in late June 2018 (Figure 4) and Eva Purple Ball tomato seeds, bought from Dizengorff Ghana Ltd. as part of the greenhouse production package, were nursed

and transplanted (Figure 5). According to the supplier, the potential yield of the Eva purple tomato in a greenhouse is 2000 kg per production cycle. The agronomic practices recommended by Dizengoff Ghana were strictly followed in the production, involving minimal use of pesticides. The guiding principle was an “integrated production and protection” (IPP) approach that links the production practices with plant protection practices to minimize use of pesticides and make the production environmentally sustainable. The plants grew well without serious pest and disease incidences during the development. Nonetheless, limited incidences of blossom end rot were observed. This was curtailed with the application of a liquid calcium fertilizer bought from Dizengorff as part of the greenhouse production package. Figures 6 and 7 show the development of the crop during various growth stages.



Figure 5: Greenhouses ready to receive seedlings and transplanting in session in one of the greenhouses



Figure 6: The tomato plants during vegetative and anthesis growth stages in the greenhouses.



Figure 7: The tomato plants during fruiting and ripening stages of growth in the greenhouses.

Greening of Spaces Around the Greenhouses

Grasses and border/hedge plants were planted in the spaces around the greenhouses (Figure 8). These were generally part of our integrated preventive environmental strategy of ensuring protection of the surrounding environment of the greenhouses, reducing environmental degradation by ensuring soil cover and increasing ecosystem services, such as landscape aesthetics, erosion control and prevention of vermin or nefarious acts in the area. The idea of the project was to maintain landscape or urban aesthetics while producing food. In this way, food production and basic landscaping as practiced in Ghana's urban areas are integrated to deliver multiple ecosystem services in consonance with multi-functional land use goals. Hence, the grasses and border/hedge plants were maintained to ensure the aesthetics of the landscape and the general environment for the vegetable production. The hedges and grasses were irrigated twice daily during periods of no rainfall, using water from taps in the greenhouses which required a huge quantity of water. This was necessary as Cape Coast lies in the Coastal Savannah agro-ecological zone with limited rainfall. Due to the short lifespan of the project, we limited ourselves to the grasses and border plants or shrubs, but fruit trees could be incorporated in an up-scaled model to provide even more produce to the project as well as erosion control. The grassed spaces attracted families nearby to bring their children to play in the area while, curiously, learning about the crop production in the greenhouse. Thus, the project provided greenspace and opportunity for active

living and learning for children and families that would otherwise avoid the area due to dangerous creatures like snakes and pollution in their own neighbourhoods.



Figure 8: Grasses and hedges to green the spaces around the greenhouses for aesthetics

Sale of Tomatoes Produced from the Greenhouses

Greenhouse production offers an opportunity to produce marketable tomatoes all year round, including lean seasons. However, greenhouse tomatoes must be sold for a higher price per unit than field-grown tomatoes to justify the higher production costs and quality of the produce. This was one of the challenges faced in marketing our produce. Local consumers, eateries and hospitality outlets were unwilling to pay a higher price, GH¢10 per kilogram of tomatoes (approximately, US\$2 kg⁻¹ of tomatoes), although acknowledging the premium quality of our produce. The outlets were also concerned about the sustainability of our supply and needed guarantee of all-year-round supply to shift from their regular suppliers to us before they would commit to paying the premium price. That meant we had to be in production for some time for them to be certain of supplies. However, since our harvest coincided with the rainy season and supply exceeded demand, prices were drawn down. A compromise was reached to reduce our unit price in order to sell the produce to the local community and some market women. This was also necessitated by the need to reduce losses due to the synchronous ripening of the tomatoes and their high perishability. Eventually, the sale at GH¢5.00 kg⁻¹ adversely impacted the expected revenue. However, we believe that continuous production (2-3 cycles per year) could offset revenue gaps in the first year. The quality of the tomatoes could fetch premium prices during the lean season when market women, users in the hospitality industry, and local home consumers have little choice due to much lower supply compared to demand.

Moreover, there was a huge gap in revenue between stated production potential (i.e. 2000 kg per greenhouse per production cycle) and observed yield of approximately 400 kg per greenhouse per cycle. Reasons for this gap cannot be readily established but we believe that it was due to inexperience of the staff in greenhouse tomato production and untimely support from the greenhouse providers. This notwithstanding, it could also be an overestimation of the greenhouse production potential by the greenhouse providers. Fewer number of fruiting episodes were recorded by the plants in our

greenhouses. The plants recorded only one cycle of fruiting in the greenhouses but normally tomato plants should record multiple fruiting cycles during its lifespan. Under the directive of Dizengorff, the greenhouse attendants pruned off all offshoots, leaving only the main vines of the plant during the reproductive stage of the growth. It however appears that second episode of fruiting were going to emanate from new offshoots of the vines and therefore pruning all the new shoots curtailed new flower development. While pruning is a recommended practice in tomato production, our experiences suggest this must be done prudently and studied further for the variety or genotype being supplied with the greenhouses. It is also crucial that multiple trials are conducted under different spatio-temporal conditions to authenticate the potential yield stated by the supplier of the greenhouse kit.

Production in Open Urban Spaces (Non-Greenhouse Urban Vegetable Production)

Another part of the project was to produce vegetables in open urban spaces. After considerable efforts, one person was willing to produce vegetables without salary on an unused land without greenhouses. Inputs and other basic farm tools were provided for this farmer and she was trained to produce eggplant and pepper both on land and in pots, on a portion of a vacant residential lot in the farmer's backyard (Figure 9). The project team struggled to recruit additional urban farmers to enrol for the project and realized that urban farmers normally shift to arable production, cultivating crops such as maize and cassava on farm-lands located elsewhere while minimizing urban vegetable production during the rainy season. The farmers return to the urban lands during the dry season to produce the vegetables under irrigation (with water from sources such as wastewater, tap water, and wells), at which time they expect higher prices for their produce due to low supplies from the rural areas. However, this backyard production was so successful that neighbours were highly impressed and surprised about the quantity of vegetable that could be produced from such a small space. Participants in the public engagement (dissemination forum) were also highly impressed and some were surprised to note how much could be produced to generate food, save money and potentially earn extra money from a small piece of idle land. Some became so interested that they confessed their decision to produce their own vegetables on idle lands near their homes. If this is widely taken up, it could contribute immensely to household food security and potentially entire urban areas.



Figure 9: Eggplant and hot pepper production in a residential community in Cape Coast by an urban farmer.

Dissemination (Public Engagement) Forum

On Thursday, 6th September 2018, a public engagement event was held at the project sites to present the project to the public and stakeholders (Figure 9) and was well attended by representatives of stakeholder groups, about 50 participants for both sites. After given a tour in the greenhouses, the participants, consisting of authority officers, residents, staff and students from the University of Cape Coast as well as vegetable sellers, farmers and media, were unanimous in accepting the concept, indicating that the community could benefit enormously from the initiative, particularly jobs and availability of quality vegetables. They were also extremely happy about the idea of the landscaping which had not been given priority consideration in urban planning or management. Participants suggested that this should be part of urban agriculture and physical planning due to the environmental and health benefits. Participants who had earlier visited the sites with their children or family and used them as playgrounds emphasized the importance of such integration of food production and landscaping to produce multiple services and benefits not only for the producers but also the community.

Participants however raised concerns about the cost involved in obtaining and operating the greenhouse. It was agreed that the greenhouse production could be a component of a diversified portfolio or suite of production approaches and not the only one. A participant from the Regional Office of the Ministry of Food and Agriculture (MoFA) indicated that the Ministry (MoFA) had previously supplied greenhouses to some farmers in the region but the facilities had been abandoned. This was attributed to farmers' inadequate knowledge and training in producing crops in greenhouses and the relative high cost of producing vegetables in greenhouses compared to unwillingness of locals to pay premium prices, especially during the rainy season. Participants came to the conclusion that these issues could be overcome through production-contracts with hotels, restaurants, and supermarkets, which could be facilitated by the central government or metropolitan authority.

Several issues were identified as important in the set-up and maintenance of the greenhouse production:

- i) Training, support and encouragement, with favourable terms of repayment of capital cost, would help overcome the challenges. For example, allowing farmers to learn and stabilize the greenhouse production in the first year and start capital cost repayment in the second year could be transformational. The project team, through self-learning, could and is willing to contribute and support these training and management activities, for example through workshops.
- ii) Issues regarding land acquisition and tenure were raised and discussed, with the agreement that formal channels of access to the vacant, idle lands in urban spaces would play a catalytic role by securing both tenants and landlords. We realized through this project that some landlords would take a token for use of the land, others would want compensation dictated by them, but the majority felt insecure about getting their lands back when they are ready to develop, regardless of written agreement between the two parties. In this project, all lands were leased on trust with a token fee.
- iii) While central governments could offer subsidies in purchasing the greenhouse facilities, farmers could also come together to form farmer groups or associations in order to purchase these packages. Meanwhile, the prospects of planned production of vegetables in open spaces lying idle within the urban landscape was stressed.
- iv) Participants noted that it would be easier to site such projects on unused communal lands or government lands because obtaining unused private lands would be too difficult.

The main agreement from the discussion was trust between government representatives and prospective users of such communal or government lands and the removal of considerations based on affiliations with political parties from the allocation and use of public lands. Some radio stations that attended the programme, including Radio Central, the regional radio station for the Ghana Broadcasting Corporation (GBC) subsequently invited the project team to their studios for a prime-time radio interview session to offer further insights about the project idea and implementation. The public demonstration/stakeholder event was carried by a number of online news platforms including the University of Coast public affairs section (<https://www.ucc.edu.gh/news/ucc-researchers-introduce-stakeholders-greenhouse-technology>) and Myjoyonline, the online news section of Joy FM, one of the media outlets in Ghana (<https://www.myjoyonline.com/news/2018/september-13th/ucc-pilots-edible-urban-landscape-in-cape-coast.php>).



Figure 10: A cross section of participants during the public demonstration/stakeholder engagement

Willingness-to-Accept Survey

The project adopted the willingness to accept (WTA) method to estimate the degree to which plot owners, city authorities and the general public would accept the edible urban landscape concept as part of their urban scenery. The WTA exercise was to explore the regulatory, policy and practical requirements for replicating, expanding and sustaining this idea across the entire city and for out-scaling. Structured survey questionnaire (Appendix 1) on Willingness-to-Accept multifunctional land use in urban neighbourhoods was developed and administered within two districts in the Central Region (i.e.: The Cape Coast Metropolis and the Komenda Edina, Eguafo Abirem District, or KEEA). The questionnaire elicited information from respondents on land ownership and land management decisions, willingness to accept urban agriculture in their neighbourhoods, the perceived benefits of multifunctional land use, opinions on urban agriculture, environment and land use, factors that influence the growing of food in an urban landscape, among others. The aim was to estimate the degree to which plot owners, city authorities and the general public would accept the incorporation of the idea of edible urban landscape as part of their urban space. This survey was done concurrently with the production aspect of the project; so respondents were unaware of the project results although they would become aware later through

the public engagement phase. Approximately 500 respondents were targeted in the WTA survey and this report present only a brief overview of the results.

Overview of Results from the Willingness-to-Accept Survey with Regard to Land Allocation

Annex 1 compares the responses of residents in the two districts regarding ownership and support for multifunctional land use. Even though both districts are urban, the heterogeneities in the responses indicate that the decision of respondents to support or adopt multifunctional land use is complex. Based on Cramer's V statistic (i.e., $V > 0.3$), strong associations exist between the district where respondents reside and their decision to support any media campaign, support financially, rent their land for crop production and voluntarily convince their neighbours to embrace multifunctional land use. With regard to land ownership, respondents in the Komenda Edina Eguafu Abirem (KEEA) District had much larger share of communal and government lands as opposed to Cape Coast Metro where private ownership was predominant. This suggests that there could be more public lands in KEEA for such multi-functional land use projects than in Cape Coast Metro.

However, Cape Coast is over-represented in all sub-groups of willingness to forfeit present benefits (tangible or intangible), willingness to give all lands for free as well as access to sufficient information about the concept of multifunctional land use. The higher willingness in Cape Coast to embrace multifunctional land use at the expense of present benefits from current land use suggests that land owners might be willing to use their own land for such projects assuming they become more informed and benefits are larger or accrue to the wider community. However, the high indication of willingness to give land for multifunctional use seems contrary to our experience with the current project in which land owners were reluctant or uncomfortable to give their idle lands for the project even with the assurance of written agreements executable in courts. This reflects a situation where survey responses are at variance with reality. The distribution of respondents who strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree or strongly agree was mixed for all other variables. Annex 2 shows the distribution of the level of willingness to accept multifunctional land use and associated issues.

For the pooled data, nature of land ownership or land tenure (e.g. whether the respondent owns the land, leases or rent the land from public or private owner, occupies the land as a family member, and whether the land is registered or not) was the only variable that was not significantly associated with the level of willingness of respondents to accept multifunctional land use. Land tenure is known to be a major determinant of farmers' adoption of new technology or ideas, as well as willingness to invest in production. The observation in the current study that willingness to accept multifunctional land use is not significantly associated with land tenure or ownership suggests that prospecting for land for future projects should consider all types of land ownership, which could make the process cumbersome. That is, overall, land may or may not be obtained under any form of land ownership. This then reinforces the point made earlier that formalizing the acquisition of potential land for multifunctional land use projects would be appropriate to ease the process and secure both landlords and tenants.

Figure 11A – 11E show land under crop cultivation presently, land used for animal feed cultivation or grazing, land used for housing, land for tree planting, and land used for flowers and horticulture, respectively, based on responses from the survey. It is evident that the proportion of respondents who said "no" decreased as land size currently under crop cultivation increased, suggesting that the larger land under current crop cultivation, the larger the willingness to accept multifunctional land use for edible urban landscape. It is probable that respondents with large land sizes felt they could allocate a portion for multifunctional projects, while those with smaller land sizes could feel the need to either secure more land parcels or concentrate their activities on what they currently have. As asset (land in this case) increases, it is easier to allocate or invest a fraction of it in other ventures. Hence, the association between the level of willingness to accept multifunctional land use activities or projects and larger land size could be a reflection of the need to diversify, try something new, or probably just contribute to communal development without fearing so much the impact of a potential loss. For all categories of land size currently under crop cultivation, the proportion of "yes" responses was higher except for land size up to 1 plot (a standard plot size is 80 x 100 ft). Fewer respondents used land for animal feed cultivation

or grazing than those who did not. Similarly, fewer respondents used land for tree planting or horticulture than those who did not. However, the proportion of responses on use of land for housing was mixed.

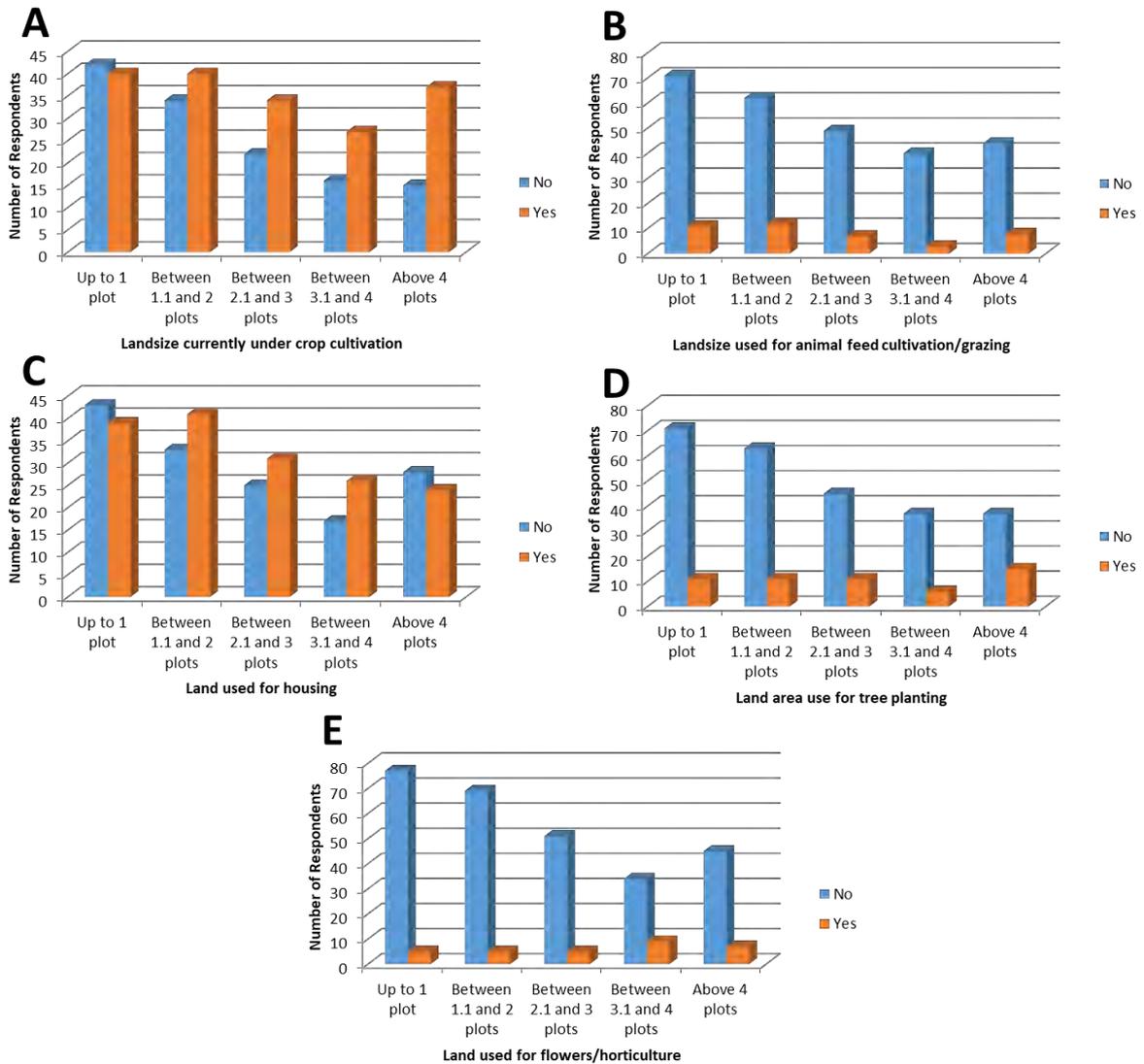


Figure 11: Current land sizes under (A) crop cultivation; (B) animal feed cultivation or grazing; (C) housing; (D) tree planting; and (E) flowers and horticulture (1 plot ~ 80 x 100 ft).

Project Successes

- Vacant, idle spaces in urban areas were successfully secured and transformed to produce multiple functions or services: vegetable production, landscape beautification, limit environmental pollution, protect soil, and provide income to young people and recreational space for neighbouring residents. This was due largely to the determination and enthusiasm of the project team to pilot the edible landscape idea, which indicates the need for a 'champion' and also for future sustainability of the land use.
- The project deepened the interest of the School of Agriculture (University of Cape Coast) to secure and use greenhouses from Dizengorff Ghana for teaching and research. The School had earlier contemplated securing the greenhouse facility but had not taken steps until this project started.

- Steps have been taken to successfully transfer the greenhouses to the School of Agriculture (University of Cape Coast) for sustained production and maintenance, adding to the assets and enlarging teaching and research opportunities and capabilities of the School of Agriculture.
- The project provided short term paid jobs and work experiences for eight youths (four males and four females, between the ages of 19 and 26 years) for approximately seven months. These were recruited and trained to manage the greenhouses and the surrounding landscapes. They were enthusiastic about the project and excited about the new experience and skill to be acquired and that motivated them throughout the project lifespan.
- With the support of the project, an urban backyard that lied idle was successfully used to produce pepper and garden eggs which won the admiration of the neighbourhood and participants in the public engagement event. Some expressed interest in starting backyard gardening.
- The project demonstrated the possibility of successfully producing premium quality tomatoes (and for that matter other vegetables or crops) in urban spaces which are hitherto idle, unmanaged and unkempt, detracting from urban beauty and posing environmental, health and social hazards to nearby residents.
- The transformation of these idle urban spaces into aesthetic spaces demonstrated the huge potential of out-scaling the edible landscape idea across the city and the country. Those living near the project sites were happy about the landscape transformation and maintenance. The landscaped surfaces attracted families in the neighbourhoods to visit the sites with children to play and learn about the production in the greenhouses.
- Successful collection and analysis of data on the willingness of urban residents and stakeholders to accept the edible landscape idea in the context of multifunctional land use in the urban space. This has been aided by the project team's enthusiasm to further understand the perspectives of stakeholders as a basis for future engagement on multifunctional landscapes.
- Stakeholder engagement successfully held to disseminate the project and demonstrate the idea to a wide range of stakeholders, in addition to an open discussion on the pathways for scaling out the project across the city, the region, and the country.
- Greenhouses are currently available for continuous production and for experiential agricultural education and training to the local community and the University of Cape Coast.
- At least, two community members have initiated vegetable production on idle lands in their neighbourhoods following the stakeholder engagement.
- The project was listed and visited by an AgriCorps team from the USA who were excited about the project and found it valuable for Ghana and developing countries.

Unexpected Events/Challenges

The following events/challenges delayed or adversely affected the project:

- In spite of oral assurances prior to securing project funds, and expressed willingness for contract and payment of compensation, land owners felt insecure releasing land for the project. Public lands had cumbersome, unclear procedure for acquisition.
- Considerations of access to water for irrigation and presumed associated utility bills presented a challenge to site selection and land acquisition. This indicates that unconstrained access to reliable source of water supply should be a major consideration in future site selection for greenhouse production.
- We learnt that crop theft in urban farms was a real danger, so physical security of the greenhouse and the crops, especially nearing harvest time, had to be factored into selection of sites.

- Difficulty in recruiting local farmers to work in the greenhouses and in the open fields during the rainy season, resulting in the need to adjust project plans and budget.
- There were both yield and revenue gaps from the greenhouse production. The actual yield was below the yield stated by the supplier of the greenhouse package. This could be due to our first-time experience with the facility.
- The need to sell the produce below target or profitable price due mainly to the coincidence of harvest during the rainy season, and the uncertainty of restaurants and hotels regarding our ability to maintain year-round supply and over a long time period. Locals had alternative due to large availability of tomatoes from rainy season harvest (especially from rural farmers).

Lessons Learned

The project demonstrated the idea and scope for edible urban landscapes in Ghana. It highlights benefits, opportunities and challenges of implementing edible landscapes in Ghana. It has shown that there is huge potential for green transformation of urban idle spaces through food production and landscaping to provide jobs, contribute to food security and environmental sustainability goals. Through the project, the social, legal, economic, and ecological constraints to edible urban landscapes have been revealed. The lessons learnt and considerations for future designs are presented below.

Formalize or institutionalize access to and use of idle spaces: Firstly, there is no easy access to idle urban spaces for a project of this nature due to insecurities among landowners. There is the need for institutional framework that guarantees and protects the access to, use and maintenance of such urban spaces for food production and aesthetic landscaping. Such a framework ought to afford landowners the security of their land and assure ease of repossessing their land when the need arises. In this way, considerable idle spaces can be freed to provide food, jobs and beautiful landscapes in the urban spaces. Apart from policy and regulatory mechanisms, incentives such as tax breaks, waiving of some costs associated with land administration (e.g. land registration, building permit, property rate), share cropping or sharing of revenue from produce in an agreed proportion, and formal public protection of landowner's interests from an institutional framework, can go a long way in helping ease use and green transformation of idle parcels in the urban space. The stakeholder forum agreed on the need for urban planning and land management to recognize the adverse impact of idle spaces on urban productivity and wellbeing, and therefore make provisions to limit the prevalence of idle, unmanaged, unkempt spaces as it is now. Future projects should formally secure the land before proceeding with project planning. It is important to emphasize the temporary nature of such projects while finding innovative ways to incentivize and protect the tenure of prospective farmers. This problem can be addressed through a formal or institutional channel that can establish time-bound contracts between farmers and land owners to give security to both parties and use of a mix of production portfolios that match the circumstance of land ownership, size and period offered for use.

Disrupt seasonality and diversify production systems to reduce risks: The impact of seasonal nature of urban vegetable production was learnt at first hand. The low price for vegetables during the rainy season harvest discourages urban vegetable farmers from rainy season production. Hence, an effort to implement edible urban landscape on a large scale should consider a production scheme that incentivizes farmers to work even during the rainy season. Getting urban farmers to engage in vegetable production throughout the year as part of the edible urban landscape transformation requires that the seasonal nature of their work be broken. This can be achieved through guaranteed market and/or prices using appropriate combination of production contracts and market schemes that stabilize prices for quality produce. This can be achieved at local level with the involvement of local authorities. In addition, starting with dry season production cycle could be a better way to recover considerable part of the initial investment in the first production cycle (especially if greenhouse is used) and to sustain the motivation of farmers. In addition, this project produced only tomatoes in the two greenhouses but the outdoor production was based on garden eggs and pepper. It is important to trial out different crops and production systems or schemes (i.e. greenhouse vs non-greenhouse) to reduce risks and examine what works well for whom. Currently, cucumbers and sweet peppers are being produced in the greenhouses

by the School of Agriculture, University of Cape Coast, to see how these crops perform. Use of greenhouse or non-greenhouse production should be dictated by contextual factors such as land size, period of lease for use, nature of landscape elements, farmer capacity, among others. It is possible and cost-effective, for example, to incorporate edible plants in recreational areas to enrich biodiversity, provide opportunities for learning, and raise interest in backyard gardening and edible landscapes without worrying about revenue from the production. Those caretakers of the recreational grounds could benefit from access to the food produced from these areas as they would concurrently manage the crops and recreational grounds.

Address cost of production: The main concern during the stakeholder forum was the huge capital outlay for the greenhouse package, which is beyond the pocket of most prospective farmers. In addition, the huge cost implies a need for longer term lease of land to enable farmers recover the cost of the kit. While use of greenhouse is not mandatory, it gives a sense of quality and an appearance of serious business to both farmers and buyers. While government can technically and financially support interested persons, farmers can also form cooperatives to acquire the technology provided stable markets and prices can be secured. Greenhouse production could be more secure from praedial larceny compared to non-greenhouse systems which currently incur production penalties from praedial larceny. Hence, while greenhouse production is an option, ways to ease the acquisition and raise the profitability of greenhouse production should be identified. For example, part of budget for urban transformation or agriculture can be allocated to planned edible urban landscapes. Alternatively, landowners unwilling to give their parcels of land and/or unable to maintain their parcels to a desirable standard can be levied to provide support for edible urban landscape farmers and incentives to landowners who release their idle lands for such projects. Local production or assembling of the greenhouse could probably help reduce cost and make it more amenable to the local conditions.

Access to water influences usability of a site: Access to a reliable source of clean water is crucial to successful edible urban landscape production, especially in the dry season, regardless of whether greenhouse or non-greenhouse production is adopted. Greenhouse production would require irrigation throughout the year and this should be coupled with the water requirement for the landscaping plants. Cape Coast lies in the coastal savannah zone and, as such, receives less rainfall compared to the forest belt. Intra-seasonal dry spells are common even during the rainy season and the dry season can be harsh. Until the Brimsu river, the source of water supply for Cape Coast, was dredged recently, droughts or low water levels during the dry season often led to closure of schools and businesses in Cape Coast. The current project relied on pipe-borne water supply from benevolent neighbouring residents to irrigate the crops in the greenhouses and the landscaped area. This arrangement did not come easily, due to the prevalence of conflicts over water bills in multi-user dwellings, and it had considerable influence on the final selection of the sites. It is probable that most idle parcels in urban areas would not have water supply (as, normally, developers bring utility services to the site after completing the building) but would be close to portable water source from mains or a residential unit. Decisions on direct supply from the Ghana Water Company Ltd. and related arrangements or tapping from a nearby property need to be made in advance. It is therefore important that access to a reliable source of clean water supply is given due consideration in site selection for future edible urban landscape projects.

Gender issues: In Ghana, there are very few female farmers in the urban core. However, at the periphery, some women (often with their husbands or families) cultivate idle parcels. This is because, unlike men who would normally occupy an idle land for cultivation and later seek the consent of the owner, women normally prefer to operate from a safe space and arrangement, which is often not easy a priori. The current project provided short term jobs, experience and skills to four young females and another four young males, who were all enthusiastic about the project. The only urban farmer found to cultivate an idle residential plot was a woman. Thus, this project had a strong gender balance in its operationalization. By so doing, within the short life of this project, these young people had something to wake up to and a payment to look forward to at the end of the month. This is empowering considering that graduate unemployment has exploded in Ghana and unemployed graduates are not given the same financial support as when they were students. Because of the potential adverse outcomes of unemployment and weak finances for girls or women, this project, at least, empowered the employed women even if temporarily. Women and children also visited the sites for recreational purposes and curiosity learning by the kids. However, the stakeholder forum had fewer women because of the nature of representation, a situation over which the project team had no control. For example, the vegetable

wing of the market women association was invited but they sent only one representative. Other bodies (e.g. regional and metropolitan agricultural offices) were represented mostly by men, which highlights potential skew in gender balance in those institutions. The few women who were at the forum, were all enthusiastic about access to the greenhouse package for their own production. Going forward, it is important to consider encouraging and facilitating the participation of women in such activities.

Sustainability and Future Directions

Overall, it is clear from the project that there is considerable scope or opportunity for transforming the urban landscape in Ghana through the use of idle spaces to deliver food, jobs and beautiful scenery in the context of multifunctional land use. This can be achieved through judicious combination of policy, regulation, and practice in a multi-stakeholder context. It is important to bring together policy makers, planners, landowners, farmers, landscapists, market women and value chain actors, hoteliers and restaurant owners, among others, to devise a harmonious and actionable plan towards the implementation of edible urban landscapes. Considerable land surfaces in the urban areas in Ghana are bare and dusty, and edible urban landscapes can be an approach to cover and beautify these areas while providing incomes, edible produce and other benefits to urban dwellers.

Based on the outputs and outcomes from the current project, the School of Agriculture (University of Cape Coast) has taken over the management of and production in the greenhouses, as well as the maintenance of the landscape to sustain the project. Sustainability of the current edible urban landscape project, based on greenhouse production, hinges on two factors: continuous funding or profitability and human resource capacity. This project has learnt and built human capacity. While the original source of funding has ended, the takeover by the School of Agriculture for teaching and research as primary focus while generating revenue from sales of produce would ensure the sustainability of the project. In addition, the School of Agriculture is able to switch some of its labourers to work on the site as part of the regular schedules and thereby reduce its cost. For large up- or out-scaling purposes, it is important to secure stable market outlets for the produce from edible urban landscapes (especially in greenhouses) as the fulcrum of sustainability and exit strategy. For non-greenhouse production, sustainability and exit strategies would depend on the purpose of production: commercial, subsistence, or a mix of the two, or simply to serve environmental goals such as urban beautification and promotion of active management of recreational grounds. For non-commercial production, active interest by non-producing actors (through formal recognition, protection and support) would be crucial for sustainability.

Multi-stakeholder Approach for Up- and Out-scaling

Poor physical and land use planning underpin the chaotic evolution and spatial expansion of cities and towns in Sub-Saharan Africa. Worse, urban landscapes are rarely considered or planned and are not part of the discourse on urban development. Yet, landscapes are known to play crucial roles in social, economic, and cultural resilience in cities and towns. Hence, designing basic forms of appealing and functional urban landscapes is essential to the drive towards resilience, which relates to the ability to maintain or improve the supply of life support services and products (such as food and water) in the face of disturbance. Food security and seasonality of fresh produce (especially vegetables) are a challenge in urban centres in Ghana. Based on the concept of edible urban landscapes and the principles espoused in this project, it is evident that the urban landscapes of Ghana and Sub-Saharan Africa can be transformed into green, productive, and resilient forms. The current project points to a feasible pathway to resilience and urban wellbeing through the transformation of idle and unmanaged spaces into beautiful and productive multifunctional landscapes. Moving beyond this pilot requires multi-stakeholder mobilization of policies, regulations, knowledge, finance and incentives.

Policy: In Ghana, urban farming already plays crucial roles in material cycling and food supply. However, urban farming is not part of the rubric of urban planning and agricultural development. In addition, agricultural policies tend to focus on traditional, rural production systems. The pilot project demonstrates a need to recognize urban farming as an important component of the urban structure and functioning. As a result, policies on agriculture, food security and urban management should recognize

edible urban landscapes as a multi-functional land use and management approach essential to urban sustainability and resilience. Just as Singapore made a deliberate policy on urban agriculture to augment food security, Ghana ought to direct policy attention to edible urban landscapes as an approach to transform idle, degraded, unmanaged and even dusty spaces into green, productive and beautiful spaces to augment food supply, support active living and human wellbeing. The ongoing Fertilizer Subsidy Policy and the Planting for Food and Jobs need to be inclusive of urban production, which in turn would include edible urban landscapes. Such a policy posture would send positive signal to the business, finance, and producer communities, as well as urban managers to support edible urban landscapes. Thus, government needs to provide a supportive policy environment in which other actors can actively pursue edible urban landscapes both as a business or social wellbeing activity.

Regulation: Laws and administrative procedures are crucial for successful up- and out-scaling of edible urban landscapes. Laws and regulations govern the acquisition, ownership, use and disposal of land in the urban area. Even though there were several potential sites, access to land was a major challenge to this project. While the law in Ghana permits private ownership of land, land use and physical planning, and land administration in general, are the responsibilities of public agencies. Poor land administration and inefficient justice system have meant an erosion of the customary trust with which persons lease land to others for various purposes, whether short- or long-term. Registering and obtaining a title deed for one's piece of land is a very cumbersome and expensive process. As a result, very few parcels of land bear title deed. Multiple sale of the same piece of land and informal occupation of vacant lands is commonplace. As a result, the cost of defending a piece of land is higher than the cost of acquiring that same piece of land. Stronger and effectively enforced regulatory framework for land use and physical planning, land ownership and transactions are prerequisites for successful up- and out-scaling of the edible urban landscape project. This will enable regulated access to available urban spaces for subsequent use as edible urban landscape. It will provide security for both the owner and tenant. City managers can also use their authority for local regulations to drive formal acquisition and management of open spaces for edible urban landscapes. For example, incorporation or consideration of urban farming from edible landscapes perspectives into urban planning and development schemes would create the needed physical space for such purposes.

Finance and Incentives: Scaling up or out the edible urban landscape project depends on access to finance to acquire the productive resources and engage in actual operations. It was obvious that the protected (greenhouse) production could be more reasonable, secure and profitable in the context of edible urban landscapes, but the capital outlay is huge. The greenhouse production can deliver high yields and quality produce throughout the year if well planned and managed. Here, businesses and investors are required. As individual urban farmers (current or prospective) might not have the financial capacity to acquire and operate such production systems, businesses can. These can be encouraged to enter into edible urban landscape enterprises. Investors can equally support farmer groups or individual farmers to acquire these systems. It is here that incentives to investors and businesses would enable up- and out-scaling. Incentives here could include, crucially, linking production to markets or buyers through direct production contracts or to a value chain. It could also include providing cost-effective, formal access to land and production resources (e.g. water), tax breaks, or delayed or reasonable terms of payment of loans. By so doing, it is possible to demonstrate that the production can be profitable and self-sustaining over time. For example, hotels and restaurants in Cape Coast have to rely on tomatoes, onions and other vegetables from outside the Central Region during the dry season.

This suggests that city authorities, businesses and investors can collaborate to address this gap through edible urban landscape enterprises that produce quality vegetables during the dry season or throughout the year. The rationale for such collaboration would be to invest in the beautification, food security, job creation and human wellbeing in the city. Financing schemes, together with technical support, from government and the investor community could therefore make edible urban landscapes attractive to young people. While the open production (non-greenhouse) could generate a more beautiful landscape, it requires further investments for security and protection from the vagaries of the weather, pests and diseases in order to deliver quality produce on consistent basis. However, it is still possible to use it to achieve both social (community) and business goals. Mobilizing an appropriate level of finance and incentives requires the cooperation between government, local or city authorities, producers and the business and investment communities.

Knowledge: Practice without theory is dangerous. Successful up- and out-scaling of the edible urban landscape concept or project needs to be backed by technical knowledge. Here, the experience gathered through this project and the existing expertise and knowledge in crop production at the University of Cape Coast would be crucial. The project team would need to continue to work with Dizengoff Ghana Ltd. and similar businesses, government, local or city authorities, edible landscapists and other stakeholders to provide support to up- and out-scaling effort. The project team and researchers would also need to continue to conduct research on ways to improve productivity and profitability as well as the socio-ecological sustainability of edible urban landscape activities. Knowledge can be shared through farmer field schools, demonstration sites and farmer to farmer learning.

Conclusions and Recommendations

This pilot project has demonstrated the feasibility and benefits of transforming idle, unmanaged urban spaces, that detract from urban beauty and sustainability, into green, beautiful, productive sites that support multiple goals. These goals include food supply, job creation, environmental protection, active living and learning, and overall human wellbeing. The concept of edible urban landscape which was piloted in this project has manifold benefits and potential as components of adaptive response to urban development challenges such as food security, poverty and climate change. The overall lesson from the project is that idle spaces, which abound in Ghana's urban areas (and potentially in Sub-Saharan Africa), should not continue to remain as such but rather, their transformation should be a rational must and integral component of urban transformation, development and resilience. It holds promise as an entrepreneurial avenue in the greening and management of open spaces in urban areas. It is recommended that government authorities, urban managers, investors and businesses cooperate and work together with researchers and producers to mobilize the requisite policies, regulations, finance, incentives and knowledge for successful up- and out-scaling.

Key messages from this project

- 1) Idle or unmanaged urban spaces should not continue to detract from urban beauty, productivity and sustainability but be transformed into green, productive and beautiful sites.
- 2) Edible urban landscapes (harmonious co-existence of food production, landscape aesthetics, and urban structures) are feasible pathways to land use intensification to derive multiple socio-ecological benefits (products and services) from a given piece of land.
- 3) Edible urban landscapes need to be integrated into urban physical and land use planning to make it attractive, secure, and sustainable.
- 4) There is a need for multi-stakeholder mobilization of laws, policies, knowledge and incentives to deploy edible urban landscapes as components of adaptive responses to challenges related to food security, job creation, poverty reduction, climate change, environmental protection, active living and human wellbeing.

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Annexes

Annex 1: Distribution of ownership & predisposition towards multifunctional land use in the 2 districts (n=307)

VARIABLES	CAPE COAST	KEEA	INFERENTIAL STATS.
<i>Nature of land ownership</i>			
	%	%	
Owned with title deed	66	34	<i>Pearson $\chi^2(4) = 34.5041$; Pr = 0.000; Cramér's V = 0.3352</i>
Owned without title deed	77	23	
Rented	75	25	
Owned by parents	75	25	
Communal/ government	10	90	
<i>Derive benefits/profits from agricultural lands in your residence</i>			
Strongly disagree	70	30	<i>Pearson $\chi^2(4) = 29.1654$; Pr = 0.000; Cramér's V = 0.2437</i>
Somewhat disagree	39	61	
Neither agree nor disagree	55	45	
Somewhat agree	85	15	
Strongly agree	75	25	
<i>Willingness to forfeit present benefits for multifunctional land use</i>			
No	78	22	<i>Pearson $\chi^2(1) = 7.0589$; Pr = 0.008; Cramér's V = 0.1378</i>
Yes	66	34	
<i>Willingness to give all of your land for free</i>			
No	69	31	<i>Pearson $\chi^2(1) = 4.5324$; Pr = 0.033; Cramér's V = -0.1104</i>
Yes	82	18	
<i>I am sufficiently informed about the concept of multifunctional land use</i>			
No	66	34	<i>Pearson $\chi^2(1) = 5.7074$; Pr = 0.017; Cramér's V = -0.1075</i>
Yes	76	24	
<i>I will support media campaign to implement multifunctional land use</i>			
Strongly disagree	26	74	<i>Pearson $\chi^2(4) = 118.1589$; Pr = 0.000; Cramér's V = 0.4891</i>
Somewhat disagree	23	77	
Neither agree nor disagree	71	29	
Somewhat agree	85	15	
Strongly agree	82	18	
<i>I will consider renting my land for crop production</i>			
Strongly disagree	62	38	<i>Pearson $\chi^2(4) = 75.1352$; Pr = 0.000; Cramér's V = 0.3900</i>
Somewhat disagree	32	68	
Neither agree nor disagree	67	33	
Somewhat agree	77	23	
Strongly agree	89	11	
<i>I am willing to sell my land for multi-functional land use purposes</i>			
Strongly disagree	71	29	<i>Pearson $\chi^2(4) = 22.1874$; Pr = 0.000; Cramér's V = 0.2119</i>
Somewhat disagree	47	53	
Neither agree nor disagree	76	24	
Somewhat agree	78	22	
Strongly agree	88	12	
<i>I will financially support any campaign to implement multifunctional land use</i>			
Strongly disagree	52	48	<i>Pearson $\chi^2(4) = 83.9237$; Pr = 0.000; Cramér's V = 0.4122</i>
Somewhat disagree	41	59	
Neither agree nor disagree	89	11	
Somewhat agree	72	28	
Strongly agree	94	6	
<i>I will voluntarily convince my neighbours to embrace multifunctional land use</i>			
Strongly disagree	39	61	<i>Pearson $\chi^2(4) = 77.8089$; Pr = 0.000; Cramér's V = 0.3969</i>
Somewhat disagree	23	77	
Neither agree nor disagree	55	45	
Somewhat agree	78	22	
Strongly agree	82	18	

Annex 2: Willingness to accept multifunctional land use in urban settings (n=307)

Variables	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree	Inferential Statistics
<i>Nature of land ownership</i>							
Owned with title deed	9	13	16	28	29	6	Pearson $\chi^2(20) =$ 21.9481; $Pr = 0.343$; Cramér's $V =$ 0.1337
Owned without title deed	11	9	15	28	34	4	
Rented	15	20	10	35	15	5	
Owned by parents	7	9	15	28	26	15	
Communal/ government	0	40	10	20	30	0	
<i>Derive benefits/profits from agricultural lands in your residence</i>							
Strongly disagree	12	14	15	17	32	10	Pearson $\chi^2(20) =$ 96.9324; $Pr = 0.000$; Cramér's $V =$ 0.2222
Somewhat disagree	21	27	12	18	15	6	
Neither agree nor disagree	13	18	18	15	28	10	
Somewhat agree	3	7	12	46	22	10	
Strongly agree	0	2	12	37	40	9	
<i>Willingness to forfeit present benefits for multifunctional land use</i>							
No	3	6	18	40	26	7	Pearson $\chi^2(5)$ $= 35.2965$; $Pr = 0.000$; Cramér's $V =$ 0.3080
Yes	11	15	10	20	33	11	
<i>Willingness to give all of your land for free</i>							
No	8	11	17	29	28	7	Pearson $\chi^2(5)$ $= 18.2769$; $Pr = 0.003$; Cramér's $V =$ 0.2217
Yes	5	8	4	29	36	18	
<i>I am sufficiently informed about the concept of multifunctional land use</i>							
No	9	10	17	25	29	10	Pearson $\chi^2(5)$ $= 21.0369$; $Pr = 0.001$; Cramér's $V =$ 0.2064
Yes	3	8	9	34	37	9	
<i>I will support any media campaign to implement multifunctional land use</i>							
Strongly disagree	41	41	13	1	3	0	Pearson $\chi^2(20) =$ 415.1526; $Pr = 0.000$; Cramér's $V =$ 0.4584+
Somewhat disagree	12	42	38	4	4	0	
Neither agree nor disagree	0	14	29	43	14	0	
Somewhat agree	0	2	16	58	24	0	
Strongly agree	0	1	10	31	44	14	
<i>I will consider renting my land for crop production</i>							
Strongly disagree	22	16	29	31	2	0	Pearson $\chi^2(20) =$ 350.3585; $Pr = 0.000$; Cramér's $V =$ 0.4211
Somewhat disagree	5	30	16	44	5	0	
Neither agree nor disagree	0	9	22	49	20	0	
Somewhat agree	0	0	2	29	65	4	
Strongly agree	0	2	5	17	50	25	
<i>I am willing to sell my land for multi-functional land use purposes</i>							
Strongly disagree	9	8	17	34	32	0	Pearson $\chi^2(20) =$ 299.1025; $Pr = 0.000$; Cramér's $V =$ 0.3891
Somewhat disagree	2	33	12	18	35	0	
Neither agree nor disagree	0	7	12	32	34	15	
Somewhat agree	0	4	4	19	52	22	
Strongly agree	0	0	0	10	24	67	
<i>I will financially support any campaign to implement multifunctional land use</i>							
Strongly disagree	24	24	28	21	3	0	Pearson $\chi^2(20) =$ 353.2553; $Pr = 0.000$; Cramér's $V =$ 0.4228
Somewhat disagree	4	25	29	37	4	0	
Neither agree nor disagree	0	2	7	57	30	5	
Somewhat agree	0	1	6	36	51	6	
Strongly agree	0	0	5	17	52	27	
<i>I will voluntarily convince my neighbours to embrace multifunctional land use</i>							
Strongly disagree	44	39	14	3	0	0	Pearson $\chi^2(20) =$ 444.7182; $Pr = 0.000$; Cramér's $V =$ 0.4744
Somewhat disagree	23	50	9	18	0	0	
Neither agree nor disagree	0	21	40	24	14	0	
Somewhat agree	0	1	24	43	29	2	
Strongly agree	0	0	6	32	46	16	

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